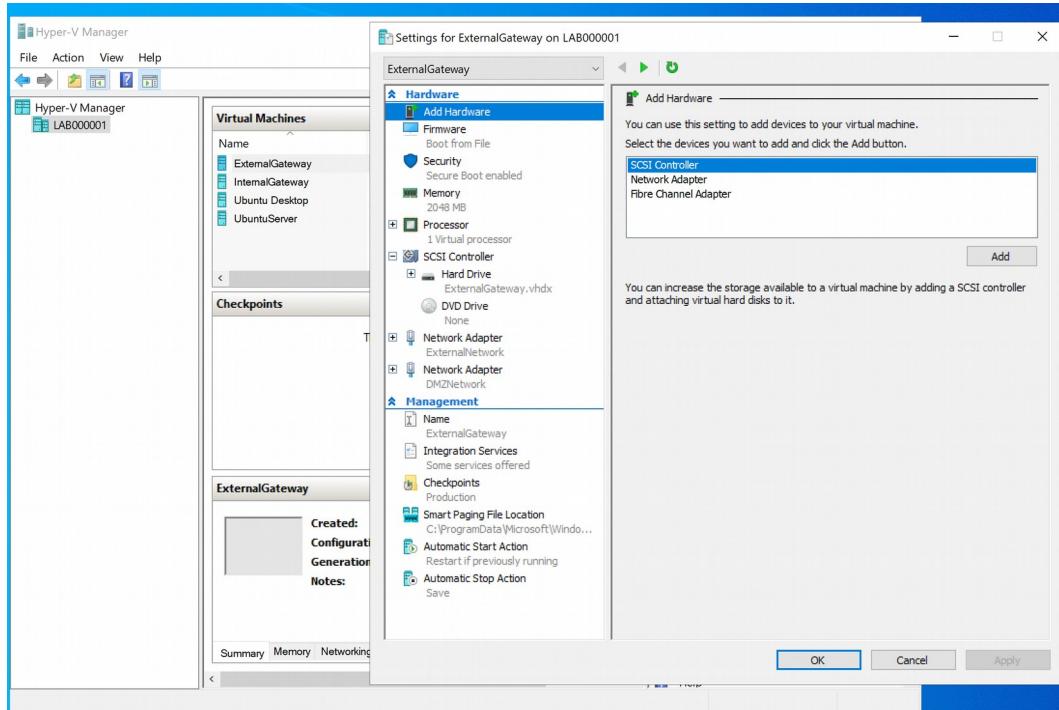
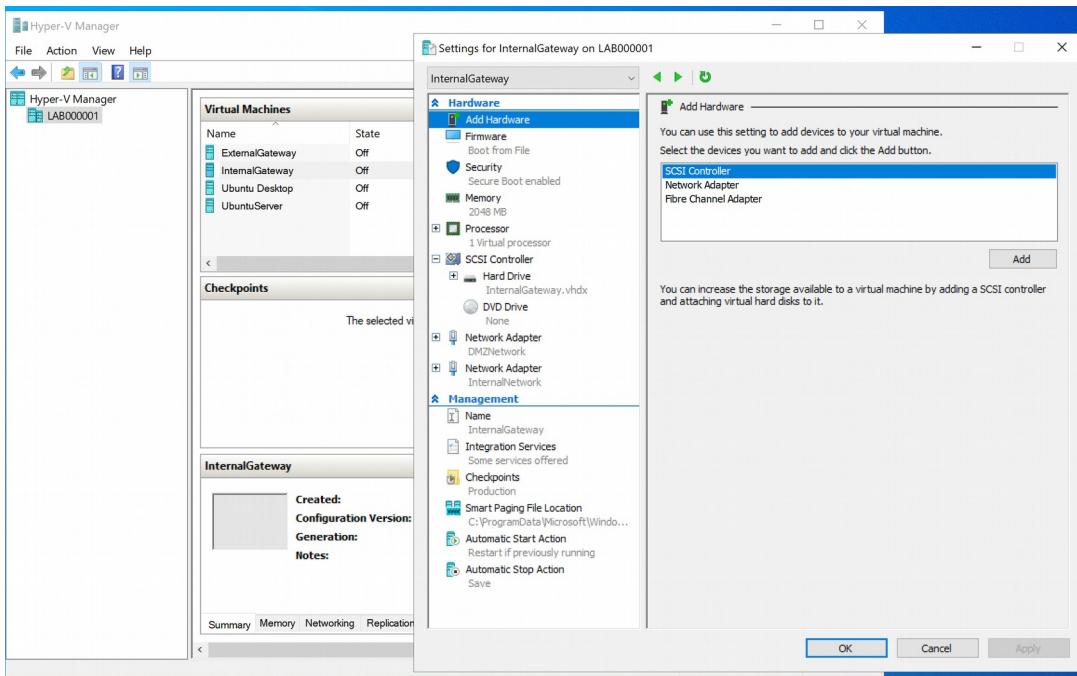


Activity 1 - DMZ Network

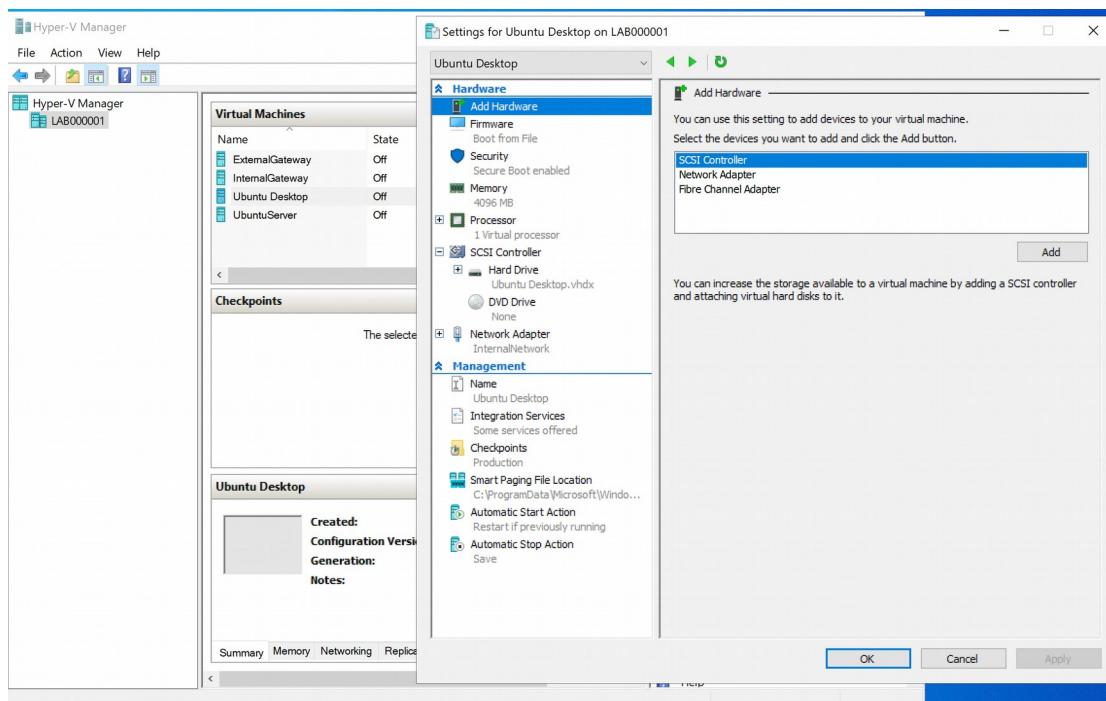
1. Change virtual switches on External Gateway:



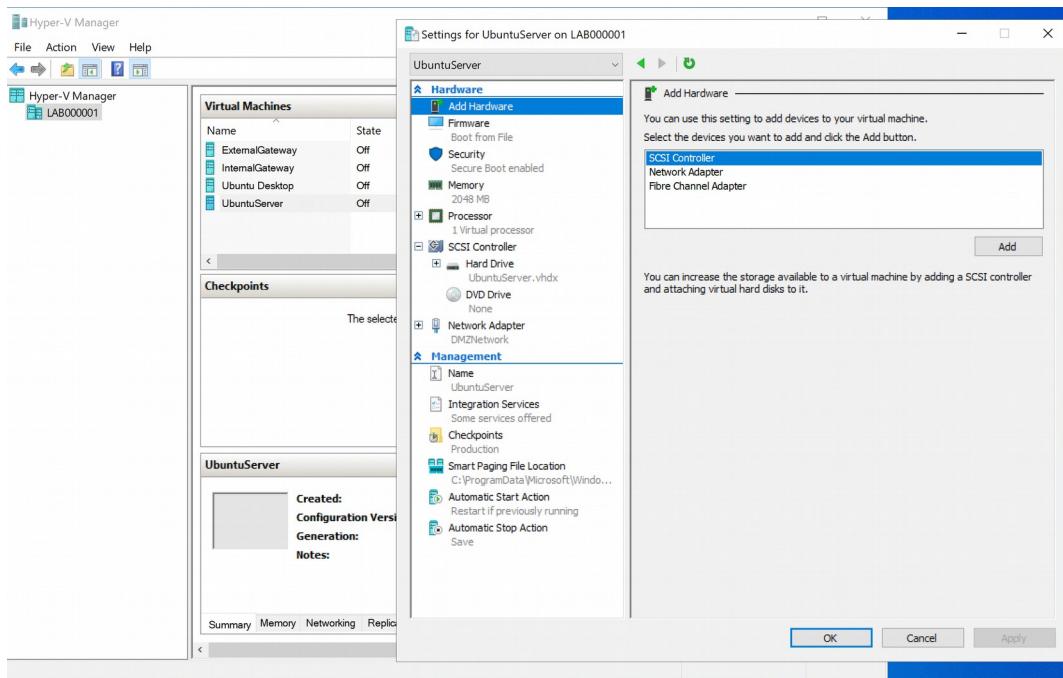
2. Change virtual switches on Internal Gateway:



3. Change virtual switches on Ubuntu Desktop:



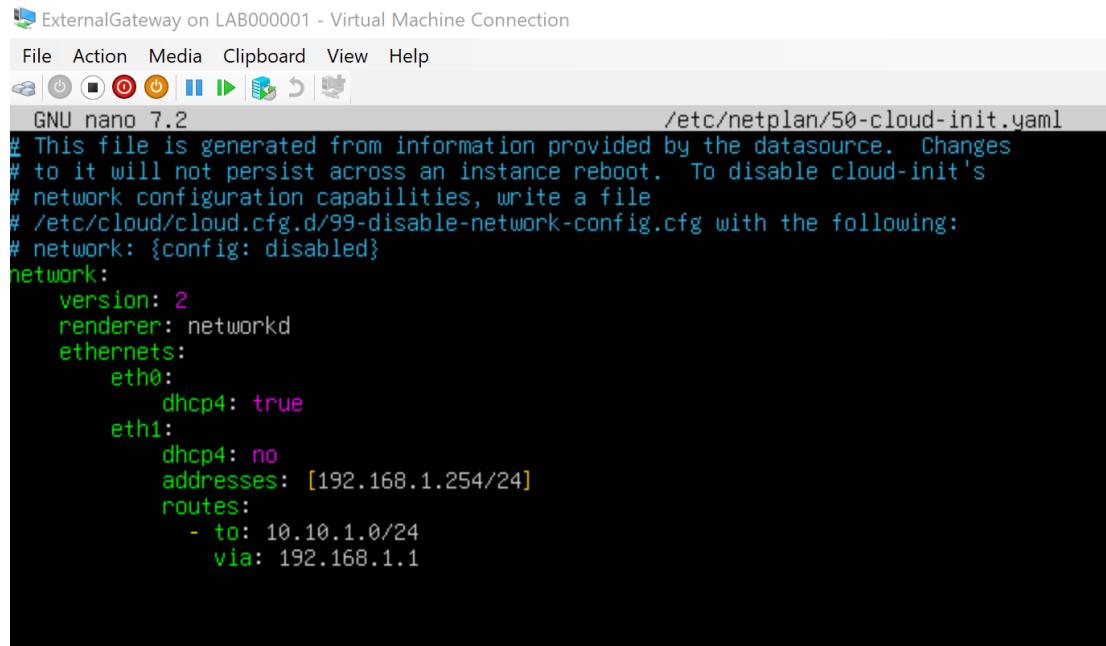
Change virtual switches on Ubuntu Server:



4. IP External Gateway:

```
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 noprefixroute
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:00:07:04 brd ff:ff:ff:ff:ff:ff
    inet 172.16.10.100/24 metric 100 brd 172.16.10.255 scope global dynamic eth0
        valid_lft 691135sec preferred_lft 691135sec
    inet6 fe80::215:5dff:fe00:704/64 scope link
        valid_lft forever preferred_lft forever
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:00:07:07 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.254/24 brd 192.168.1.255 scope global eth1
        valid_lft forever preferred_lft forever
    inet6 fe80::215:5dff:fe00:707/64 scope link
        valid_lft forever preferred_lft forever
user@externalgateway:~$
```

5. Set up IP addresses for external Gateway:



The screenshot shows a terminal window titled "ExternalGateway on LAB000001 - Virtual Machine Connection". The window contains a terminal session where the user is editing the file "/etc/netplan/50-cloud-init.yaml" using the nano text editor. The file content is as follows:

```
# This file is generated from information provided by the datasource. Changes
# to it will not persist across an instance reboot. To disable cloud-init's
# network configuration capabilities, write a file
# /etc/cloud/cloud.cfg.d/99-disable-network-config.cfg with the following:
# network: {config: disabled}
network:
  version: 2
  renderer: networkd
  ethernets:
    eth0:
      dhcp4: true
    eth1:
      dhcp4: no
      addresses: [192.168.1.254/24]
      routes:
        - to: 10.10.1.0/24
          via: 192.168.1.1
```

6. Sudo netplan External Gateway:



The screenshot shows a terminal window titled "ExternalGateway on LAB000001 - Virtual Machine Connection". The window contains a terminal session where the user runs the command "sudo netplan apply". The output shows the command was successful.

```
user@externalgateway:~$ sudo netplan apply
user@externalgateway:~$
```

7. IP Internal Gateway:

```
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-36-generic x86_64)

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

System information as of Wed Jul 17 10:27:25 AM UTC 2024

System load: 0.46 Processes: 98
Usage of /: 34.7% of 12.25GB Users logged in: 0
Memory usage: 11% IPv4 address for eth0: 192.168.1.1
Swap usage: 0%

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

The list of available updates is more than a week old.
To check for new updates run: sudo apt update
Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection or proxy settings

user@internalgateway:~$ 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 noprefixroute
                valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:00:07:05 brd ff:ff:ff:ff:ff:ff
        inet 192.168.1.1/24 brd 192.168.1.255 scope global eth0
            valid_lft forever preferred_lft forever
            inet6 fe80::215:5dff:fe00:705/64 scope link
                valid_lft forever preferred_lft forever
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:00:07:08 brd ff:ff:ff:ff:ff:ff
        inet 10.10.1.254/24 brd 10.10.1.255 scope global eth1
            valid_lft forever preferred_lft forever
            inet6 fe80::215:5dff:fe00:708/64 scope link
                valid_lft forever preferred_lft forever
user@internalgateway:~$
```

8. Set up IP addresses for external Gateway:

```
GNU nano 7.2                                     /etc/netplan/50-cloud-init.yaml
# This file is generated from information provided by the datasource. Changes
# to it will not persist across an instance reboot. To disable cloud-init's
# network configuration capabilities, write a file
# /etc/cloud/cloud.cfg.d/99-disable-network-config.cfg with the following:
# network: {config: disabled}
network:
  version: 2
  ethernets:
    eth0:
      dhcp4: no
      addresses:
        - 192.168.1.1/24
      routes:
        - to: 0.0.0.0/0
          via: 192.168.1.254
    eth1:
      addresses:
        - 10.10.1.254/24
```

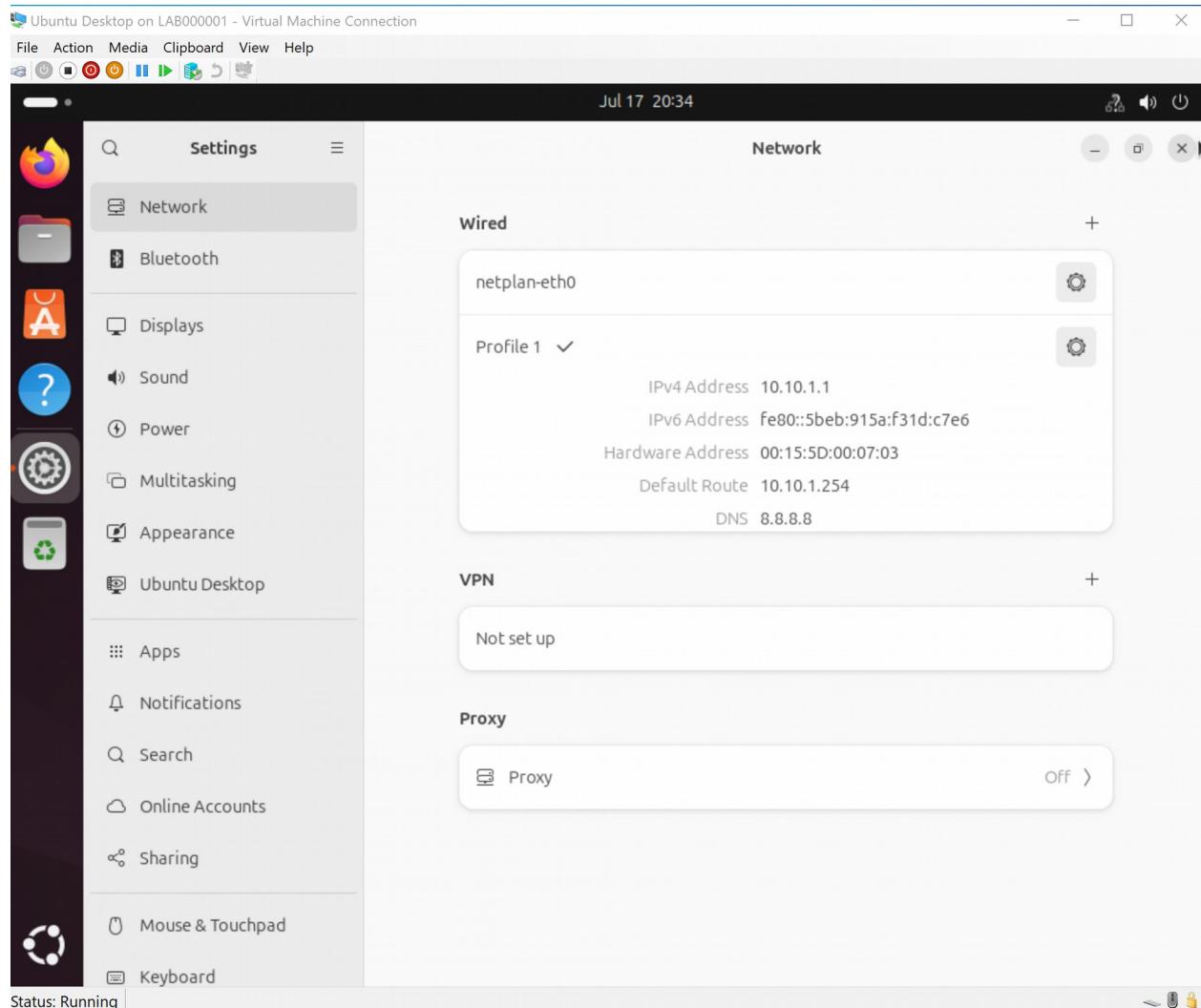
9. Sudo netplan Internal Gateway:

InternalGateway on LAB000001 - Virtual Machine Connection

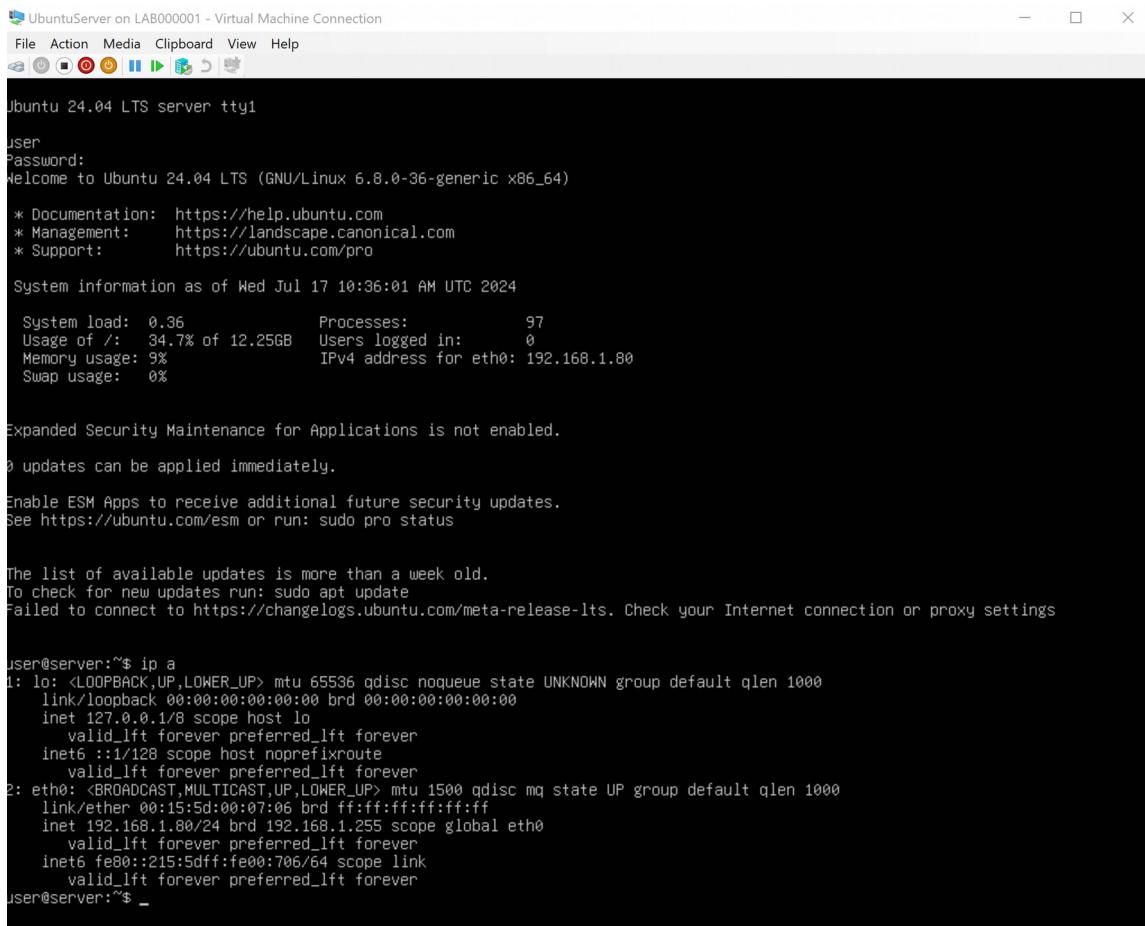
File Action Media Clipboard View Help

user@internalgateway:~\$ sudo netplan apply
user@internalgateway:~\$

10. IP set addresses for Ubuntu Desktop:



11. IP Ubuntu Server:



UbuntuServer on LAB000001 - Virtual Machine Connection

File Action Media Clipboard View Help

```
Ubuntu 24.04 LTS server tty1

user
Password:
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-36-generic x86_64)

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

System information as of Wed Jul 17 10:36:01 AM UTC 2024

 System load: 0.36      Processes:         97
 Usage of /: 34.7% of 12.25GB  Users logged in:     0
 Memory usage: 9%          IPv4 address for eth0: 192.168.1.80
 Swap usage:  0%

Expanded Security Maintenance for Applications is not enabled.

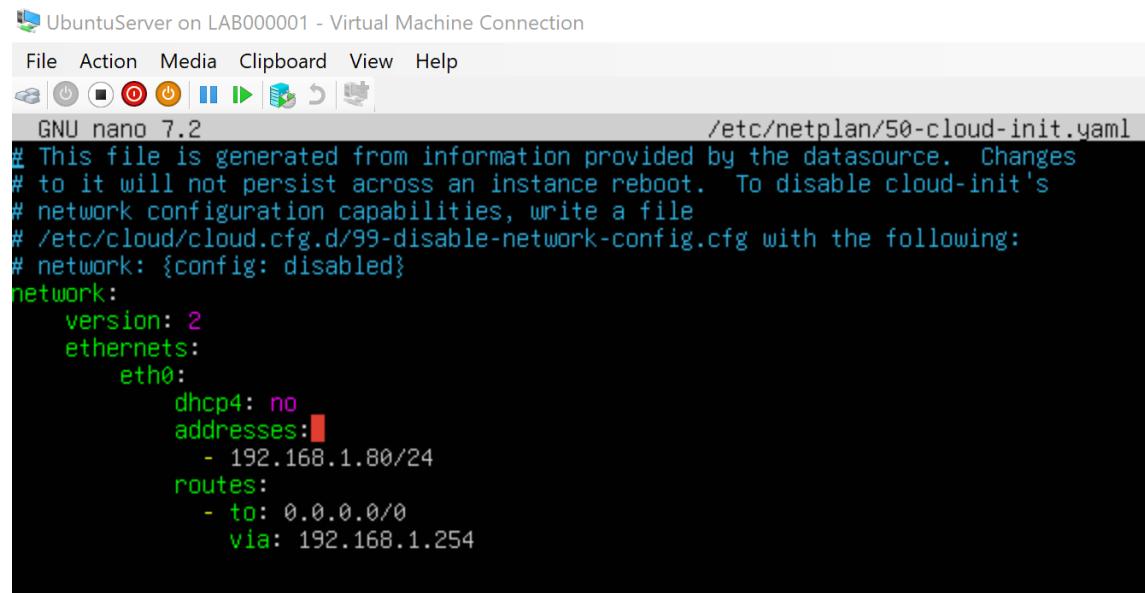
0 updates can be applied immediately.

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

The list of available updates is more than a week old.
To check for new updates run: sudo apt update
Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection or proxy settings

user@server:~$ 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 noprefixroute
                valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:00:07:06 brd ff:ff:ff:ff:ff:ff
        inet 192.168.1.80/24 brd 192.168.1.255 scope global eth0
            valid_lft forever preferred_lft forever
            inet6 fe80::215:5dff:fe00:706/64 scope link
                valid_lft forever preferred_lft forever
user@server:~$ _
```

12. Set up IP addresses for Ubuntu Server:

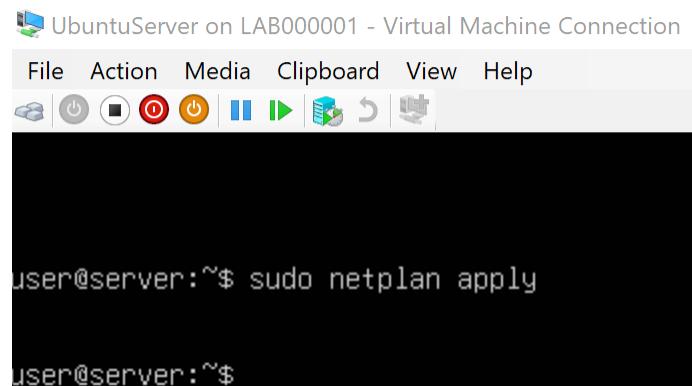


UbuntuServer on LAB000001 - Virtual Machine Connection

File Action Media Clipboard View Help

```
GNU nano 7.2                                     /etc/netplan/50-cloud-init.yaml
# This file is generated from information provided by the datasource. Changes
# to it will not persist across an instance reboot. To disable cloud-init's
# network configuration capabilities, write a file
# /etc/cloud/cloud.cfg.d/99-disable-network-config.cfg with the following:
# network: {config: disabled}
network:
  version: 2
  ethernets:
    eth0:
      dhcp4: no
      addresses: []
        - 192.168.1.80/24
      routes:
        - to: 0.0.0.0/0
          via: 192.168.1.254
```

13. Sudo netplan apply:



UbuntuServer on LAB000001 - Virtual Machine Connection

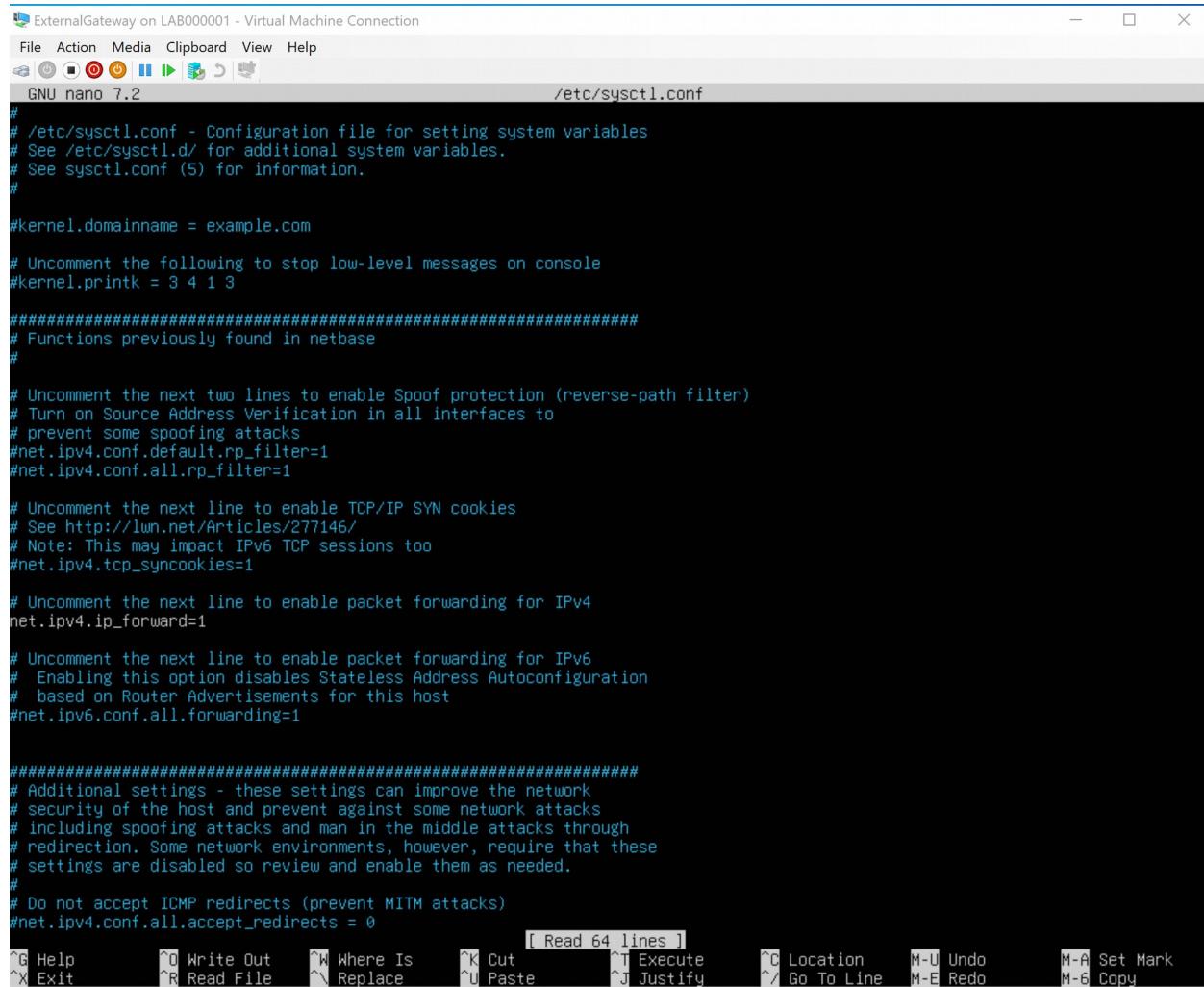
File Action Media Clipboard View Help

[Icons]

```
user@server:~$ sudo netplan apply

user@server:~$
```

14.External gateway IP forwarding enabled:



ExternalGateway on LAB000001 - Virtual Machine Connection

File Action Media Clipboard View Help

[Icons]

GNU nano 7.2 /etc/sysctl.conf

```
# /etc/sysctl.conf - Configuration file for setting system variables
# See /etc/sysctl.d/ for additional system variables.
# See sysctl.conf (5) for information.
#
#kernel.domainname = example.com

# Uncomment the following to stop low-level messages on console
#kernel.printk = 3 4 1 3

#####
# Functions previously found in netbase
#

# Uncomment the next two lines to enable Spoof protection (reverse-path filter)
# Turn on Source Address Verification in all interfaces to
# prevent some spoofing attacks
#net.ipv4.conf.default.rp_filter=1
#net.ipv4.conf.all.rp_filter=1

# Uncomment the next line to enable TCP/IP SYN cookies
# See http://lwn.net/Articles/277146/
# Note: This may impact IPv6 TCP sessions too
#net.ipv4.tcp_syncookies=1

# Uncomment the next line to enable packet forwarding for IPv4
net.ipv4.ip_forward=1

# Uncomment the next line to enable packet forwarding for IPv6
# Enabling this option disables Stateless Address Autoconfiguration
# based on Router Advertisements for this host
#net.ipv6.conf.all.forwarding=1

#####
# Additional settings - these settings can improve the network
# security of the host and prevent against some network attacks
# including spoofing attacks and man in the middle attacks through
# redirection. Some network environments, however, require that these
# settings are disabled so review and enable them as needed.
#
# Do not accept ICMP redirects (prevent MITM attacks)
#net.ipv4.conf.all.accept_redirects = 0
```

[Read 64 lines]

Keyboard Shortcuts:

- ^G Help
- ^O Write Out
- ^W Where Is
- ^K Cut
- ^T Execute
- ^C Location
- M-U Undo
- M-A Set Mark
- ^X Exit
- ^R Read File
- ^V Replace
- ^U Paste
- ^J Justify
- ^Y Go To Line
- M-B Redo
- M-C Copy

```

ExternalGateway on LAB000001 - Virtual Machine Connection
File Action Media Clipboard View Help
user@externalgateway:~$ 
user@externalgateway:~$ 
user@externalgateway:~$ sudo sysctl -p
net.ipv4.ip_forward = 1
user@externalgateway:~$ sysctl net.ipv4.ip_forward
net.ipv4.ip_forward = 1
user@externalgateway:~$ 

```

15. Internal gateway IP forwarding enabled:

```

InternalGateway on LAB000001 - Virtual Machine Connection
File Action Media Clipboard View Help
GNU nano 7.2 /etc/sysctl.conf
#
# /etc/sysctl.conf - Configuration file for setting system variables
# See /etc/sysctl.d/ for additional system variables.
# See sysctl.conf (5) for information.
#
#kernel.domainname = example.com
# Uncomment the following to stop low-level messages on console
#kernel.printk = 3 4 1 3
#####
# Functions previously found in netbase
#
# Uncomment the next two lines to enable Spoof protection (reverse-path filter)
# Turn on Source Address Verification in all interfaces to
# prevent some spoofing attacks
#net.ipv4.conf.default.rp_filter=1
#net.ipv4.conf.all.rp_filter=1
#
# Uncomment the next line to enable TCP/IP SYN cookies
# See http://lwn.net/Articles/277146/
# Note: This may impact IPv6 TCP sessions too
#net.ipv4.tcp_syncookies=1
#
# Uncomment the next line to enable packet forwarding for IPv4
net.ipv4.ip_forward=1
#
# Uncomment the next line to enable packet forwarding for IPv6
# Enabling this option disables Stateless Address Autoconfiguration
# based on Router Advertisements for this host
#net.ipv6.conf.all.forwarding=1
#####
# Additional settings - these settings can improve the network
# security of the host and prevent against some network attacks
# including spoofing attacks and man in the middle attacks through
# redirection. Some network environments, however, require that these
# settings are disabled so review and enable them as needed.
#
# Do not accept ICMP redirects (prevent MITM attacks)
#net.ipv4.conf.all.accept_redirects = 0

```

[Read 64 lines]

$\wedge G$ Help $\wedge O$ Write Out $\wedge W$ Where Is $\wedge K$ Cut $\wedge T$ Execute $\wedge C$ Location $M-U$ Undo
 $\wedge X$ Exit $\wedge R$ Read File $\wedge R$ Replace $\wedge U$ Paste $\wedge J$ Justify $\wedge /$ Go To Line $M-E$ Redo $M-A$ Set Mark
 $M-6$ Copy

InternalGateway on LAB000001 - Virtual Machine Connection

```
File Action Media Clipboard View Help
Disk | Power | Stop | Start | Run | Stop | Help | Network

# Do not accept ICMP redirects (prevent MITM attacks)
#net.ipv4.conf.all.accept_redirects = 0

user@internalgateway:~$ sudo sysctl -p
net.ipv4.ip_forward = 1
user@internalgateway:~$ sysctl net.ipv4.ip_forward
sysctl: cannot stat /proc/sys/net/ipv4/ip_forward: No such file or directory
user@internalgateway:~$ sysctl net.ipv4.ip_forward
net.ipv4.ip_forward = 1
user@internalgateway:~$
```

16.Ubuntu server IP forwarding enabled:

UbuntuServer on LAB000001 - Virtual Machine Connection

```
File Action Media Clipboard View Help
Disk | Power | Stop | Start | Run | Stop | Help | Network

GNU nano 7.2          /etc/sysctl.conf

# /etc/sysctl.conf - Configuration file for setting system variables
# See /etc/sysctl.d/ for additional system variables.
# See sysctl.conf (5) for information.
#
#kernel.domainname = example.com
#
# Uncomment the following to stop low-level messages on console
#kernel.printk = 3 4 1 3
#####
# Functions previously found in netbase
#
#
# Uncomment the next two lines to enable Spoof protection (reverse-path filter)
# Turn on Source Address Verification in all interfaces to
# prevent some spoofing attacks
#net.ipv4.conf.default.rp_filter=1
#net.ipv4.conf.all.rp_filter=1
#
# Uncomment the next line to enable TCP/IP SYN cookies
# See http://lwn.net/Articles/277146/
# Note: This may impact IPv6 TCP sessions too
#net.ipv4.tcp_syncookies=1
#
# Uncomment the next line to enable packet forwarding for IPv4
net.ipv4.ip_forward=1
#
# Uncomment the next line to enable packet forwarding for IPv6
# Enabling this option disables Stateless Address Autoconfiguration
# based on Router Advertisements for this host
#net.ipv6.conf.all.forwarding=1
#####
# Additional settings - these settings can improve the network
# security of the host and prevent against some network attacks
# including spoofing attacks and man in the middle attacks through
# redirection. Some network environments, however, require that these
# settings are disabled so review and enable them as needed.
#
# Do not accept ICMP redirects (prevent MITM attacks)
#net.ipv4.conf.all.accept_redirects = 0
```

[Read 64 lines]

G Help T O Write Out W Where Is K Cut T Execute C Location M-U Undo M-A Set Mark
X Exit R Read File ^\ Replace U Paste J Justify ^ Go To Line M-E Redo M-C Copy

 UbuntuServer on LAB000001 - Virtual Machine Connection
File Action Media Clipboard View Help


```
# Do not accept ICMP redirects (prevent MITM attacks)
#net.ipv4.conf.all.accept_redirects = 0

user@server:~$ sudo sysctl -p
net.ipv4.ip_forward = 1
user@server:~$ sysctl net.ipv4.ip_forward
net.ipv4.ip_forward = 1
user@server:~$
```

17.Iptable External Gateway:

18. Check the connection to internet:

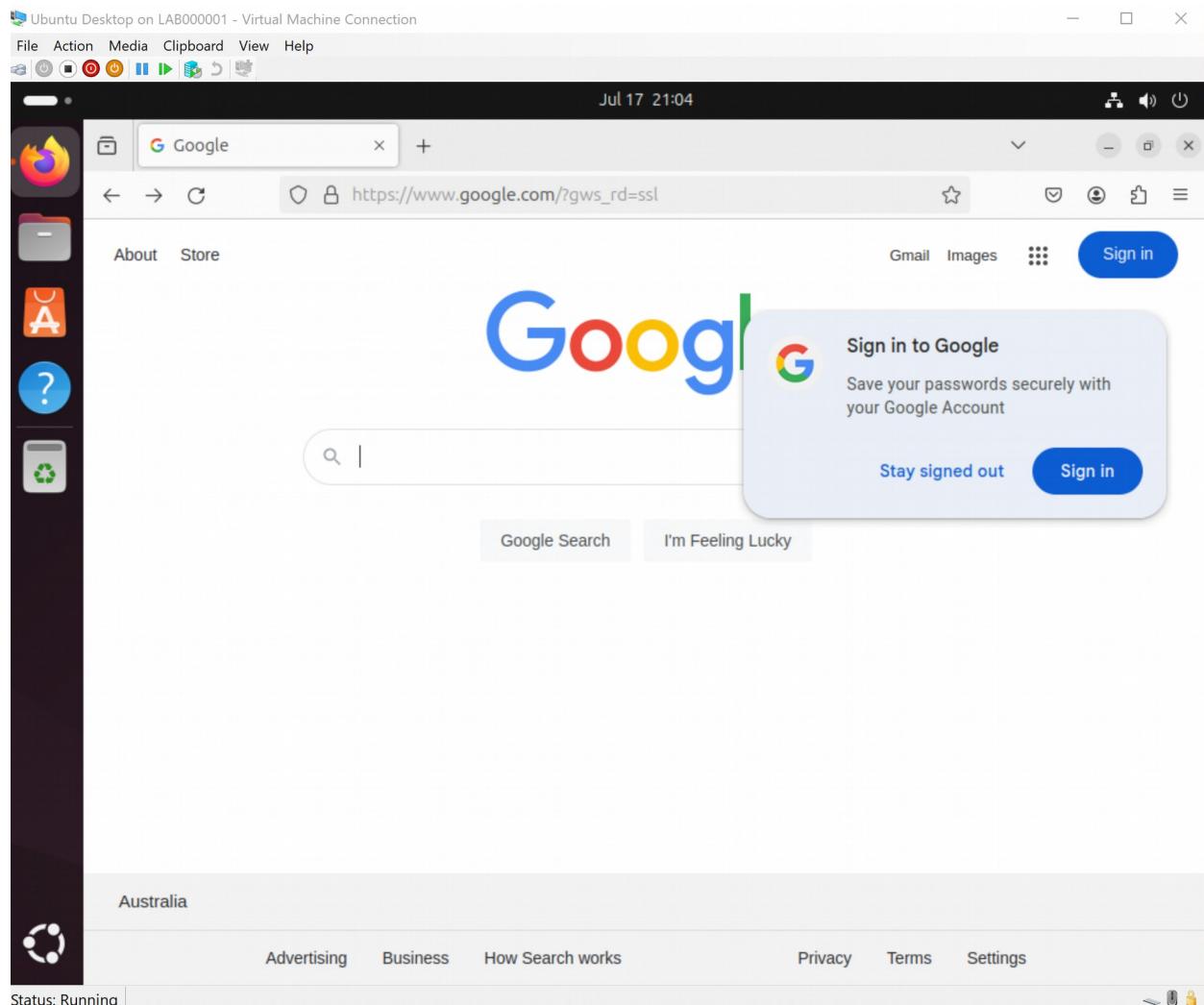
```
ExternalGateway on LAB000001 - Virtual Machine Connection
File Action Media Clipboard View Help
File Open Save Copy Paste Undo Redo
user@externalgateway:~$ user@externalgateway:~$ user@externalgateway:~$ wget google.com
--2024-07-17 11:02:46-- http://google.com/
Resolving google.com (google.com)... 142.250.204.14, 2404:6800:4006:814::200e
Connecting to google.com (google.com)|142.250.204.14|:80... connected.
HTTP request sent, awaiting response... 301 Moved Permanently
Location: http://www.google.com/ [following]
--2024-07-17 11:02:46-- http://www.google.com/
Resolving www.google.com (www.google.com)... 142.251.221.68, 2404:6800:4006:814::2004
Connecting to www.google.com (www.google.com)|142.251.221.68|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: unspecified [text/html]
Saving to: 'index.html.1'

index.html.1 [ <= ] 19.90K --.-KB/s in 0s

2024-07-17 11:02:46 (239 MB/s) - 'index.html.1' saved [20373]

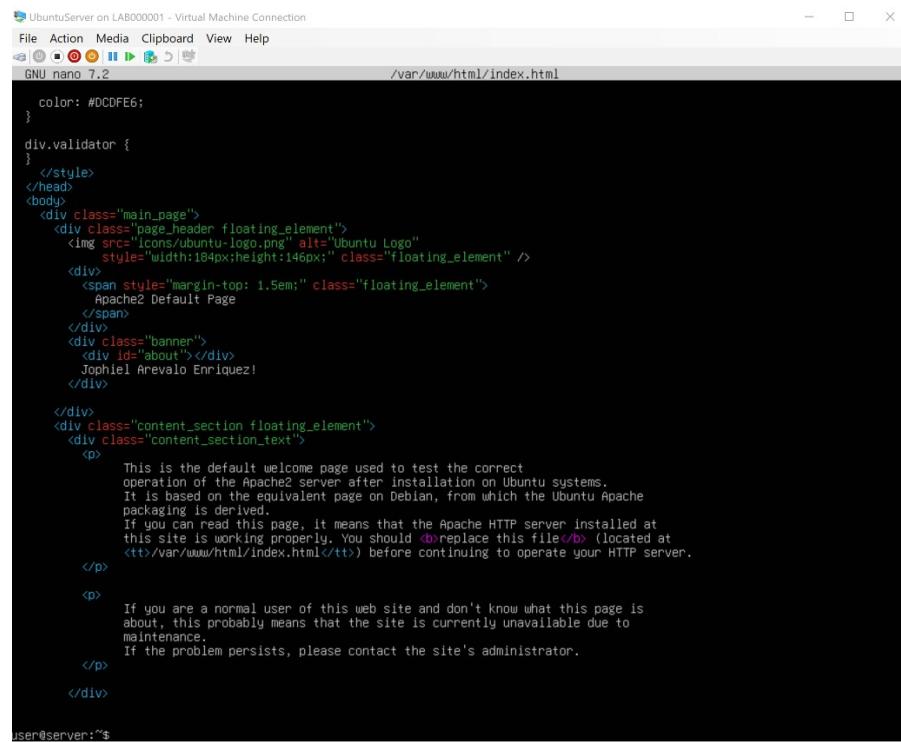
user@externalgateway:~$
```

19.Ubuntu Desktop internet verification:



Activity 2.1 – Secure Web

1. Index.html configuration



The screenshot shows a terminal window titled "UbuntuServer on LAB000001 - Virtual Machine Connection". The file being edited is "/var/www/html/index.html". The content of the file is the Apache2 Default Page, which includes a banner for "Jophiel Arevalo Enriquez!" and instructions for maintenance and configuration.

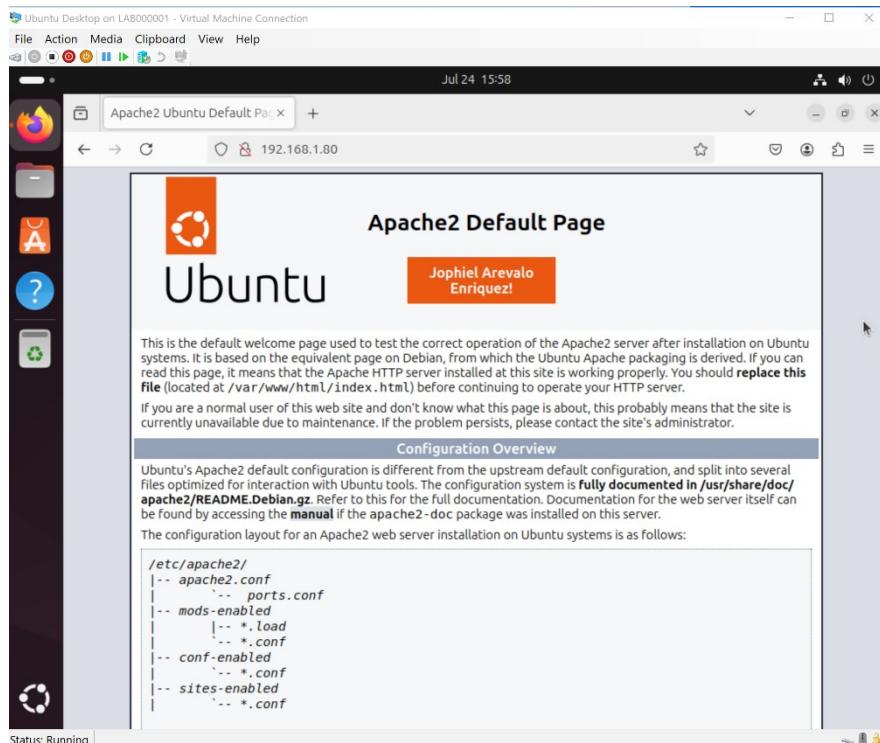
```
UbuntuServer on LAB000001 - Virtual Machine Connection
File Action Media Clipboard View Help
GNU nano 7.2 /var/www/html/index.html

    color: #DCDFE6;
}

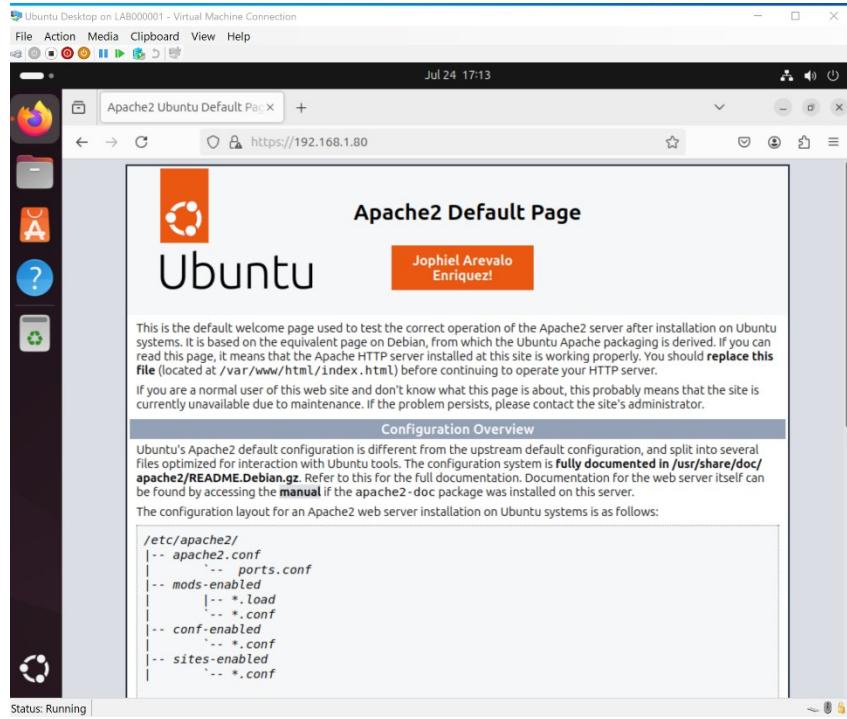
div.validator {
}
</style>
</head>
<body>
<div class="main_page">
    <div class="page_header floating_element">
        
    <div>
        <span style="margin-top: 1.5em;" class="floating_element">
            Apache2 Default Page
        </span>
    </div>
    <div class="banner">
        <div id="about"></div>
        Jophiel Arevalo Enriquez!
    </div>
</div>
<div class="content_section floating_element">
    <div class="content_section_text">
        <p>
            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 <b>replace</b> this file</p>
            (located at <tt>/var/www/html/index.html</tt>) before continuing to operate your HTTP server.
        </p>
        <p>
            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.
        </p>
    </div>
</div>

user@server:~$
```

2. <http://192.168.1.80>

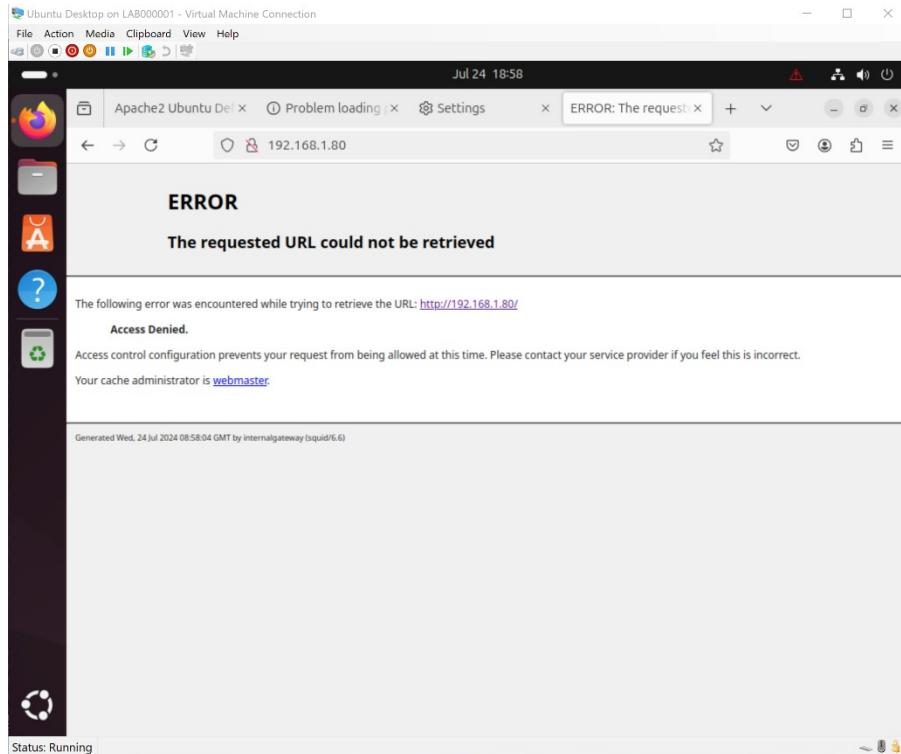


3. <https://192.168.1.80>

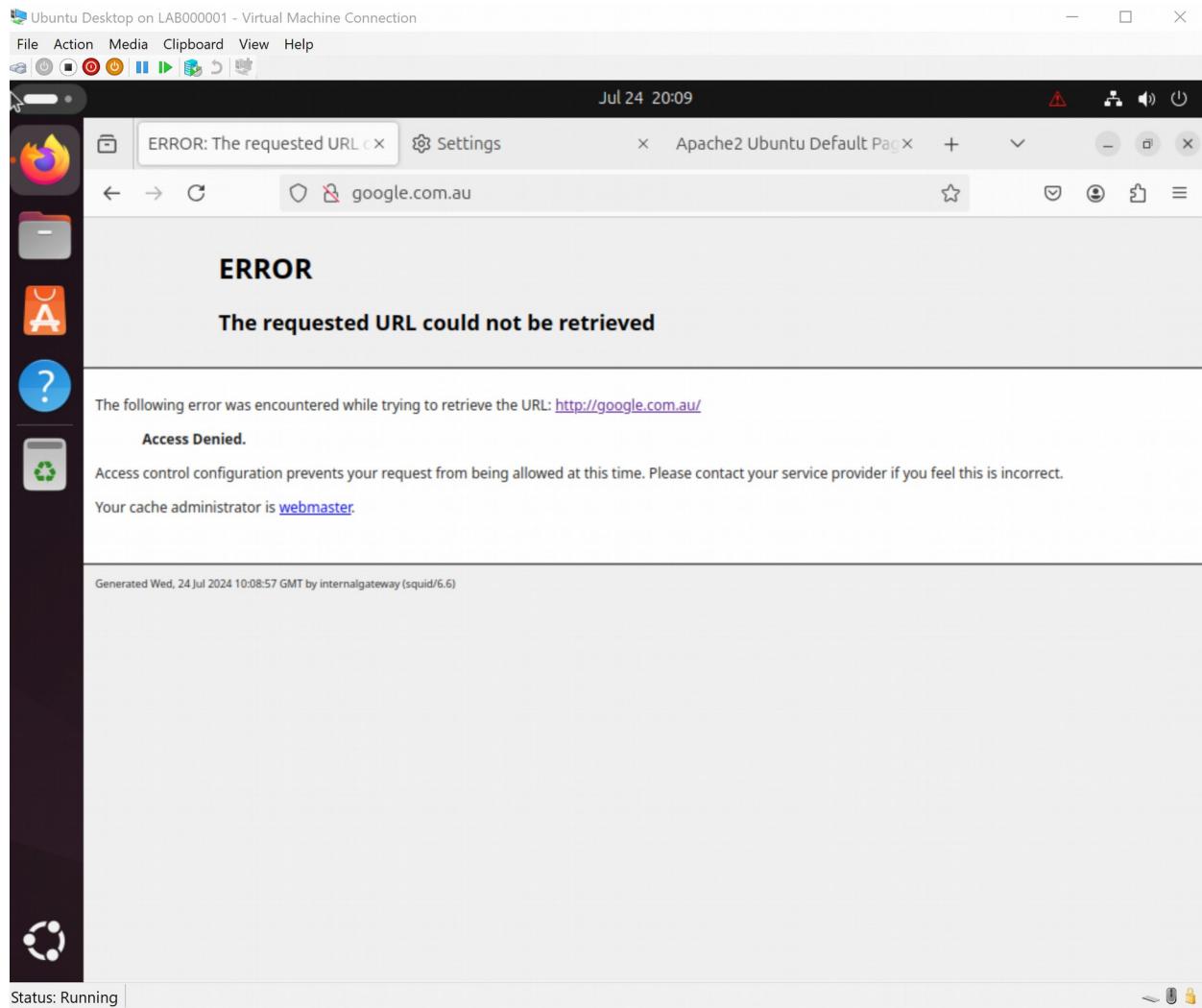


SQUID:

1. Squid proxy to http://192.168.1.80

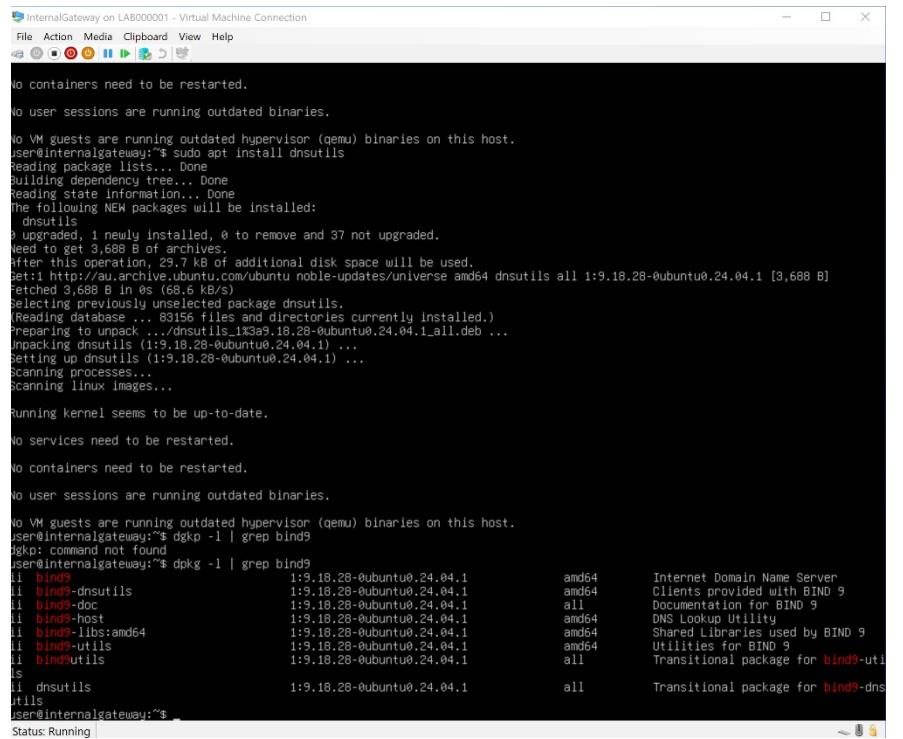


2. Squid proxy for any .au domain



Activity 2.2 – DNS server

1. Bind 9 installed:



```
InternalGateway on LAB000001 - Virtual Machine Connection
File Action Media Clipboard View Help
File Status: Running

0 containers need to be restarted.
0 user sessions are running outdated binaries.

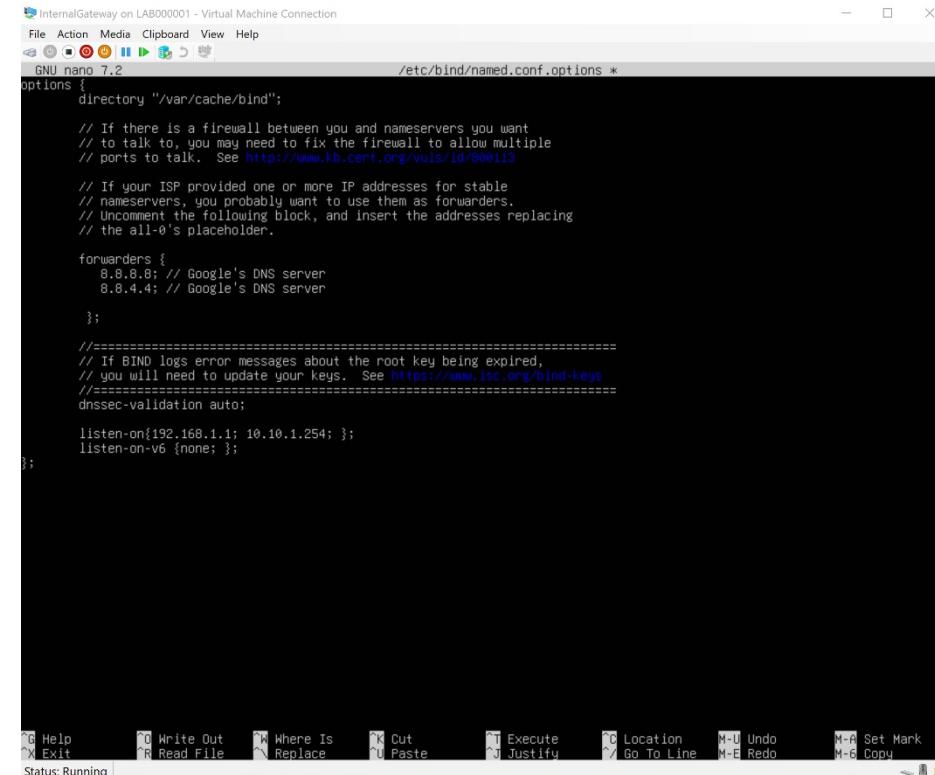
0 VM guests are running outdated hypervisor (qemu) binaries on this host.
user@internalgateway:~$ sudo apt install dnsutils
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  dnsutils
0 upgraded, 1 newly installed, 0 to remove and 37 not upgraded.
Need to get 3,688 B of archives.
After this operation, 29.7 KB of additional disk space will be used.
get: http://au.archive.ubuntu.com/ubuntu noble-updates/universe amd64 dnsutils all 1:9.18.28-0ubuntu0.24.04.1 [3,688 B]
Fetched 3,688 B in 0s (68.6 kB/s)
Selecting previously unselected package dnsutils.
(Reading database ... 83156 files and directories currently installed.)
Preparing to unpack .../dnsutils_1%3a9.18.28-0ubuntu0.24.04.1_all.deb ...
Unpacking dnsutils (1:9.18.28-0ubuntu0.24.04.1) ...
Setting up dnsutils (1:9.18.28-0ubuntu0.24.04.1) ...
Scanning processes...
Scanning Linux images...

Running kernel seems to be up-to-date.

0 services need to be restarted.
0 containers need to be restarted.
0 user sessions are running outdated binaries.

0 VM guests are running outdated hypervisor (qemu) binaries on this host.
user@internalgateway:~$ dpkg -l | grep bind9
ii  bind9                               1:9.18.28-0ubuntu0.24.04.1      amd64      Internet Domain Name Server
ii  bind9-dnsutils                        1:9.18.28-0ubuntu0.24.04.1      amd64      Clients provided with BIND 9
ii  bind9-doc                             1:9.18.28-0ubuntu0.24.04.1      all       Documentation for BIND 9
ii  bind9-host                            1:9.18.28-0ubuntu0.24.04.1      amd64      DNS Lookup Utility
ii  bind9-libs:amd64                      1:9.18.28-0ubuntu0.24.04.1      amd64      Shared Libraries used by BIND 9
ii  bind9-utils                           1:9.18.28-0ubuntu0.24.04.1      amd64      Utilities for BIND 9
ii  bind9-utils                           1:9.18.28-0ubuntu0.24.04.1      all       Transitional package for bind9-utils
ii  dnsutils                            1:9.18.28-0ubuntu0.24.04.1      all       Transitional package for bind9-dnsutils
user@internalgateway:~$
```

2.



```
InternalGateway on LAB000001 - Virtual Machine Connection
File Action Media Clipboard View Help
File Status: Running

GNU nano 7.2                                     /etc/bind/named.conf.options *
options {
    directory "/var/cache/bind";

    // If there is a firewall between you and nameservers you want
    // to talk to, you may need to fix the firewall to allow multiple
    // ports to talk. See http://www.kb.cert.org/vuls/id/808113

    // If your ISP provided one or more IP addresses for stable
    // nameservers, you probably want to use them as forwarders.
    // Uncomment the following block, and insert the addresses replacing
    // the all-0's placeholder.

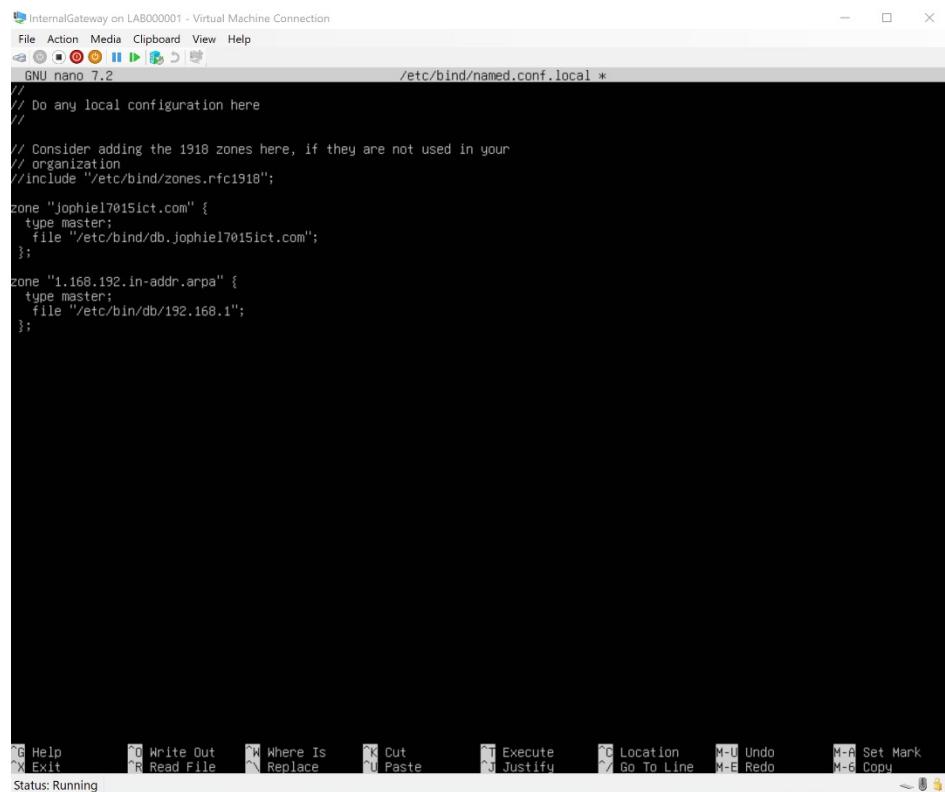
    forwarders {
        8.8.8.8; // Google's DNS server
        8.8.4.4; // Google's DNS server
    };

    //========================================================================
    // If BIND logs error messages about the root key being expired,
    // you will need to update your keys. See https://www.isc.org/bind-keys
    //========================================================================
    dnssec-validation auto;

    listen-on{192.168.1.1; 10.10.1.254; };
    listen-on-v6 {none;};
};
```

Named.conf.options

3. Named.conf.local



The screenshot shows a terminal window titled "InternalGateway on LAB000001 - Virtual Machine Connection". The window contains the contents of the `/etc/bind/named.conf.local` file. The file includes comments for local configuration and includes the `/etc/bind/zones.rfc1918` file. It defines two zones: "Jophiel70i5ict.com" (master, db file) and "1.168.192.in-addr.arpa" (master, db file). The bottom of the window shows the nano editor's command bar with various keyboard shortcuts.

```
// InternalGateway on LAB000001 - Virtual Machine Connection
File Action Media Clipboard View Help
GNU nano 7.2                               /etc/bind/named.conf.local *

// Do any local configuration here
//

// Consider adding the 1918 zones here, if they are not used in your
// organization
//include "/etc/bind/zones.rfc1918";

zone "Jophiel70i5ict.com" {
    type master;
    file "/etc/bind/db.Jophiel70i5ict.com";
};

zone "1.168.192.in-addr.arpa" {
    type master;
    file "/etc/bin/db/192.168.1";
};

Status: Running
```

4. Db.Jophiel7015ict.com

The screenshot shows a terminal window titled "InternalGateway on LAB000001 - Virtual Machine Connection". The file being edited is "/etc/bind/db.Jophiel7015ict.com". The content of the file is:

```
;BIND data file for Jophiel7015ict.com
;TTL    604800
@    IN    SOA    ns1.Jophiel7015ict.com. admin.Jophiel7015ict.com. (
                      ; Serial
                      604800    ; Refresh
                      86400     ; Retry
                     2419200   ; Expire
                     604800 )  ; Negative Cache TTL
;
@    IN    NS    ns1.Jophiel7015ict.com.
ns1  IN    A     192.168.1.1
www  IN    A     192.168.1.80
```

The status bar at the bottom indicates "Status: Running".

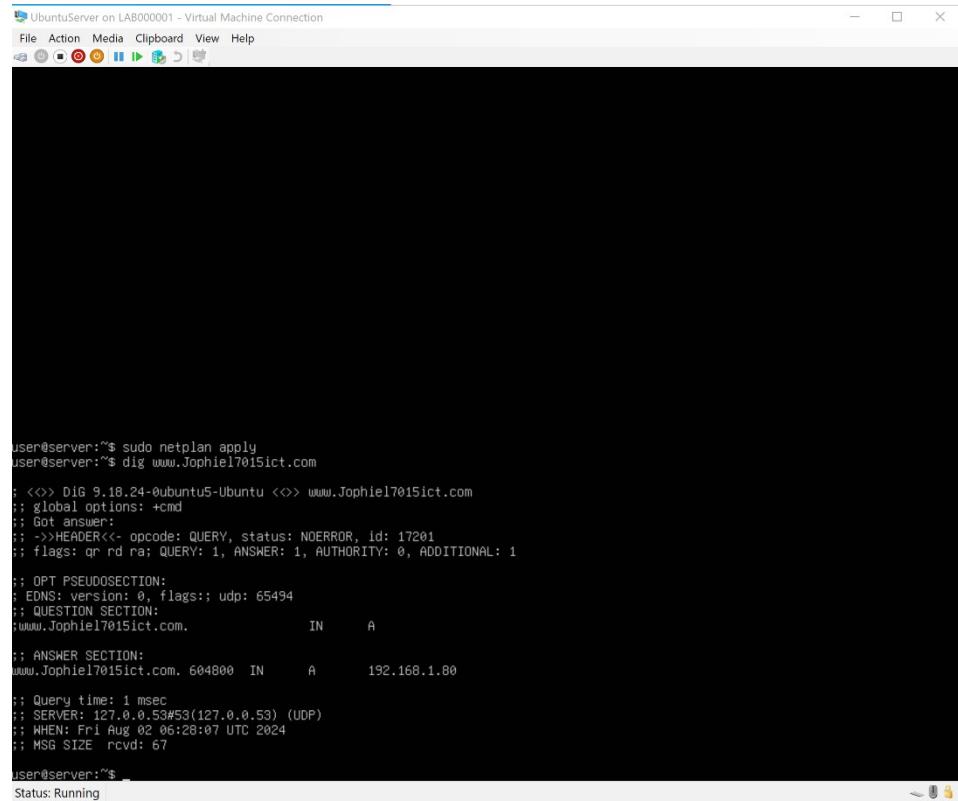
5. Db.192.168.1

The screenshot shows a terminal window titled "InternalGateway on LAB000001 - Virtual Machine Connection". The file being edited is "db.192.168.1". The content of the file is:

```
$TTL 604800
@    IN    SOA    ns1.Jophiel7015ict.com. admin.Jophiel7015ict.com. (
                      ; Serial
                      604800    ; Refresh
                      86400     ; Retry
                     2419200   ; Expire
                     604800 )  ; Negative Cache TTL
;
@    IN    NS    ns1.Jophiel7015ict.com.
254  IN    PTR   ns1.Jophiel7015ict.com.
@    IN    PTR   www.Jophiel7015ict.com.
```

The status bar at the bottom indicates "Status: Running".

6. Dig www.Jophiel7015ict.com

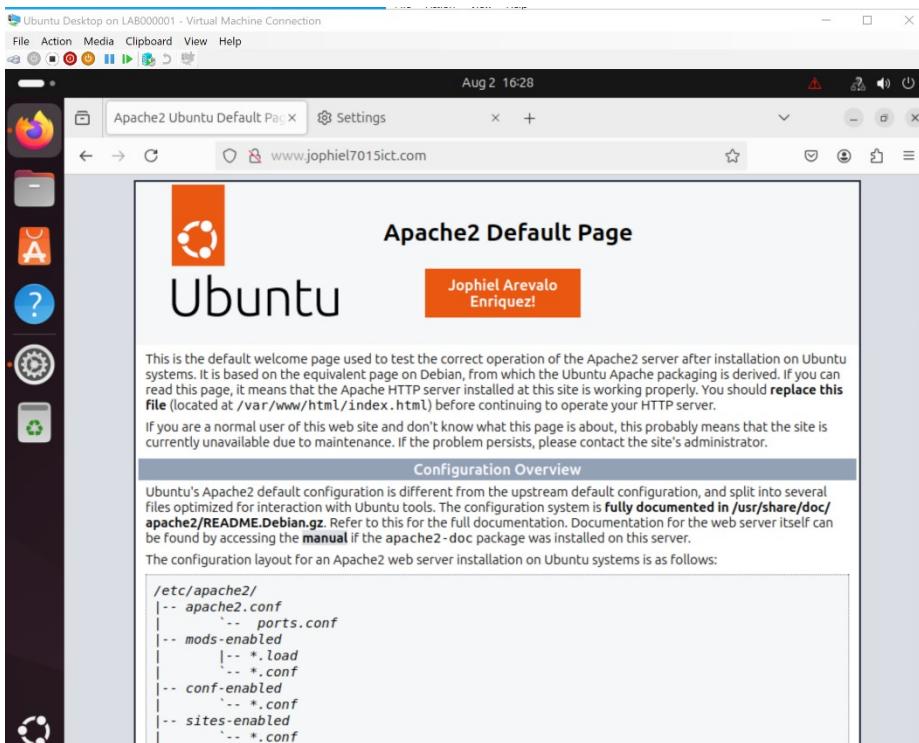


```
user@server:~$ sudo netplan apply
user@server:~$ dig www.Jophiel7015ict.com

; <>> DIG 9.18.24-0ubuntu5-Ubuntu <>> www.Jophiel7015ict.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<- opcode: QUERY, status: NOERROR, id: 17201
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags: udp: 65494
;; QUESTION SECTION:
;www.Jophiel7015ict.com.           IN      A
;; ANSWER SECTION:
www.Jophiel7015ict.com. 604800  IN      A       192.168.1.80
;; Query time: 1 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Fri Aug 02 06:28:07 UTC 2024
;; MSG SIZE rcvd: 67

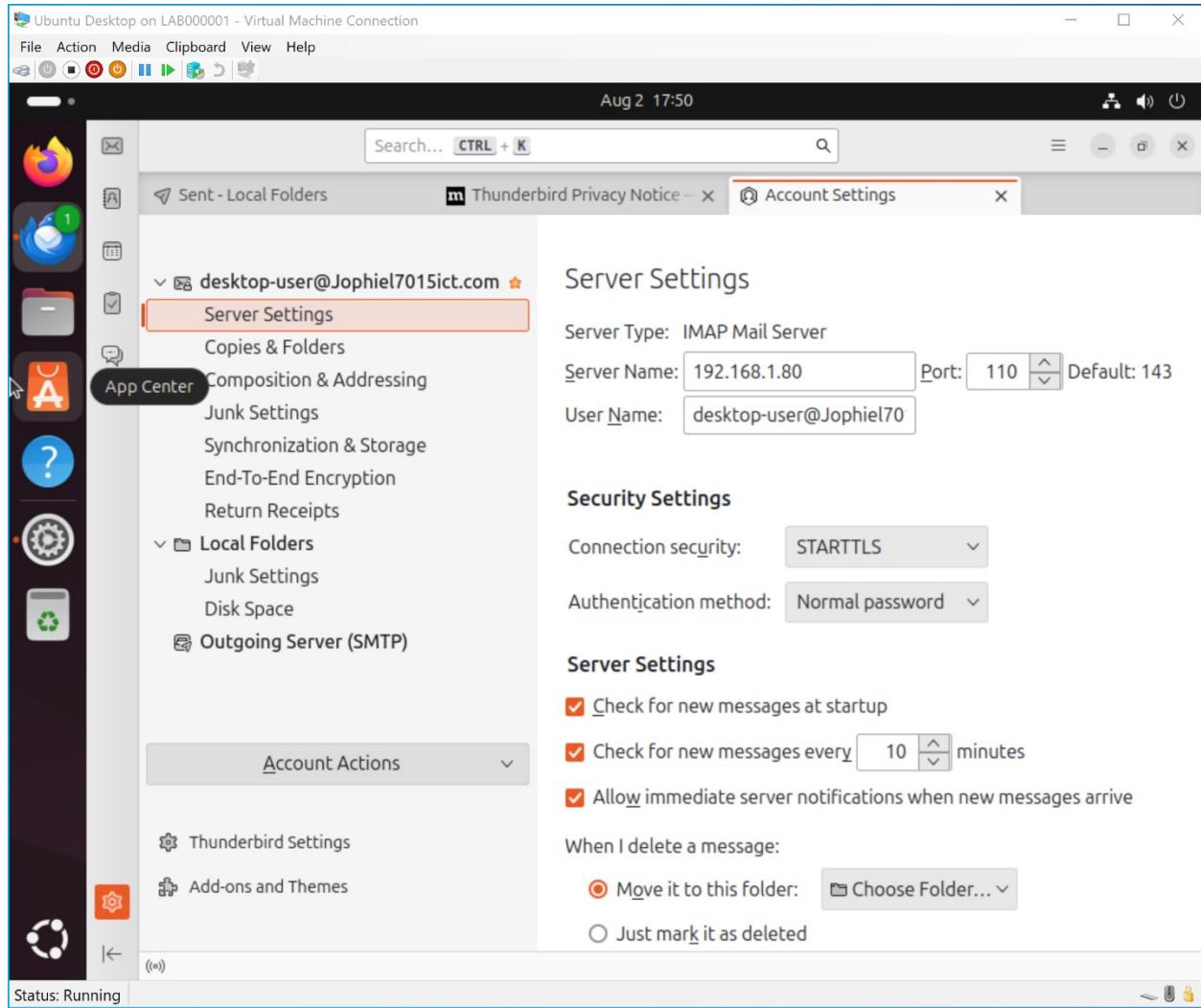
user@server:~$
```

7. http://www.Jophiel7015ict.com

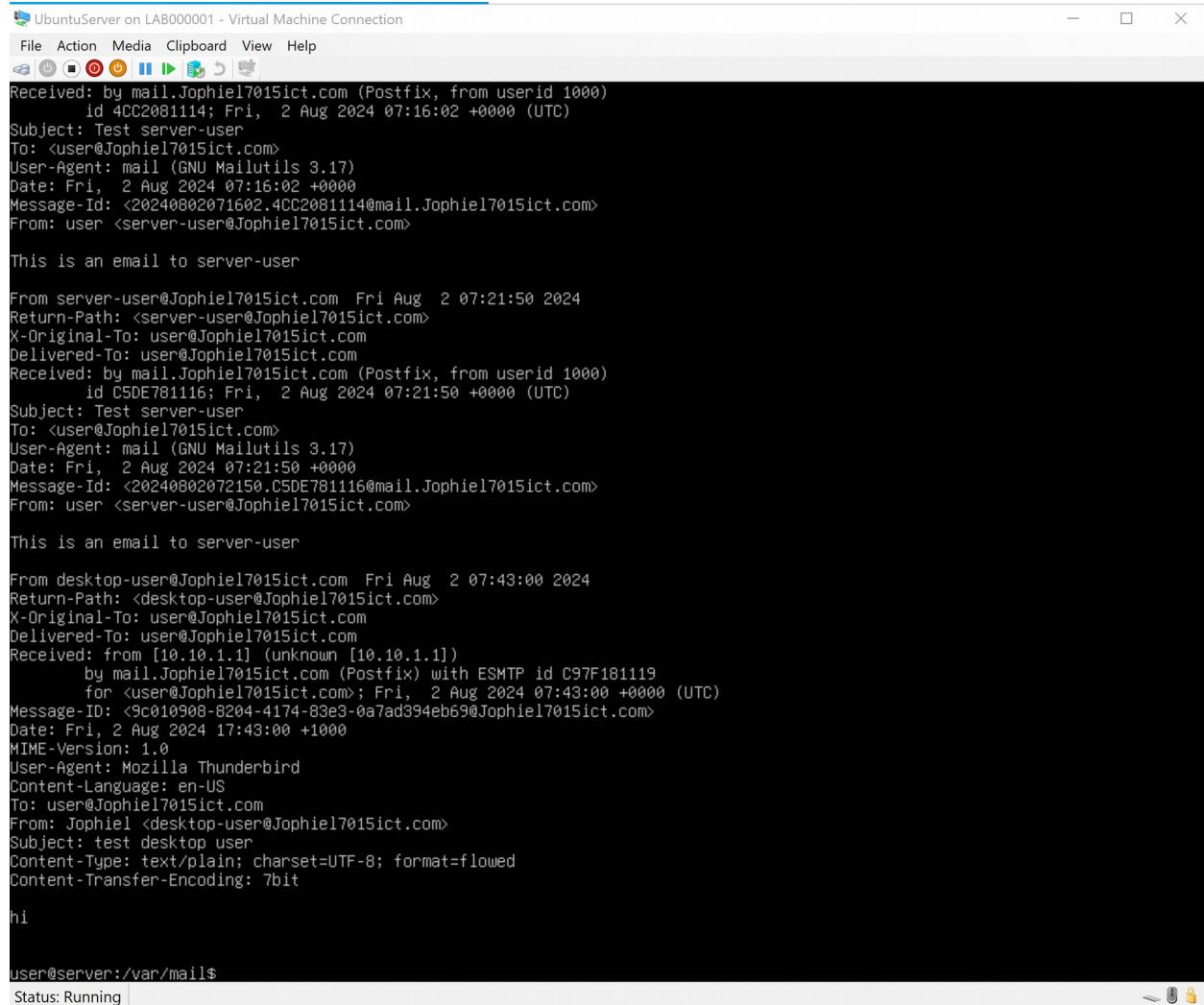


Activity 3 - Email server

1. Email set up on ubuntu sever:



2. Email from the ubuntu server



UbuntuServer on LAB000001 - Virtual Machine Connection

File Action Media Clipboard View Help

Received: by mail.Jophiel7015ict.com (Postfix, from userid 1000)
id 4CC2081114; Fri, 2 Aug 2024 07:16:02 +0000 (UTC)
Subject: Test server-user
To: <user@Jophiel7015ict.com>
User-Agent: mail (GNU Mailutils 3.17)
Date: Fri, 2 Aug 2024 07:16:02 +0000
Message-ID: <20240802071602.4CC2081114@mail.Jophiel7015ict.com>
From: user <server-user@Jophiel7015ict.com>

This is an email to server-user

From server-user@Jophiel7015ict.com Fri Aug 2 07:21:50 2024
Return-Path: <server-user@Jophiel7015ict.com>
X-Original-To: user@Jophiel7015ict.com
Delivered-To: user@Jophiel7015ict.com
Received: by mail.Jophiel7015ict.com (Postfix, from userid 1000)
id C5DE781116; Fri, 2 Aug 2024 07:21:50 +0000 (UTC)
Subject: Test server-user
To: <user@Jophiel7015ict.com>
User-Agent: mail (GNU Mailutils 3.17)
Date: Fri, 2 Aug 2024 07:21:50 +0000
Message-ID: <20240802072150.C5DE781116@mail.Jophiel7015ict.com>
From: user <server-user@Jophiel7015ict.com>

This is an email to server-user

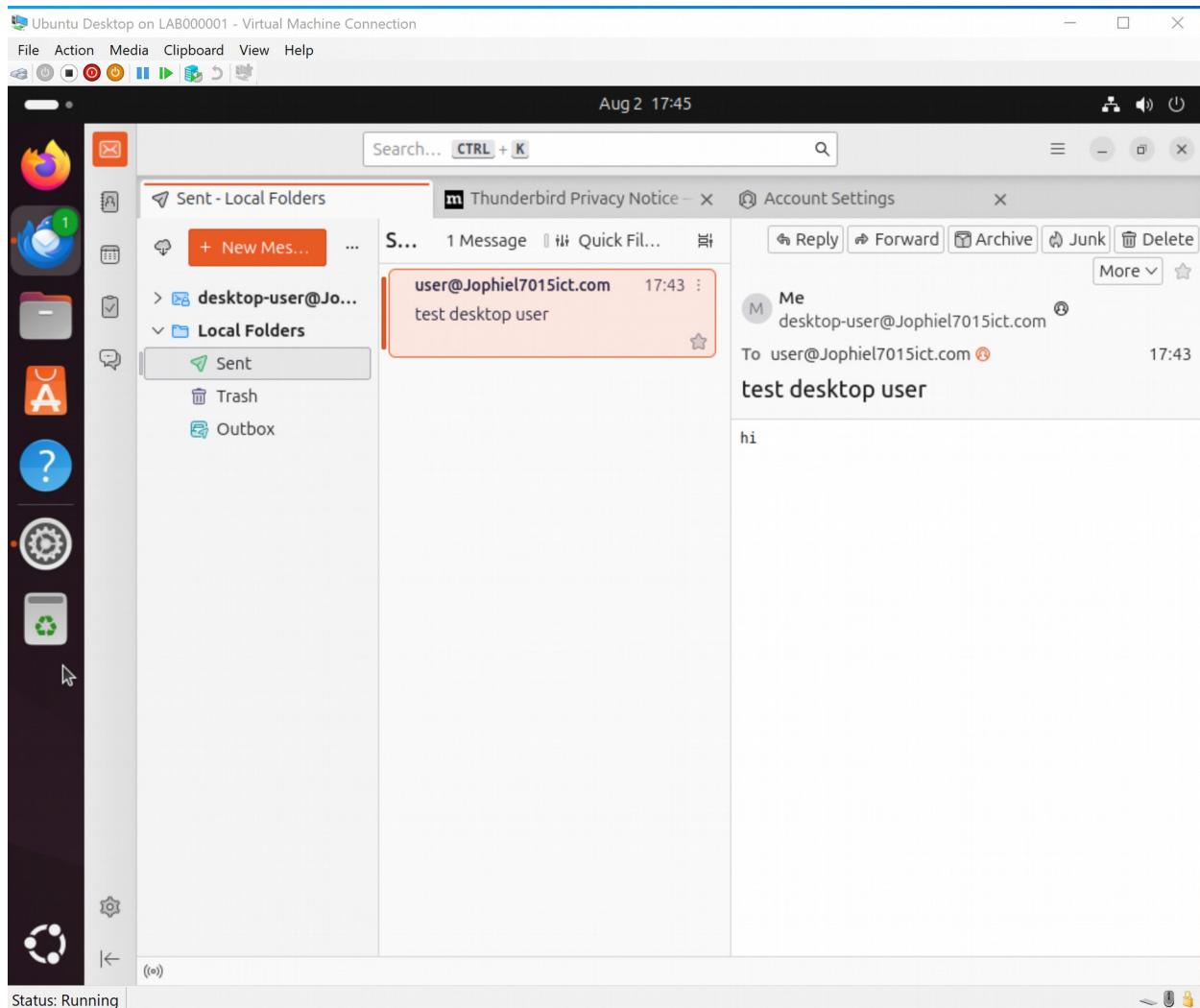
From desktop-user@Jophiel7015ict.com Fri Aug 2 07:43:00 2024
Return-Path: <desktop-user@Jophiel7015ict.com>
X-Original-To: user@Jophiel7015ict.com
Delivered-To: user@Jophiel7015ict.com
Received: from [10.10.1.1] (unknown [10.10.1.1])
by mail.Jophiel7015ict.com (Postfix) with ESMTP id C97F181119
for <user@Jophiel7015ict.com>; Fri, 2 Aug 2024 07:43:00 +0000 (UTC)
Message-ID: <9c010908-8204-4174-83e3-0a7ad394eb69@mail.Jophiel7015ict.com>
Date: Fri, 2 Aug 2024 17:43:00 +1000
MIME-Version: 1.0
User-Agent: Mozilla Thunderbird
Content-Language: en-US
To: user@Jophiel7015ict.com
From: Jophiel <desktop-user@Jophiel7015ict.com>
Subject: test desktop user
Content-Type: text/plain; charset=UTF-8; format=flowed
Content-Transfer-Encoding: 7bit

hi

user@server:/var/mail\$

Status: Running

3. Email from ubuntu desktop



Activity 4 – Firewalls

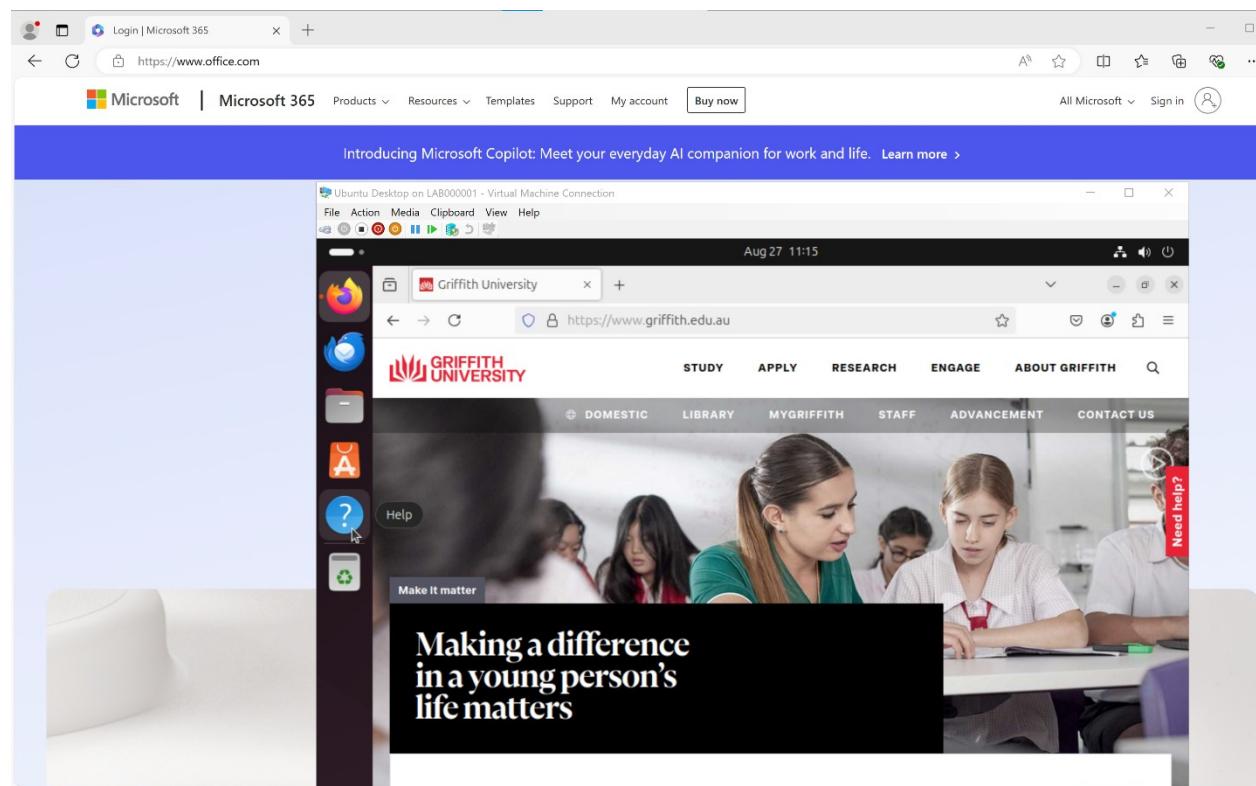
1. IP tables (Sudo iptables -L -v -n)

```
user@externalgateway: ~ $ sudo iptables -L -v -n
Chain INPUT (policy DROP 279 packets, 23286 bytes)
pkts bytes target  prot opt in     out    source          destination
  0   0 ACCEPT   17  --  *      *      0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   6   --  *      *      0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   17  --  eth0   eth1   0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   6   --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  188 21196 ACCEPT   17  --  *      *      0.0.0.0/0        192.168.1.1
  0   0 ACCEPT   17  --  *      *      0.0.0.0/0        0.0.0.0/0
  110 11085 ACCEPT   17  --  *      *      0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   17  --  eth0   eth1   0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   17  --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  1   60 ACCEPT   6   --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   6   --  eth0   eth1   0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   6   --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   6   --  eth0   eth1   0.0.0.0/0        0.0.0.0/0
  290 23786 ACCEPT   17  --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  8   782 ACCEPT   6   --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  17 2104 ACCEPT   0    --  eth0   eth1   0.0.0.0/0        0.0.0.0/0
  13 764 ACCEPT   0    --  eth1   eth0   0.0.0.0/0        0.0.0.0/0

Chain FORWARD (policy DROP 1285 packets, 102K bytes)
pkts bytes target  prot opt in     out    source          destination
  0   0 ACCEPT   6   --  eth0   eth1   0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   6   --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  188 21196 ACCEPT   17  --  *      *      0.0.0.0/0        192.168.1.1
  0   0 ACCEPT   17  --  *      *      0.0.0.0/0        0.0.0.0/0
  110 11085 ACCEPT   17  --  *      *      0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   17  --  eth0   eth1   0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   17  --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  1   60 ACCEPT   6   --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   6   --  eth0   eth1   0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   6   --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   6   --  eth0   eth1   0.0.0.0/0        0.0.0.0/0
  290 23786 ACCEPT   17  --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  8   782 ACCEPT   6   --  eth1   eth0   0.0.0.0/0        0.0.0.0/0
  17 2104 ACCEPT   0    --  eth0   eth1   0.0.0.0/0        0.0.0.0/0
  13 764 ACCEPT   0    --  eth1   eth0   0.0.0.0/0        0.0.0.0/0

Chain OUTPUT (policy DROP 9 packets, 864 bytes)
pkts bytes target  prot opt in     out    source          destination
  258 19194 ACCEPT   17  --  *      *      0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   6   --  *      *      0.0.0.0/0        0.0.0.0/0
  0   0 ACCEPT   17  --  *      *      0.0.0.0/0        udp dpt:53
  0   0 ACCEPT   6   --  *      *      0.0.0.0/0        tcp dpt:53
```

2. Azure Desktop and Ubuntu Desktop

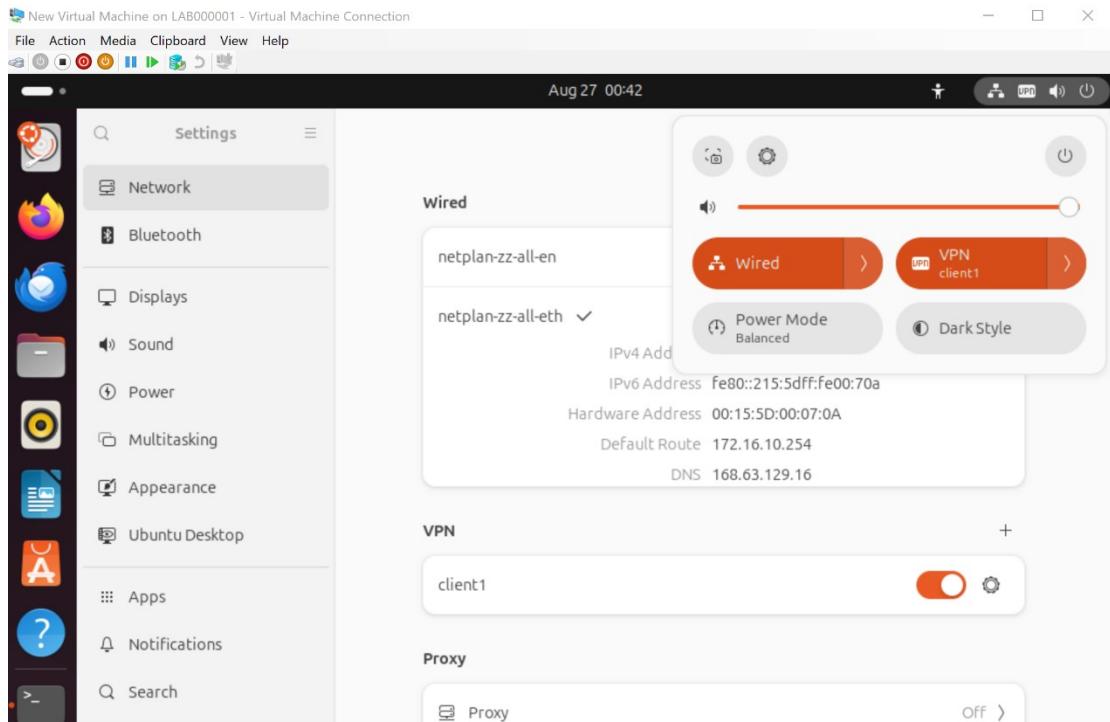


Activity 4-2 – Virtual Private Networks

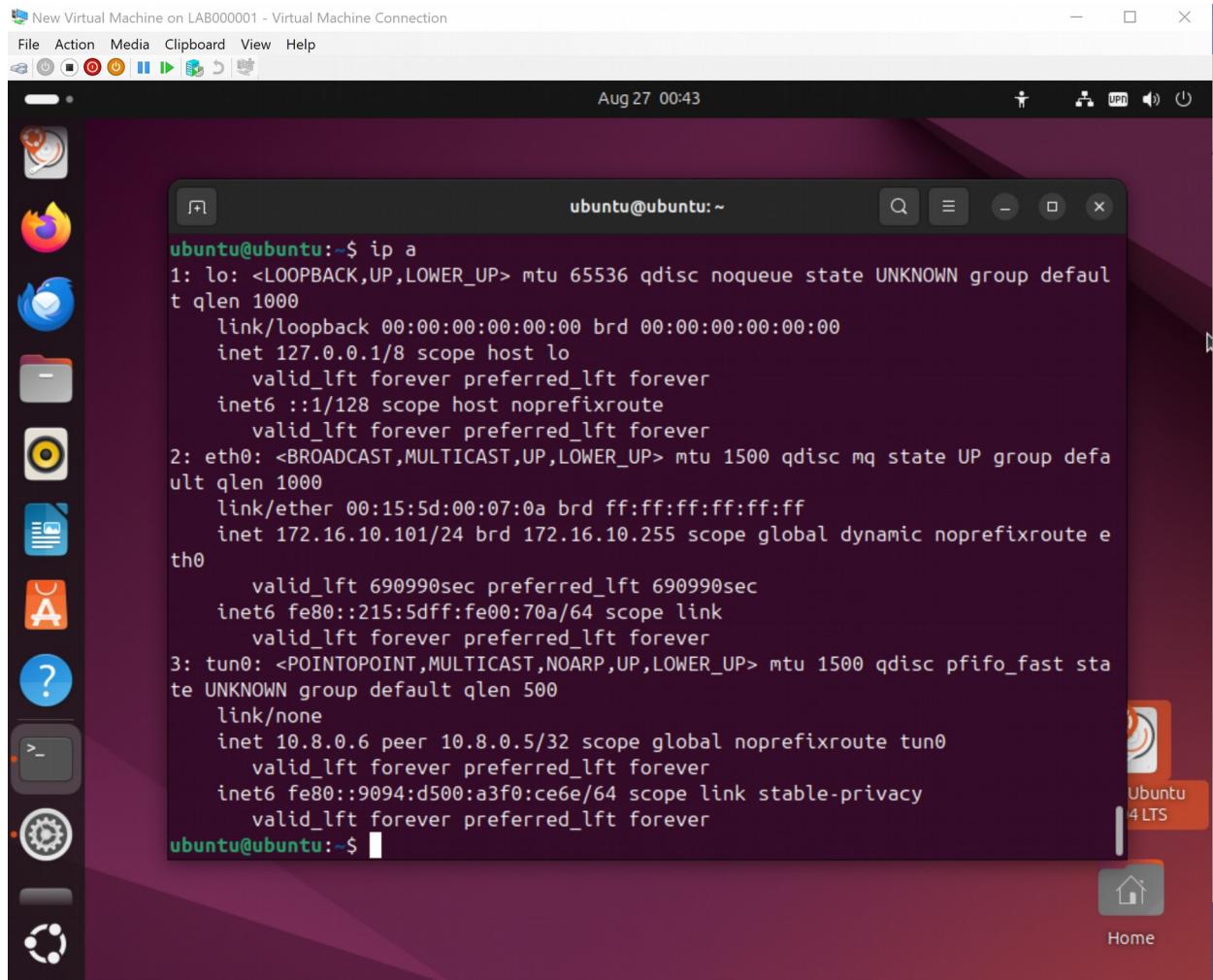
1. IP tables at External Gateway

```
user@externalgateway:~$ sudo iptables -L -v -n
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
pkts bytes target     prot opt in     out    source          destination
Chain FORWARD (policy ACCEPT 16 packets, 1240 bytes)
pkts bytes target     prot opt in     out    source          destination
  0     0 ACCEPT      6     -- eth0   eth1   0.0.0.0/0      0.0.0.0/0      tcp dpt:1194 flags:0x17/0x02 ctstate NEW
  W  0     0 ACCEPT      6     -- eth1   eth0   0.0.0.0/0      0.0.0.0/0      tcp spt:1194 flags:0x17/0x02 ctstate NEW
  W  0     0 ACCEPT     17     -- *      *      0.0.0.0/0      192.168.1.1    udp dpt:1194
  0     0 ACCEPT     17     -- *      *      0.0.0.0/0      0.0.0.0/0      udp dpt:1194
  0     0 ACCEPT     17     -- *      *      0.0.0.0/0      0.0.0.0/0      udp spt:1194
  0     0 ACCEPT     17     -- eth0   eth1   0.0.0.0/0      0.0.0.0/0      udp dpt:1194 ctstate NEW,ESTABLISHED
  0     0 ACCEPT     17     -- eth1   eth0   0.0.0.0/0      0.0.0.0/0      udp dpt:1194 ctstate ESTABLISHED
Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
pkts bytes target     prot opt in     out    source          destination
user@externalgateway:~$ sudo iptables -t nat -L -v -n
Chain PREROUTING (policy ACCEPT 2 packets, 487 bytes)
pkts bytes target     prot opt in     out    source          destination
  0     0 DNAT        17     -- *      *      0.0.0.0/0      0.0.0.0/0      udp dpt:1194 to:192.168.1.1
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
pkts bytes target     prot opt in     out    source          destination
Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
pkts bytes target     prot opt in     out    source          destination
Chain POSTROUTING (policy ACCEPT 15 packets, 1065 bytes)
pkts bytes target     prot opt in     out    source          destination
 245 19376 MASQUERADE  0     -- *      eth0   0.0.0.0/0      0.0.0.0/0
  0     0 SNAT        17     -- *      *      0.0.0.0/0      192.168.1.1    udp dpt:1194 to:172.16.10.101
```

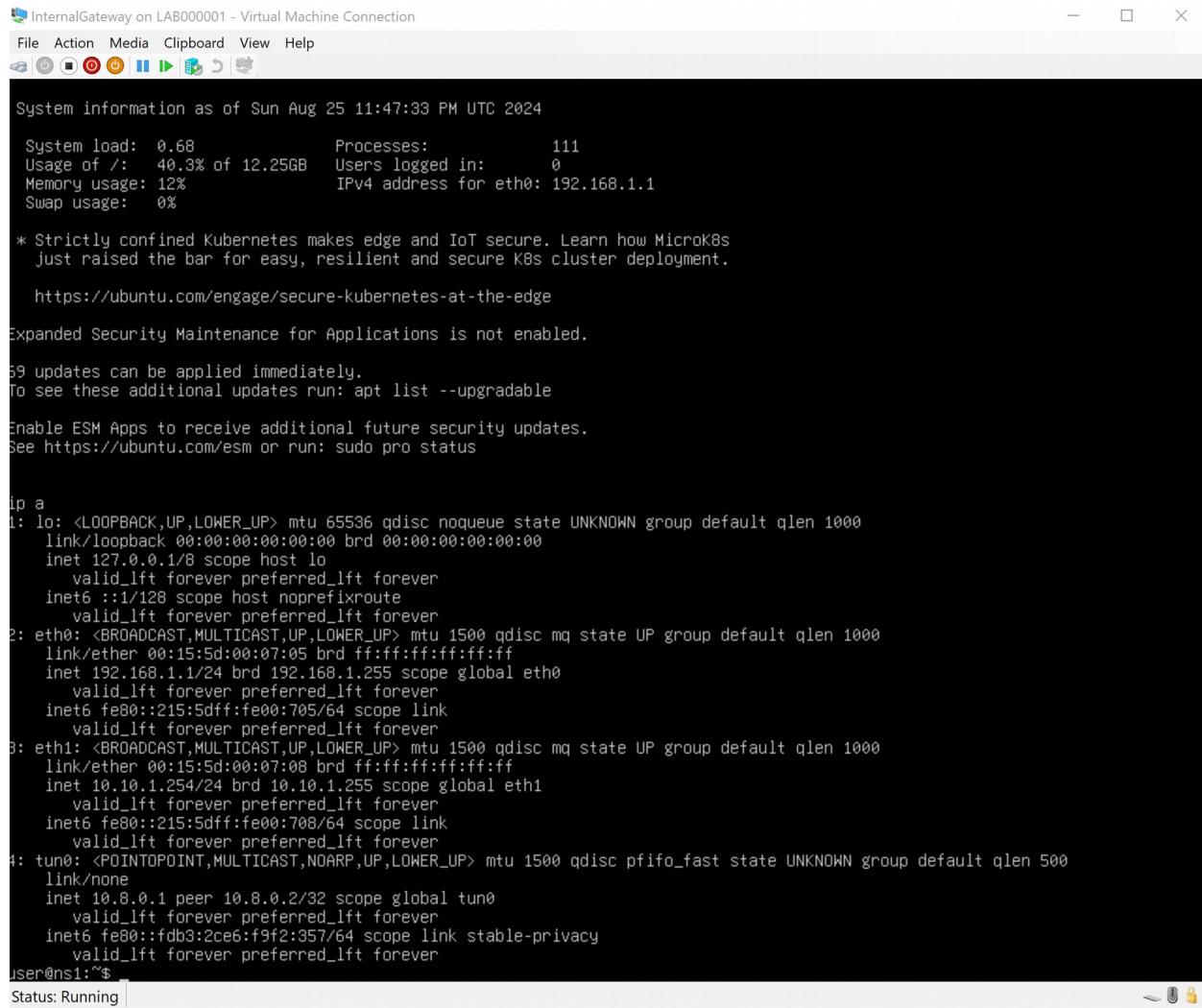
2. VPN configuration Ubuntu Desktop



3. Ip a Ubuntu Desktop



4. Ip a Internal Gateway

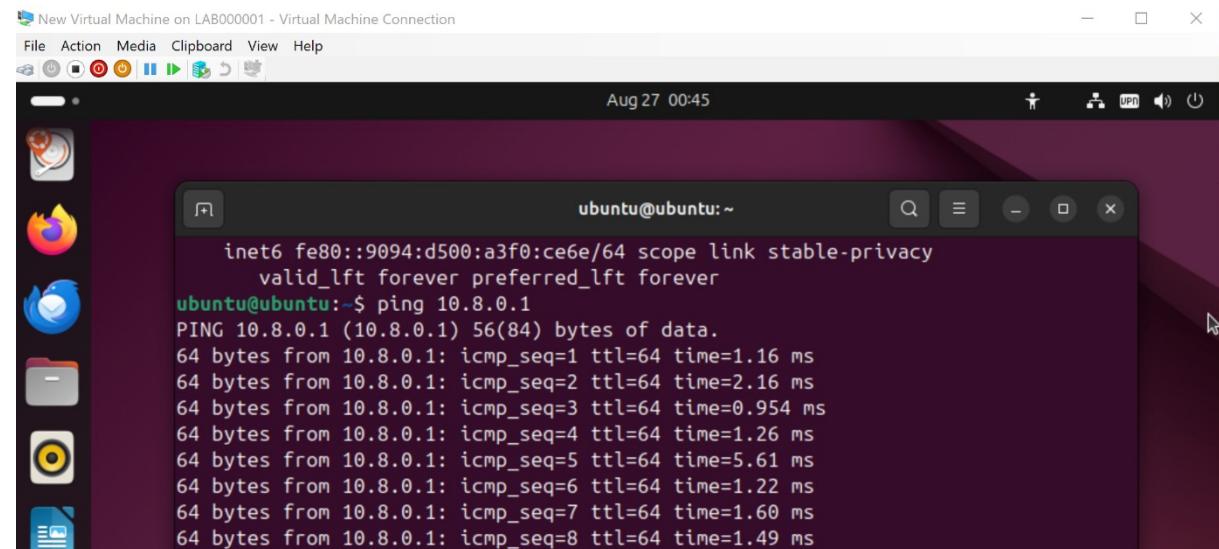


```
InternalGateway on LAB000001 - Virtual Machine Connection
File Action Media Clipboard View Help
System information as of Sun Aug 25 11:47:33 PM UTC 2024
System load: 0.68 Processes: 111
Usage of /: 40.3% of 12.25GB Users logged in: 0
Memory usage: 12% IPv4 address for eth0: 192.168.1.1
Swap usage: 0%
* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s just raised the bar for easy, resilient and secure K8s cluster deployment.
https://ubuntu.com/engage/secure-kubernetes-at-the-edge
Expanded Security Maintenance for Applications is not enabled.
59 updates can be applied immediately.
To see these additional updates run: apt list --upgradable
Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

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 noprefixroute
            valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:00:07:05 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.1/24 brd 192.168.1.255 scope global eth0
        valid_lft forever preferred_lft forever
        inet6 fe80::215:5dff:fe00:705/64 scope link
            valid_lft forever preferred_lft forever
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:00:07:08 brd ff:ff:ff:ff:ff:ff
    inet 10.10.1.254/24 brd 10.10.1.255 scope global eth1
        valid_lft forever preferred_lft forever
        inet6 fe80::215:5dff:fe00:708/64 scope link
            valid_lft forever preferred_lft forever
4: tun0: <POINTOPOINT,MULTICAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UNKNOWN group default qlen 500
    link/none
    inet 10.8.0.1 peer 10.8.0.2/32 scope global tun0
        valid_lft forever preferred_lft forever
        inet6 fe80::fdb3:2ce6:f9f2:357/64 scope link stable-privacy
            valid_lft forever preferred_lft forever
user@ns1:~$
```

Status: Running

5. Ping 10.8.0.1



```
New Virtual Machine on LAB000001 - Virtual Machine Connection
File Action Media Clipboard View Help
Aug 27 00:45
ubuntu@ubuntu:~$ 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=1.16 ms
64 bytes from 10.8.0.1: icmp_seq=2 ttl=64 time=2.16 ms
64 bytes from 10.8.0.1: icmp_seq=3 ttl=64 time=0.954 ms
64 bytes from 10.8.0.1: icmp_seq=4 ttl=64 time=1.26 ms
64 bytes from 10.8.0.1: icmp_seq=5 ttl=64 time=5.61 ms
64 bytes from 10.8.0.1: icmp_seq=6 ttl=64 time=1.22 ms
64 bytes from 10.8.0.1: icmp_seq=7 ttl=64 time=1.60 ms
64 bytes from 10.8.0.1: icmp_seq=8 ttl=64 time=1.49 ms
```