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## **TASK 1: Enterprise Network Setup**

### **1. IP Addressing Plan**

<b>Department</b>	<b>Users</b>	<b>VLAN ID</b>	<b>Subnet</b>	<b>DHCP Scope</b>
Administration	10	10	192.168.10.0/24	192.168.10.50–100
Sales	15	20	192.168.20.0/24	192.168.20.50–100
Engineering	20	30	192.168.30.0/24	192.168.30.50–100
Server Farm	3	35	192.168.35.0/24	Static only
Guest Network	5	99	192.168.99.0/24	192.168.99.50–100
IT Management	1	100	192.168.100.0/24	Static only

### **2. VLAN Table**

<b>VLAN ID</b>	<b>NAME</b>	<b>PORT ASSIGNED</b>
10	Administration	Gig0/1
20	Sales	Gig0/2
30	Engineering	Gig0/3
35	Server Farm	Gig0/3, Gig1/0, Gig1/2
99	Guest Network	Gig0/1
100	IT Management	Gig0/2

### **3. Network Topology Diagram**

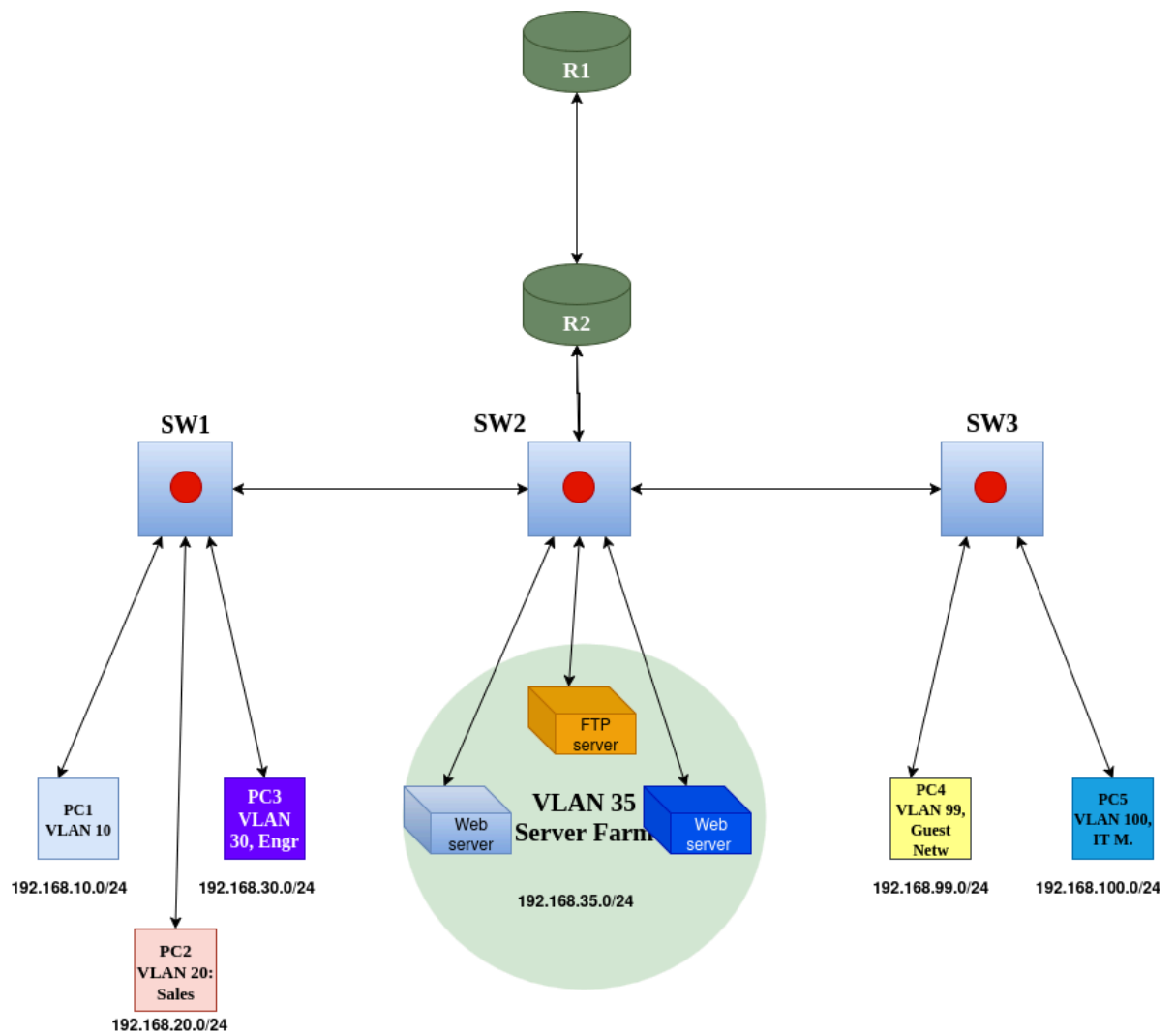


Fig.1 Network topology

#### 4. Configurations

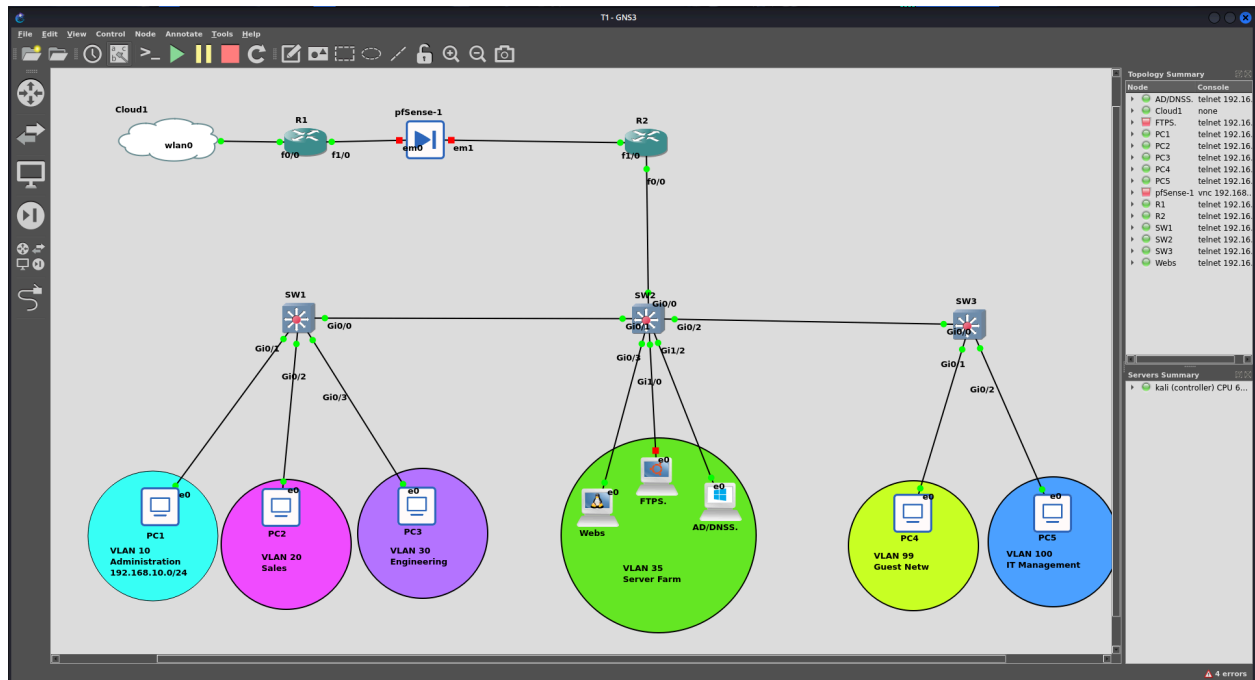


Fig. 2 Network Architecture

The above image shows the network architecture with 5 PCs each acting as a VLAN, 3 Switches for VLAN creation and configuration of trunks, 2 Routers for Inter Vlan Routing and 3 Virtual machines each acting as a server (Web Server, FTP server, AD/DNS server) imported from VMware and connected in gns3.

```

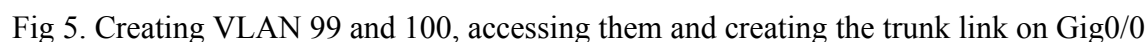
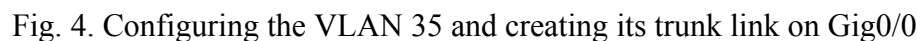
X Secure server will use temporary self-signed certificate,
# Jul 13 02:18:15.172: SSH-5-ENABLED: SSH 1.99 has been enabled
Switch0
Switch>
Jul 13 02:18:40.673: NTPAUTH-SIGNATURE_VERIFYERR: Image "flash:/voss.12-mv
verification=3m" passed code signing verification
Switch#exit
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#vlan 10
Switch(config-vlan)#
Switch(config-vlan)#name Administration
Switch(config-vlan)#ip address 10.10.10.1/24
Switch(config-vlan)#no shutdown
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#
Switch(config-vlan)#name Sales
Switch(config-vlan)#
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#
Switch(config-vlan)#name Engineering
Switch(config-vlan)#
Switch(config-vlan)#exit
Switch(config)#vlan 40
Building configuration...
Expressed configuration from 3417 bytes to 1831 bytes[OK]
# Jul 13 02:18:50.682: GRUB-S-CONFIG_WRITING: GRUB configuration is being update
d on disk. Please wait...
# Jul 13 02:18:59.890: ICMP4-WRITE_VLAN_MISMATCH: Native VLAN mismatch discover
ed on GigabitEthernet0/5 (E0) with Switch GigabitEthernet0/1 (L1).
Switch(config-vlan)#
Jul 13 02:19:00.144: GRUB-S-CONFIG_WRITTEN: GRUB configuration was written to
disk successfully.
Switch(config-vlan)#
Switch(config-vlan)#exit
Switch(config)#int gig0/1
Switch(config-if)#
Switch(config-if)#shutdown port access
A invalid input detected at "" marker.

Switch(config-if)#shutdown port access

Switch(config-if)#
Switch(config-if)#shutdown port access vlan 10
Switch(config-if)#
Switch(config-if)#shutdown port access vlan 10
Switch(config-if)#
Switch(config-if)#int gig0/2
Switch(config-if)#
Switch(config-if)#shutdown port access
Switch(config-if)#shutdown port access vlan 20
Switch(config-if)#
Switch(config-if)#int gig0/3
Switch(config-if)#
Switch(config-if)#shutdown port access
Switch(config-if)#shutdown port access vlan 30
Switch(config-if)#
Switch(config-if)#int gig0/0
Switch(config-if)#
Switch(config-if)#shutdown port trunk
However, received on interface whose trunk encapsulation is "dot1q" can not be co
nfigured to "trust" mode.
Switch(config-if)#
Switch(config-if)#shutdown port access vlan 30
Jul 13 02:19:24.597: ICMP4-WRITE_VLAN_MISMATCH: Native VLAN mismatch discover
ed on GigabitEthernet0/5 (E0) with Switch GigabitEthernet vian 30
Switch(config-if)#
Switch(config-if)#shutdown port access vlan 30
Jul 13 02:19:24.675: SPANWRITE-7-RECV_IGMP_NN_TRUNK: Received 80G.1G BPDU on non
trunk GigaibitEthernet0/VLAN30
Jul 13 02:19:24.675: SPANWRITE-7-BLOCK_PORT_TYPE: Blocking GigabitEthernet0/0
VLAN30. Ingress/trunks mode

```

Fig 3. Creating VLAN 10,20 and 30 on SW1, accessing them and creating the trunk link on the Gig0/0 interface

[illegible]

```

SW2
% Invalid input detected at '^' marker.

Switch(config-if)#do sh interfaces trunk

Port      Mode      Encapsulation  Status      Native vlan
Gi0/0     on        802.1q         trunking    1
Gi0/1     on        802.1q         trunking    1
Gi0/2     on        802.1q         trunking    1

Port      Vlans allowed on trunk
Gi0/0     1-4094
Gi0/1     1-4094
Gi0/2     1-4094

Port      Vlans allowed and active in management domain
Gi0/0     1,10,20,30,35,99-100
Gi0/1     1,10,20,30,35,99-100
Gi0/2     1,10,20,30,35,99-100

Port      Vlans in spanning tree forwarding state and not pruned
Gi0/0     1,10,20,30,35,99-100
Gi0/1     1,10,20,30,35,99-100
Gi0/2     1,10,20,30,35,99-100
Switch(config-if)#

```

Fig. 6. Trunk Interfaces. From the image, it shows that all the trunks links have been created

After creating the VLANs and the trunk link for the VLANs, we now configure Inter Vlan routing on Router so that the different VLANs can be able to communicate with each other

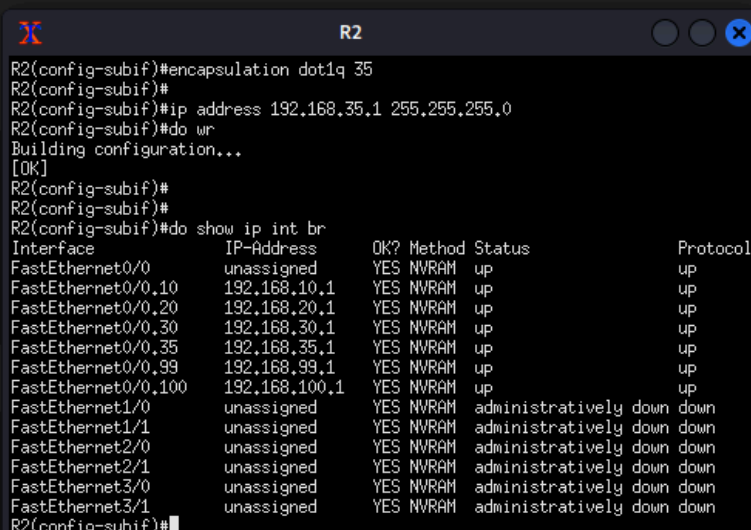
```

R2(config)#
R2(config)#
R2(config)#int fa0/0
R2(config-if)#
R2(config-if)#no shutdown
R2(config-if)#
R2(config-if)#int fa0/0.10
R2(config-subif)#
R2(config-subif)#encapsulation dot1q 10
R2(config-subif)#
R2(config-subif)#ip address 192.168.10.1 255.255.255.0
R2(config-subif)#ip helper-address 192.168.35.5
R2(config-subif)#
R2(config-subif)#exit
R2(config)#
R2(config)#int fa0/0.20
R2(config-subif)#encapsulation dot1q 20
R2(config-subif)#ip address 192.168.20.1 255.255.255.0
R2(config-subif)#ip helper-address 192.168.35.5
R2(config-subif)#exit
R2(config)#
R2(config)#int fa0/0.30
R2(config-subif)#encapsulation dot1q 30
R2(config-subif)#ip address 192.168.30.1 255.255.255.0
R2(config-subif)#ip helper-address 192.168.35.5
R2(config-subif)#exit
R2(config)#
R2(config)#int fa0/0.35
R2(config-subif)#encapsulation dot1q 35
R2(config-subif)#ip address 192.168.35.1 255.255.255.0
R2(config-subif)#exit
R2(config)#
R2(config)#int fa0/0.99
R2(config-subif)#encapsulation dot1q 99
R2(config-subif)#ip address 192.168.99.1 255.255.255.0
R2(config-subif)#ip helper-address 192.168.35.5
R2(config-subif)#exit
R2(config)#
R2(config)#int fa0/0.100
R2(config-subif)#encapsulation dot1q 100
R2(config-subif)#ip address 192.168.100.1 255.255.255.0
R2(config-subif)#exit
R2(config)#
R2(config)#
R2(config)#int fa0/0
R2(config-if)#no shutdown
R2(config-if)#
R2(config-if)#
R2(config-if)#exit
R2(config)#
R2(config)#
R2(config)#do wr
Warning: Attempting to overwrite an NVRAM configuration previously written
by a different version of the system image.
Overwrite the previous NVRAM configuration?[confirm]
Building configuration...
[OK]
R2(config)#

```

Fig. 7. Intervlan routing configuration on R2

The command “ip helper address 192.168.\*.\*” Forwards DHCP broadcasts to real server (In this case it’s our Windows server)

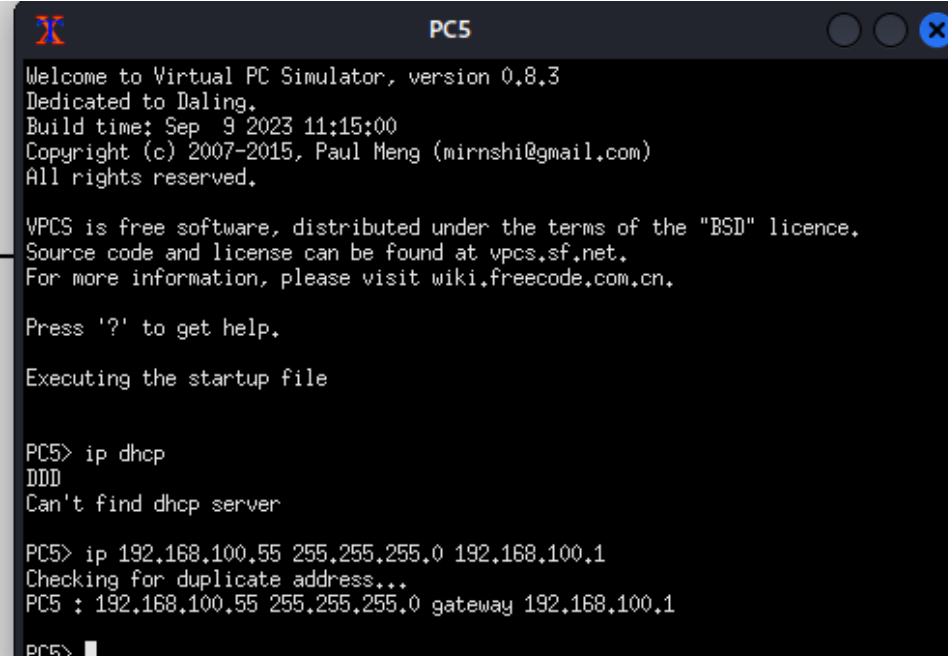


```
R2
R2(config-subif)#encapsulation dot1q 35
R2(config-subif)#
R2(config-subif)#ip address 192.168.35.1 255.255.255.0
R2(config-subif)#do wr
Building configuration...
[OK]
R2(config-subif)#
R2(config-subif)#
R2(config-subif)#do show ip int br
Interface      IP-Address      OK? Method Status        Protocol
FastEthernet0/0 unassigned      YES NVRAM  up            up
FastEthernet0/0.10 192.168.10.1    YES NVRAM  up            up
FastEthernet0/0.20 192.168.20.1    YES NVRAM  up            up
FastEthernet0/0.30 192.168.30.1    YES NVRAM  up            up
FastEthernet0/0.35 192.168.35.1    YES NVRAM  up            up
FastEthernet0/0.99 192.168.99.1    YES NVRAM  up            up
FastEthernet0/0.100 192.168.100.1   YES NVRAM  up            up
FastEthernet1/0 unassigned      YES NVRAM  administratively down down
FastEthernet1/1 unassigned      YES NVRAM  administratively down down
FastEthernet2/0 unassigned      YES NVRAM  administratively down down
FastEthernet2/1 unassigned      YES NVRAM  administratively down down
FastEthernet3/0 unassigned      YES NVRAM  administratively down down
FastEthernet3/1 unassigned      YES NVRAM  administratively down down
R2(config-subif)#
```

Fig. 8. Checking the interface configurations to ensure that all are UP (Active)

After configuring Intervlan routing, we now can test if the different VLANs are communicating with each other using the ping command but to do that, the end devices need to have IP addresses assigned first.

PCs 1,2,3, and 4 will have IP addresses assigned by DHCP which will be configured in the AD/DNS server and PC 5 and the servers will have IP addresses which are assigned manually



```
PC5
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep  9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC5> ip dhcp
DDD
Can't find dhcp server

PC5> ip 192.168.100.55 255.255.255.0 192.168.100.1
Checking for duplicate address...
PC5 : 192.168.100.55 255.255.255.0 gateway 192.168.100.1

PC5>
```

Fig. 9. Assigning a static IP to PC5 (VLAN 100)

Now, we have to configure DHCP in our windows server which is our AD/DNS server and by doing this we need to Add the DHCP role in server manager which has already been done then Add the scopes which we will use for this task.

NB; The ip of the server itself has already been set manually

To configure DHCP, you navigate to DHCP manager in the Server Manager of the Windows machine and then click on **Actions** then **New Scope**

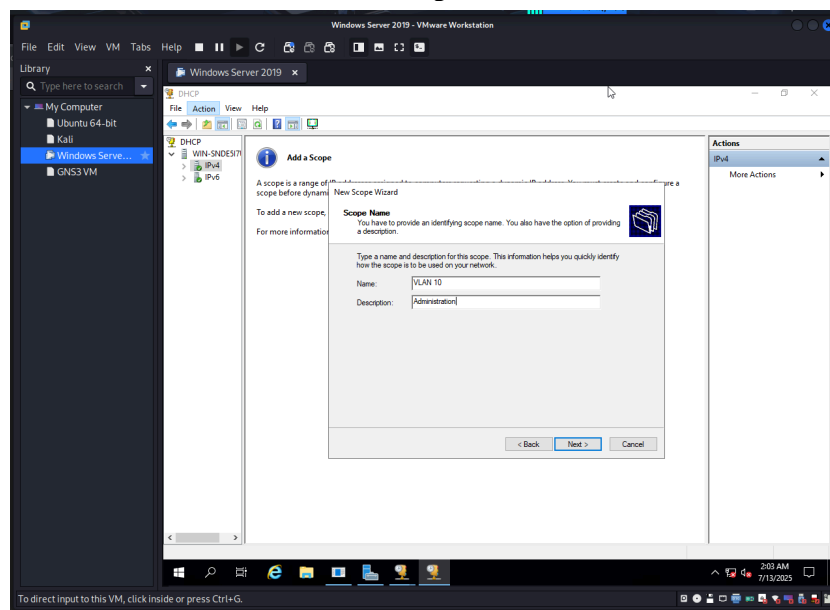


Fig 10. Creating the scope for VLAN 10

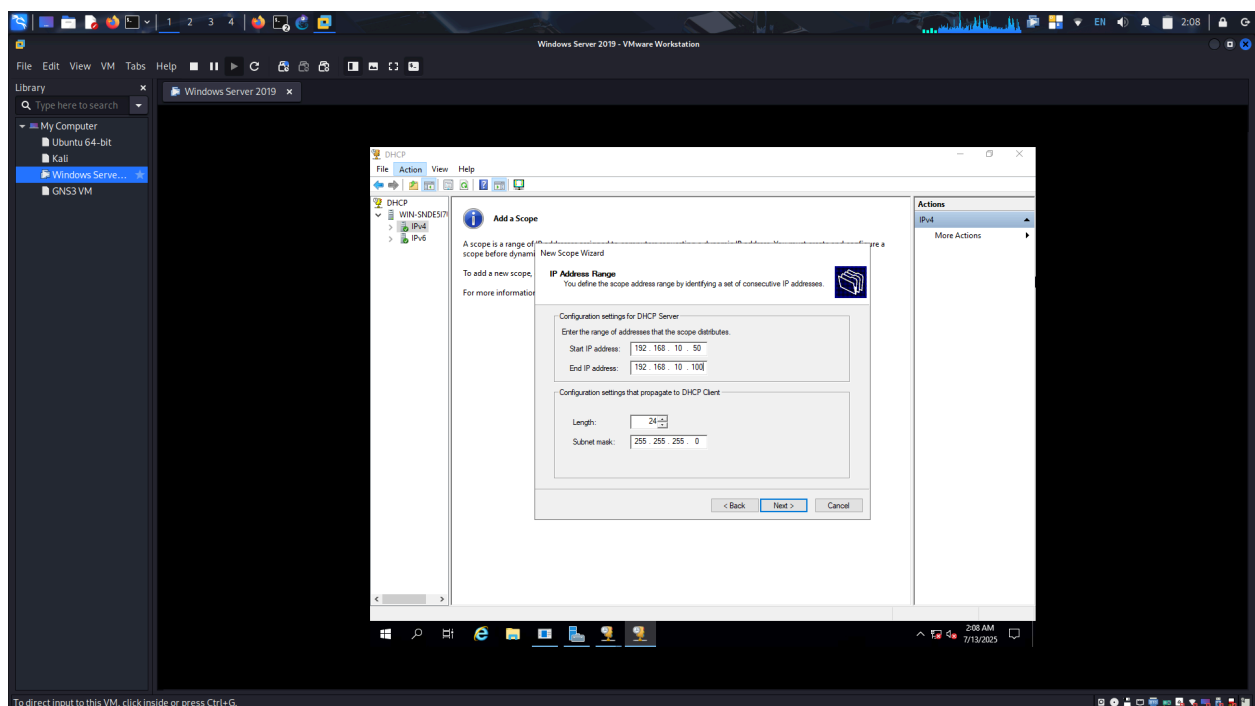


Fig. 11 Setting the DHCP scope (range of IPs to use)

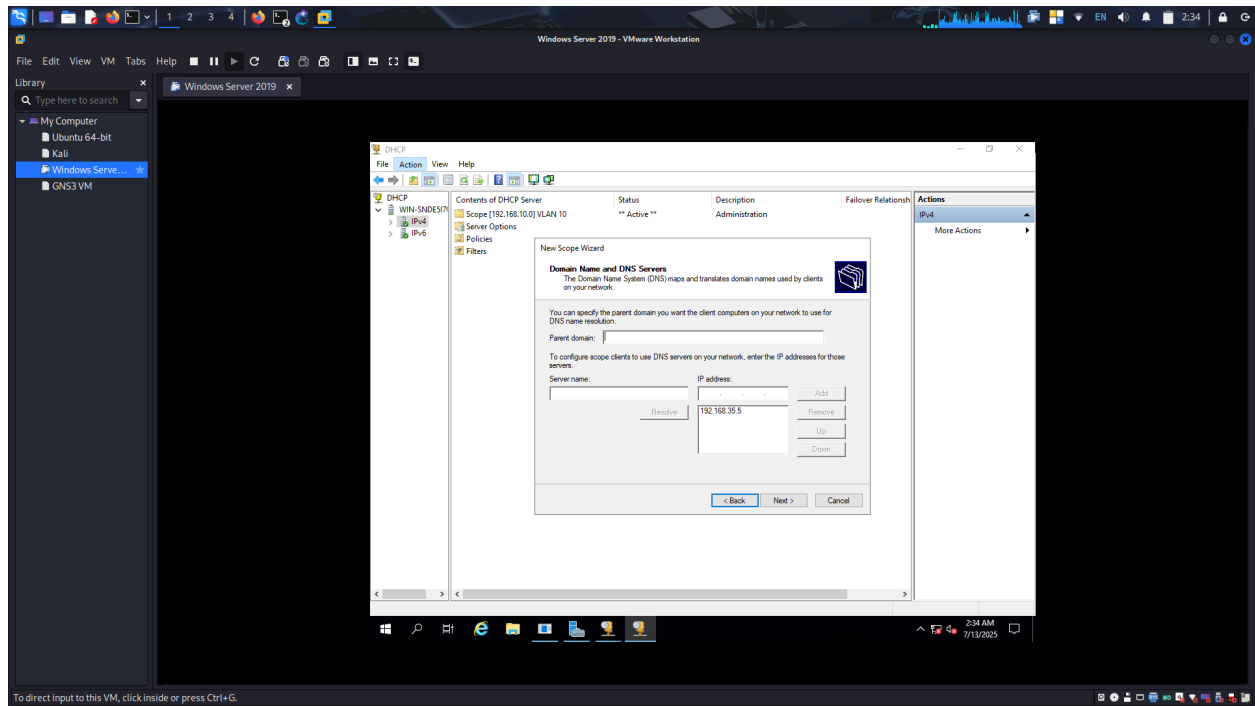


Fig. 12. Adding the DNS IP (192.168.35.5), you do same when configuring for VLANs 20, 20 and 99

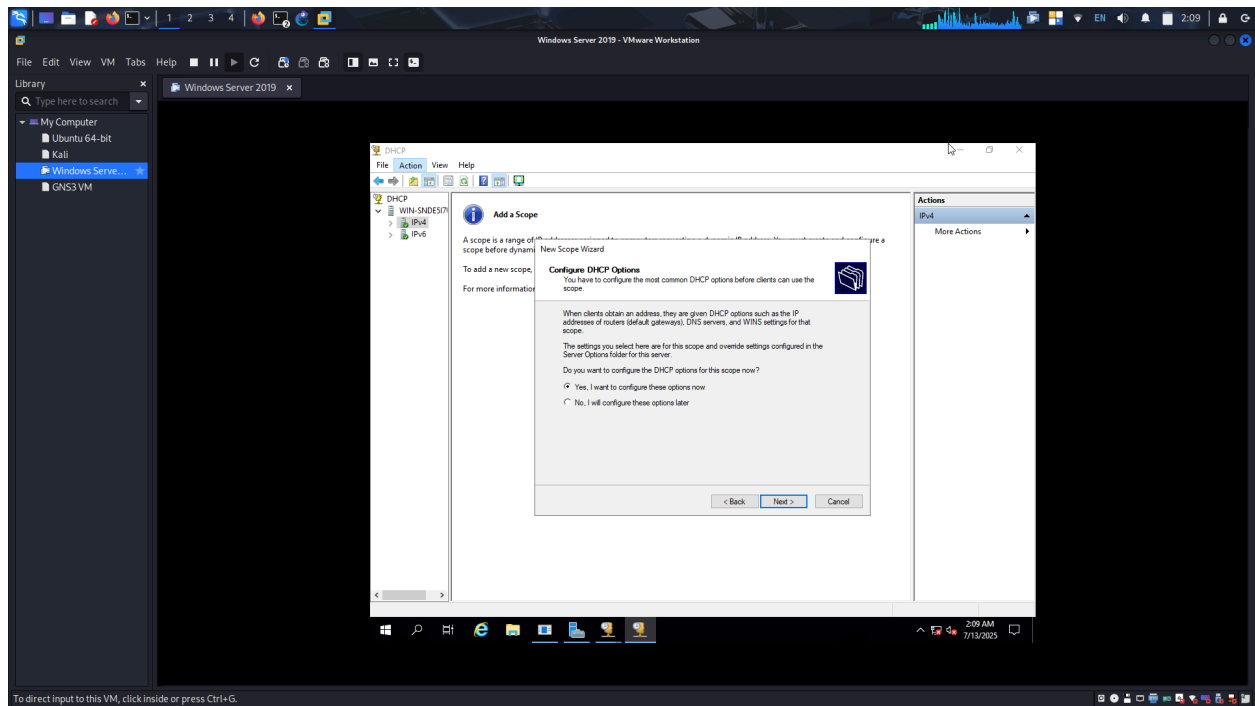


Fig.13. Configuring the DHCP Option, you do same when configuring for VLANs 20, 20 and 99



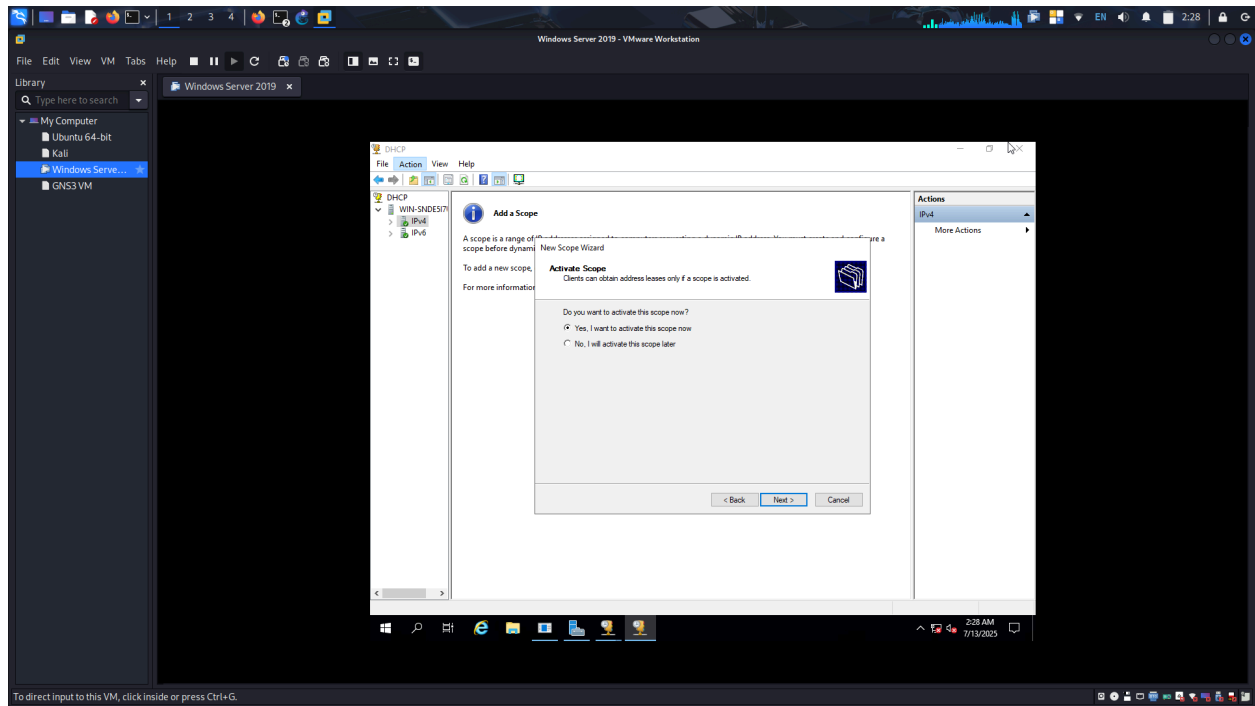


Fig. 14. Activating the Scope, you do same when configuring for VLANs 20, 20 and 99

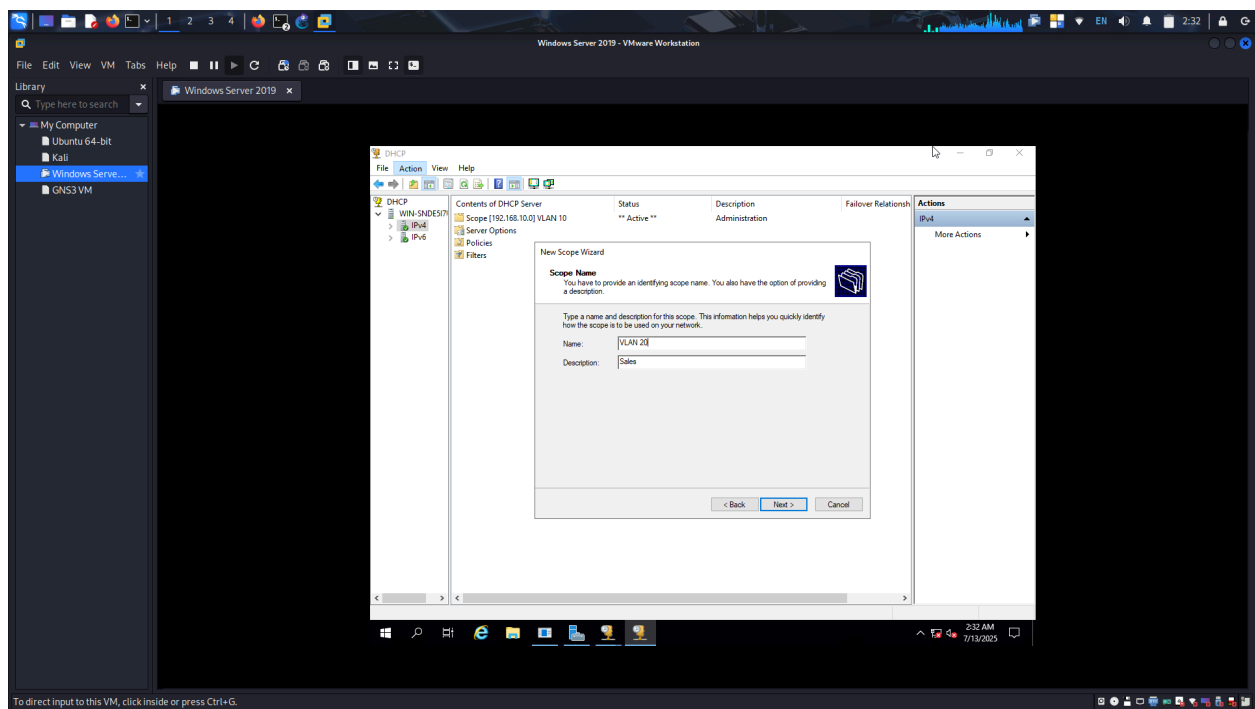


Fig. 15. Creating the scope for VLAN 20

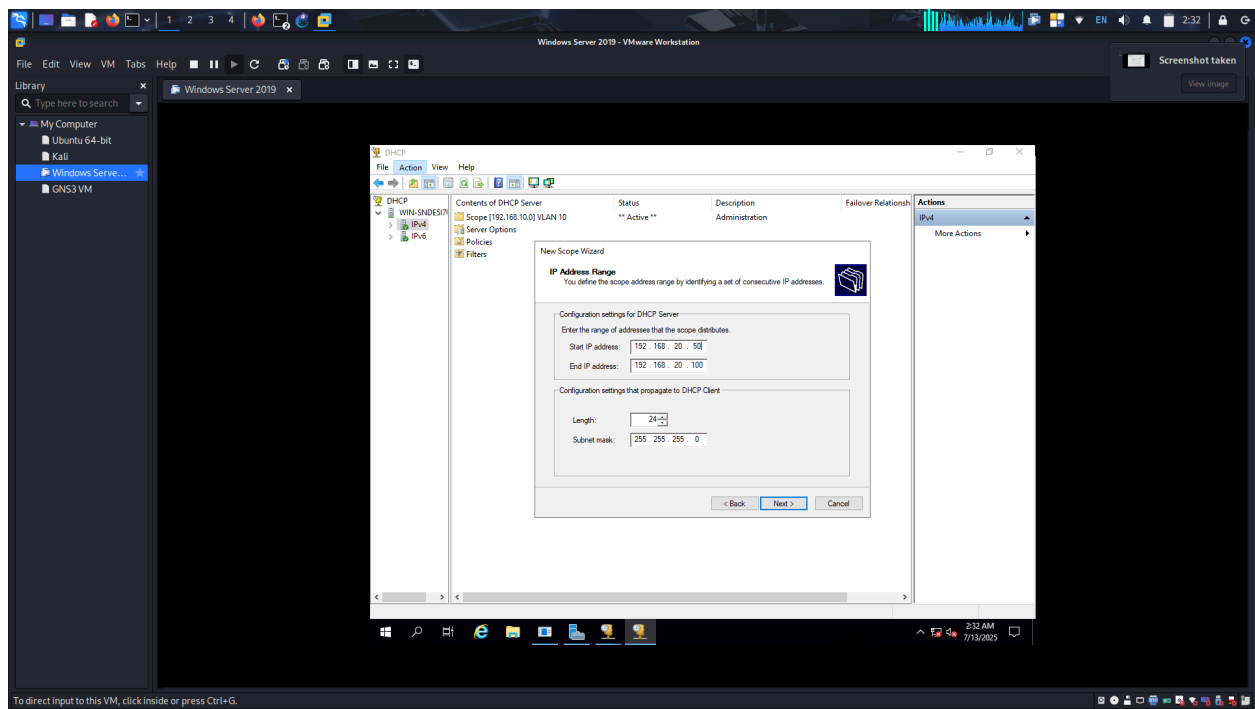


Fig. 16

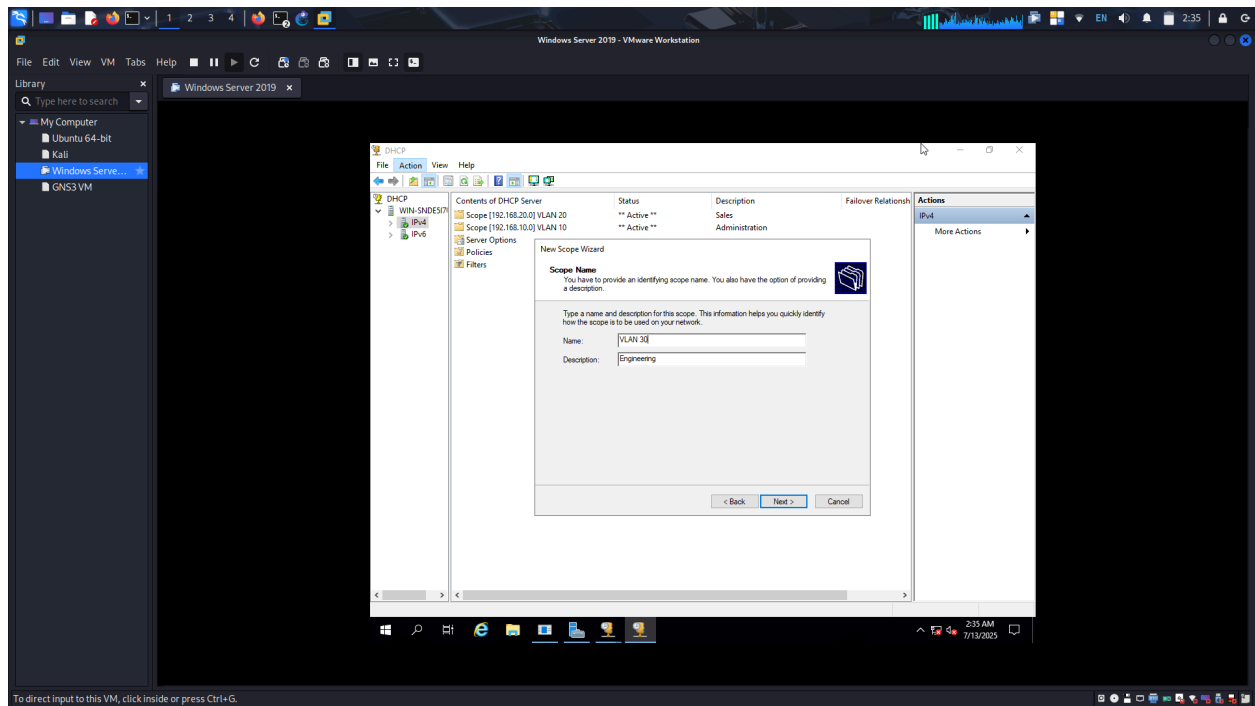


Fig. 17. Creating the scope for VLAN 30

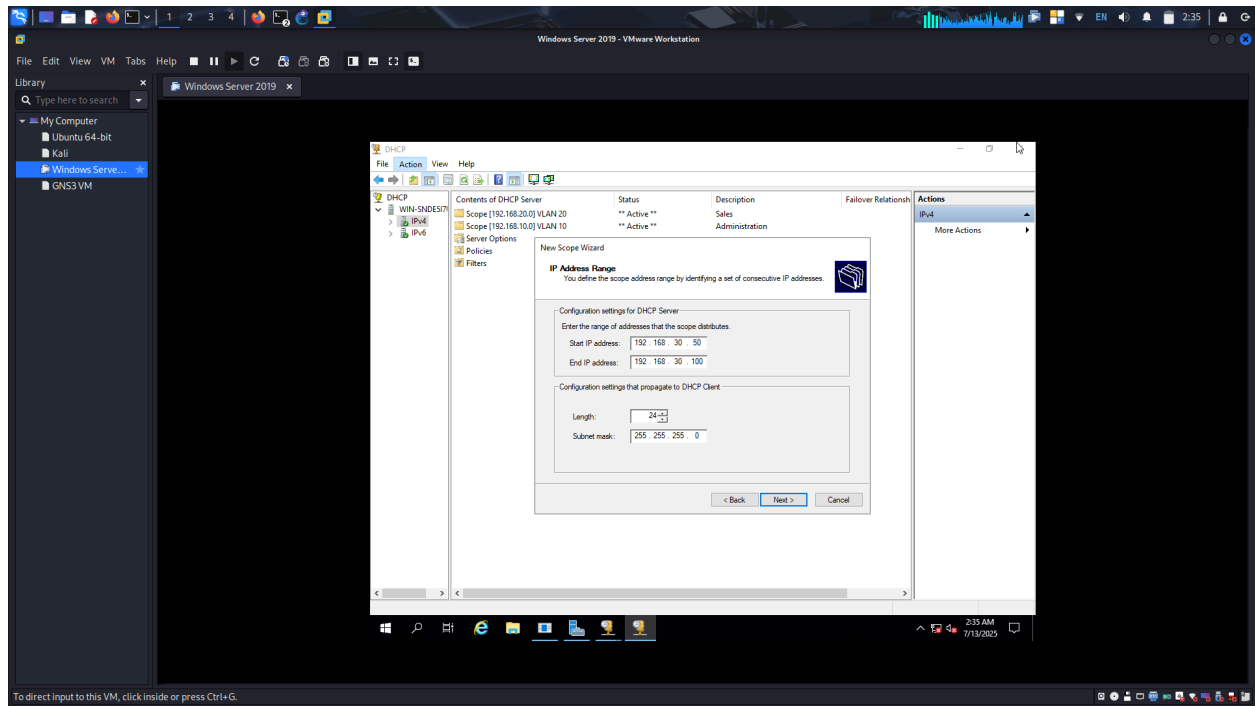


Fig. 18

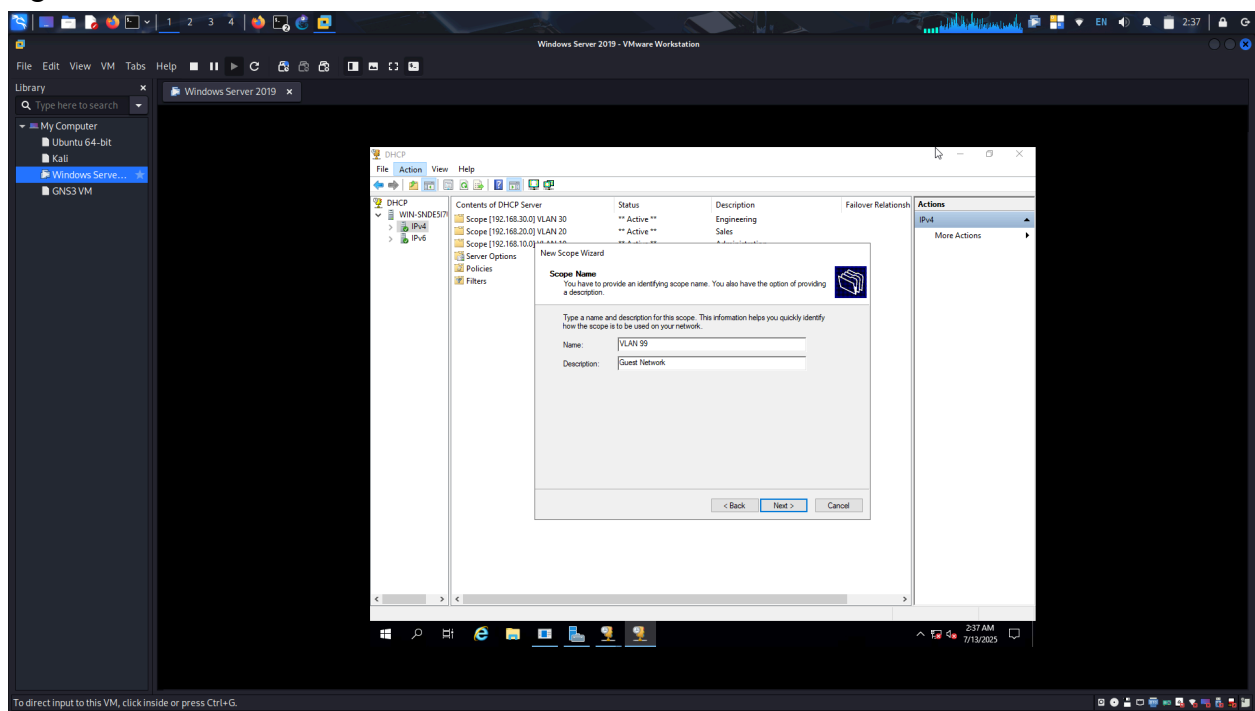


Fig. 19. Creating the scope for VLAN 99

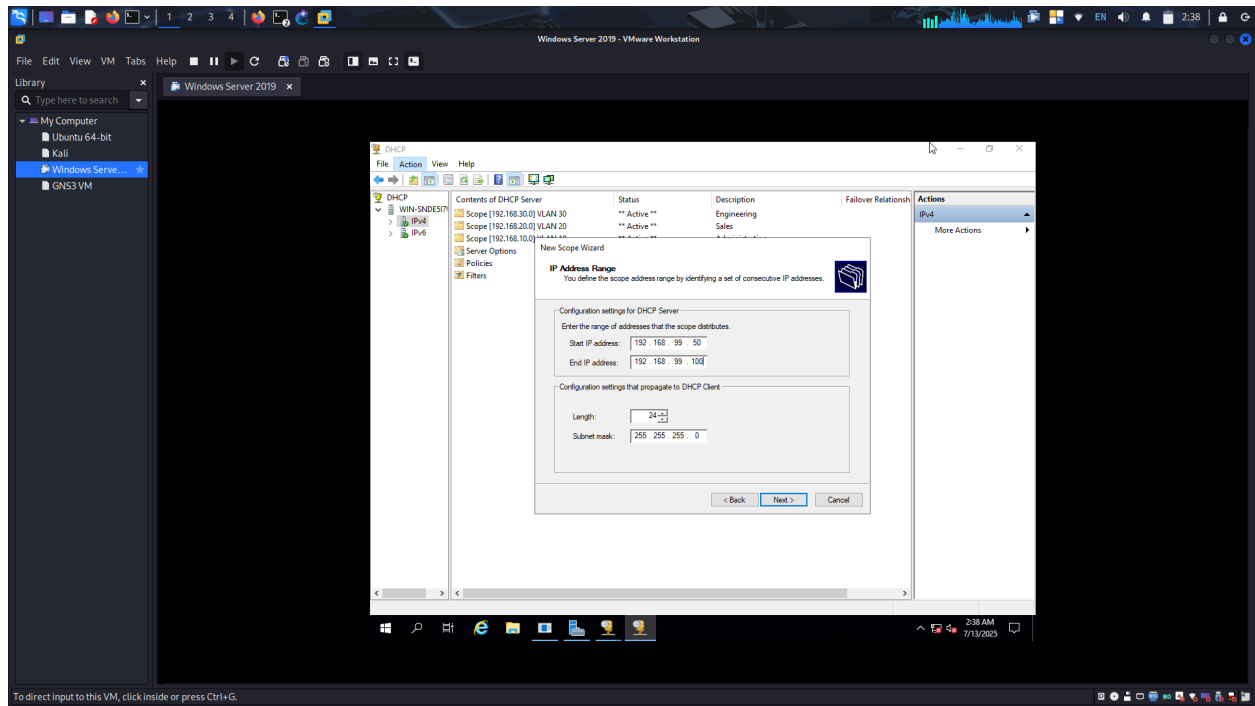


Fig. 20

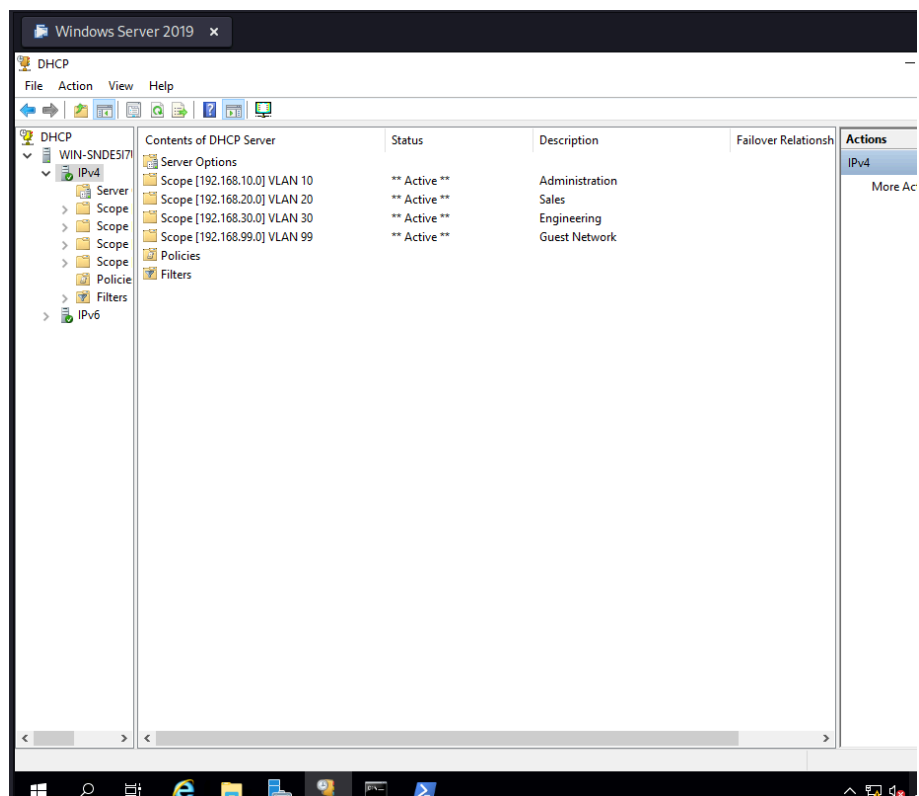


Fig. 21. The different scopes we've created are all active and ready to be used

After creating the scopes, we can ping the gateway of the AD/DNS server to make sure it is connected then we activate the IP created via DHCP in the different PCs which require DHCP

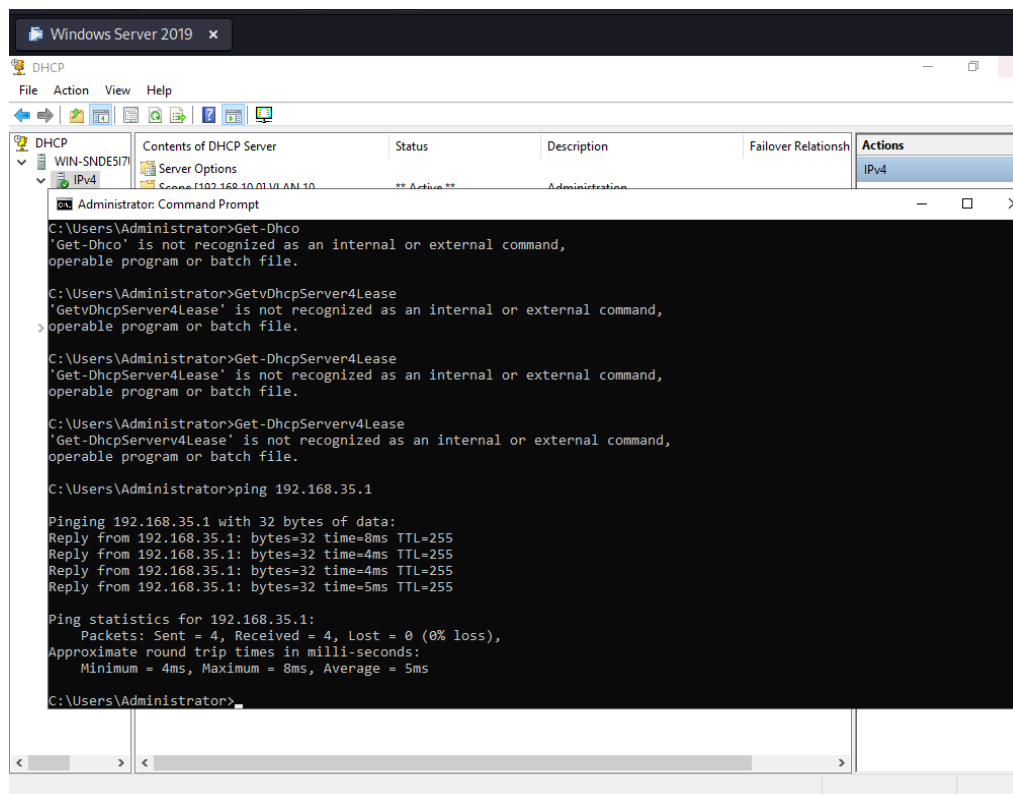


Fig. 22. AD/DNS server pinging the gateway (192.168.35.1)

Now we activate the dhcp ips to the different PCs and making sure they communicate with the AD/DNS server

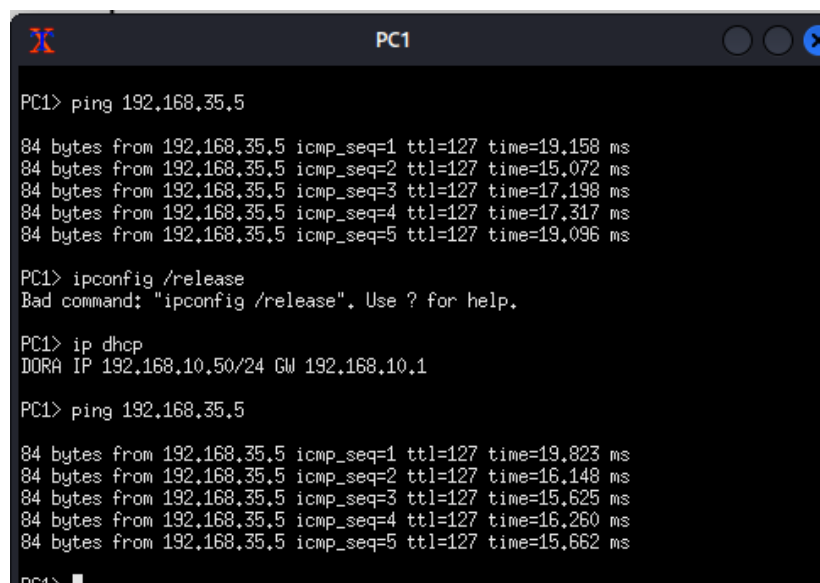


Fig. 23. PC1 getting the dhcp ip and pinging the AD/DN server

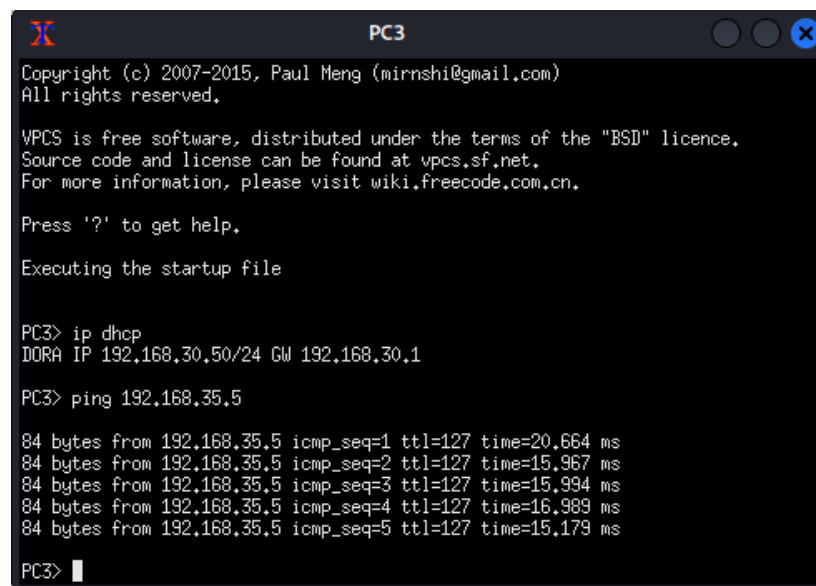
```
PC2> ip dhcp
DORA IP 192.168.20.50/24 GW 192.168.20.1

PC2> ping 192.168.35.5

84 bytes from 192.168.35.5 icmp_seq=1 ttl=127 time=19.049 ms
84 bytes from 192.168.35.5 icmp_seq=2 ttl=127 time=17.304 ms
84 bytes from 192.168.35.5 icmp_seq=3 ttl=127 time=15.823 ms
84 bytes from 192.168.35.5 icmp_seq=4 ttl=127 time=16.677 ms
84 bytes from 192.168.35.5 icmp_seq=5 ttl=127 time=16.047 ms

PC2> █
```

Fig. 24. PC2 getting the dhcp ip and pinging the AD/DN server

A screenshot of a terminal window titled "PC3". The window has a dark background with a red 'X' icon in the top-left corner and standard window controls (minimize, maximize, close) in the top-right. The text inside the terminal shows the execution of 'ip dhcp' and 'ping 192.168.35.5' commands, along with their outputs. The DHCP output shows an assigned IP of 192.168.30.50 and a gateway of 192.168.30.1. The ping output shows five successful pings with varying response times.

```
PC3
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For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

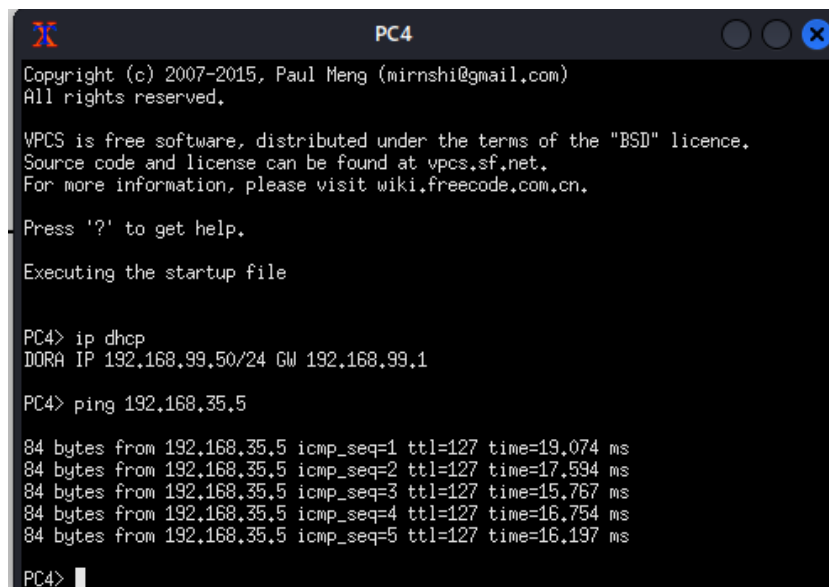
PC3> ip dhcp
DORA IP 192.168.30.50/24 GW 192.168.30.1

PC3> ping 192.168.35.5

84 bytes from 192.168.35.5 icmp_seq=1 ttl=127 time=20.664 ms
84 bytes from 192.168.35.5 icmp_seq=2 ttl=127 time=15.967 ms
84 bytes from 192.168.35.5 icmp_seq=3 ttl=127 time=15.994 ms
84 bytes from 192.168.35.5 icmp_seq=4 ttl=127 time=16.989 ms
84 bytes from 192.168.35.5 icmp_seq=5 ttl=127 time=15.179 ms

PC3> █
```

Fig. 25. PC3 getting the dhcp ip and pinging the AD/DN server

A screenshot of a terminal window titled "PC4". The window has a dark background with a red 'X' icon in the top-left corner and standard window controls (minimize, maximize, close) in the top-right. The text inside the terminal shows the execution of 'ip dhcp' and 'ping 192.168.35.5' commands, along with their outputs. The DHCP output shows an assigned IP of 192.168.99.50 and a gateway of 192.168.99.1. The ping output shows five successful pings with varying response times.

```
PC4
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For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC4> ip dhcp
DORA IP 192.168.99.50/24 GW 192.168.99.1

PC4> ping 192.168.35.5

84 bytes from 192.168.35.5 icmp_seq=1 ttl=127 time=19.074 ms
84 bytes from 192.168.35.5 icmp_seq=2 ttl=127 time=17.594 ms
84 bytes from 192.168.35.5 icmp_seq=3 ttl=127 time=15.767 ms
84 bytes from 192.168.35.5 icmp_seq=4 ttl=127 time=16.754 ms
84 bytes from 192.168.35.5 icmp_seq=5 ttl=127 time=16.197 ms

PC4> █
```

Fig. 26. PC4 getting the dhcp ip and pinging the AD/DN server

Now that all the pcs have Ip addresses, we now make sure each pc can access all the different VLANs before we configure ACL(Access Control List)

```
PC1> ping 192.168.20.1

84 bytes from 192.168.20.1 icmp_seq=1 ttl=255 time=10.571 ms
84 bytes from 192.168.20.1 icmp_seq=2 ttl=255 time=6.132 ms
84 bytes from 192.168.20.1 icmp_seq=3 ttl=255 time=6.391 ms
84 bytes from 192.168.20.1 icmp_seq=4 ttl=255 time=5.069 ms
84 bytes from 192.168.20.1 icmp_seq=5 ttl=255 time=5.577 ms

PC1> ping 192.168.30.1

84 bytes from 192.168.30.1 icmp_seq=1 ttl=255 time=12.623 ms
84 bytes from 192.168.30.1 icmp_seq=2 ttl=255 time=6.386 ms
84 bytes from 192.168.30.1 icmp_seq=3 ttl=255 time=6.559 ms
84 bytes from 192.168.30.1 icmp_seq=4 ttl=255 time=6.524 ms
84 bytes from 192.168.30.1 icmp_seq=5 ttl=255 time=15.103 ms

PC1> ping 192.168.35.1

84 bytes from 192.168.35.1 icmp_seq=1 ttl=255 time=13.553 ms
84 bytes from 192.168.35.1 icmp_seq=2 ttl=255 time=6.335 ms
84 bytes from 192.168.35.1 icmp_seq=3 ttl=255 time=6.328 ms
84 bytes from 192.168.35.1 icmp_seq=4 ttl=255 time=6.566 ms
84 bytes from 192.168.35.1 icmp_seq=5 ttl=255 time=5.305 ms

PC1> ping 192.168.99.1

84 bytes from 192.168.99.1 icmp_seq=1 ttl=255 time=11.207 ms
84 bytes from 192.168.99.1 icmp_seq=2 ttl=255 time=5.826 ms
84 bytes from 192.168.99.1 icmp_seq=3 ttl=255 time=6.680 ms
84 bytes from 192.168.99.1 icmp_seq=4 ttl=255 time=5.637 ms
84 bytes from 192.168.99.1 icmp_seq=5 ttl=255 time=6.299 ms

PC1> ping 192.168.100.1

84 bytes from 192.168.100.1 icmp_seq=1 ttl=255 time=11.961 ms
84 bytes from 192.168.100.1 icmp_seq=2 ttl=255 time=6.128 ms
84 bytes from 192.168.100.1 icmp_seq=3 ttl=255 time=6.293 ms
84 bytes from 192.168.100.1 icmp_seq=4 ttl=255 time=6.019 ms
84 bytes from 192.168.100.1 icmp_seq=5 ttl=255 time=6.073 ms

PC1> █
```

Fig. 27. PC1 accessing all the VLANs, same for PC2, PC3, PC4, PC5 and the server

```
PC2> ping 192.168.10.1

84 bytes from 192.168.10.1 icmp_seq=1 ttl=255 time=5.680 ms
84 bytes from 192.168.10.1 icmp_seq=2 ttl=255 time=5.340 ms
84 bytes from 192.168.10.1 icmp_seq=3 ttl=255 time=7.458 ms
84 bytes from 192.168.10.1 icmp_seq=4 ttl=255 time=5.925 ms
84 bytes from 192.168.10.1 icmp_seq=5 ttl=255 time=6.477 ms

PC2> ping 192.168.30.1

84 bytes from 192.168.30.1 icmp_seq=1 ttl=255 time=8.119 ms
84 bytes from 192.168.30.1 icmp_seq=2 ttl=255 time=5.608 ms
84 bytes from 192.168.30.1 icmp_seq=3 ttl=255 time=6.395 ms
84 bytes from 192.168.30.1 icmp_seq=4 ttl=255 time=5.666 ms
84 bytes from 192.168.30.1 icmp_seq=5 ttl=255 time=5.703 ms

PC2> ping 192.168.35.1

84 bytes from 192.168.35.1 icmp_seq=1 ttl=255 time=7.312 ms
84 bytes from 192.168.35.1 icmp_seq=2 ttl=255 time=5.257 ms
84 bytes from 192.168.35.1 icmp_seq=3 ttl=255 time=6.287 ms
84 bytes from 192.168.35.1 icmp_seq=4 ttl=255 time=7.663 ms
84 bytes from 192.168.35.1 icmp_seq=5 ttl=255 time=4.329 ms

PC2> ping 192.168.99.1

84 bytes from 192.168.99.1 icmp_seq=1 ttl=255 time=9.665 ms
84 bytes from 192.168.99.1 icmp_seq=2 ttl=255 time=4.734 ms
84 bytes from 192.168.99.1 icmp_seq=3 ttl=255 time=6.317 ms
84 bytes from 192.168.99.1 icmp_seq=4 ttl=255 time=5.850 ms
84 bytes from 192.168.99.1 icmp_seq=5 ttl=255 time=6.984 ms

PC2> ping 192.168.100.1

84 bytes from 192.168.100.1 icmp_seq=1 ttl=255 time=10.395 ms
84 bytes from 192.168.100.1 icmp_seq=2 ttl=255 time=5.200 ms
84 bytes from 192.168.100.1 icmp_seq=3 ttl=255 time=6.049 ms
84 bytes from 192.168.100.1 icmp_seq=4 ttl=255 time=6.567 ms
84 bytes from 192.168.100.1 icmp_seq=5 ttl=255 time=6.468 ms

PC2> █
```

Fig. 28. PC2

```

PC3> ping 192.168.10.1

84 bytes from 192.168.10.1 icmp_seq=1 ttl=255 time=9.691 ms
84 bytes from 192.168.10.1 icmp_seq=2 ttl=255 time=5.639 ms
84 bytes from 192.168.10.1 icmp_seq=3 ttl=255 time=6.298 ms
84 bytes from 192.168.10.1 icmp_seq=4 ttl=255 time=6.075 ms
84 bytes from 192.168.10.1 icmp_seq=5 ttl=255 time=7.067 ms

PC3> ping 192.168.20.1

84 bytes from 192.168.20.1 icmp_seq=1 ttl=255 time=6.989 ms
84 bytes from 192.168.20.1 icmp_seq=2 ttl=255 time=6.250 ms
84 bytes from 192.168.20.1 icmp_seq=3 ttl=255 time=5.790 ms
84 bytes from 192.168.20.1 icmp_seq=4 ttl=255 time=6.295 ms
84 bytes from 192.168.20.1 icmp_seq=5 ttl=255 time=6.617 ms

PC3> ping 192.168.35.1

84 bytes from 192.168.35.1 icmp_seq=1 ttl=255 time=9.218 ms
84 bytes from 192.168.35.1 icmp_seq=2 ttl=255 time=6.043 ms
84 bytes from 192.168.35.1 icmp_seq=3 ttl=255 time=6.307 ms
84 bytes from 192.168.35.1 icmp_seq=4 ttl=255 time=5.625 ms
84 bytes from 192.168.35.1 icmp_seq=5 ttl=255 time=7.219 ms

PC3> ping 192.168.9.1

*192.168.30.1 icmp_seq=1 ttl=255 time=11.578 ms (ICMP type:3, code:1, Destination
n host unreachable)
*192.168.30.1 icmp_seq=2 ttl=255 time=5.785 ms (ICMP type:3, code:1, Destination
host unreachable)
*192.168.30.1 icmp_seq=3 ttl=255 time=6.390 ms (ICMP type:3, code:1, Destination
host unreachable)
*192.168.30.1 icmp_seq=4 ttl=255 time=6.853 ms (ICMP type:3, code:1, Destination
host unreachable)
*192.168.30.1 icmp_seq=5 ttl=255 time=6.842 ms (ICMP type:3, code:1, Destination
host unreachable)

PC3> ping 192.168.99.1

84 bytes from 192.168.99.1 icmp_seq=1 ttl=255 time=8.159 ms
84 bytes from 192.168.99.1 icmp_seq=2 ttl=255 time=14.621 ms
84 bytes from 192.168.99.1 icmp_seq=3 ttl=255 time=6.825 ms
84 bytes from 192.168.99.1 icmp_seq=4 ttl=255 time=5.831 ms
84 bytes from 192.168.99.1 icmp_seq=5 ttl=255 time=5.813 ms

PC3> ping 192.168.100.1

84 bytes from 192.168.100.1 icmp_seq=1 ttl=255 time=10.085 ms
84 bytes from 192.168.100.1 icmp_seq=2 ttl=255 time=5.544 ms
84 bytes from 192.168.100.1 icmp_seq=3 ttl=255 time=5.203 ms
84 bytes from 192.168.100.1 icmp_seq=4 ttl=255 time=6.391 ms
84 bytes from 192.168.100.1 icmp_seq=5 ttl=255 time=4.926 ms

PC3> █

```

Fig. 29. P3

```

PC4> ping 192.168.10.1

84 bytes from 192.168.10.1 icmp_seq=1 ttl=255 time=13.309 ms
84 bytes from 192.168.10.1 icmp_seq=2 ttl=255 time=5.614 ms
84 bytes from 192.168.10.1 icmp_seq=3 ttl=255 time=5.643 ms
84 bytes from 192.168.10.1 icmp_seq=4 ttl=255 time=5.647 ms
84 bytes from 192.168.10.1 icmp_seq=5 ttl=255 time=5.177 ms

PC4> ping 192.168.20.1

84 bytes from 192.168.20.1 icmp_seq=1 ttl=255 time=6.135 ms
84 bytes from 192.168.20.1 icmp_seq=2 ttl=255 time=6.132 ms
84 bytes from 192.168.20.1 icmp_seq=3 ttl=255 time=5.761 ms
84 bytes from 192.168.20.1 icmp_seq=4 ttl=255 time=5.004 ms
84 bytes from 192.168.20.1 icmp_seq=5 ttl=255 time=7.730 ms

PC4> ping 192.168.30.1

84 bytes from 192.168.30.1 icmp_seq=1 ttl=255 time=14.918 ms
84 bytes from 192.168.30.1 icmp_seq=2 ttl=255 time=5.907 ms
84 bytes from 192.168.30.1 icmp_seq=3 ttl=255 time=6.010 ms
84 bytes from 192.168.30.1 icmp_seq=4 ttl=255 time=5.883 ms
84 bytes from 192.168.30.1 icmp_seq=5 ttl=255 time=6.661 ms

PC4> ping 192.168.35.1

84 bytes from 192.168.35.1 icmp_seq=1 ttl=255 time=10.943 ms
84 bytes from 192.168.35.1 icmp_seq=2 ttl=255 time=6.312 ms
84 bytes from 192.168.35.1 icmp_seq=3 ttl=255 time=5.685 ms
84 bytes from 192.168.35.1 icmp_seq=4 ttl=255 time=6.446 ms
84 bytes from 192.168.35.1 icmp_seq=5 ttl=255 time=6.677 ms

PC4> ping 192.168.99.1

84 bytes from 192.168.99.1 icmp_seq=1 ttl=255 time=12.544 ms
84 bytes from 192.168.99.1 icmp_seq=2 ttl=255 time=6.360 ms
84 bytes from 192.168.99.1 icmp_seq=3 ttl=255 time=4.650 ms
84 bytes from 192.168.99.1 icmp_seq=4 ttl=255 time=6.458 ms
84 bytes from 192.168.99.1 icmp_seq=5 ttl=255 time=7.037 ms

PC4> ping 192.168.100.1

84 bytes from 192.168.100.1 icmp_seq=1 ttl=255 time=13.492 ms
84 bytes from 192.168.100.1 icmp_seq=2 ttl=255 time=5.461 ms
84 bytes from 192.168.100.1 icmp_seq=3 ttl=255 time=5.534 ms
84 bytes from 192.168.100.1 icmp_seq=4 ttl=255 time=4.959 ms
84 bytes from 192.168.100.1 icmp_seq=5 ttl=255 time=6.354 ms

PC4> █

```

Fig. 30. PC4



```

PC5> ping 192.168.35,5

34 bytes from 192.168.35,5 icmp_seq=1 ttl=127 time=19.689 ms
34 bytes from 192.168.35,5 icmp_seq=2 ttl=127 time=16.832 ms
34 bytes from 192.168.35,5 icmp_seq=3 ttl=127 time=16.369 ms
34 bytes from 192.168.35,5 icmp_seq=4 ttl=127 time=17.349 ms
34 bytes from 192.168.35,5 icmp_seq=5 ttl=127 time=14.113 ms

PC5> ping 192.168.10,1

34 bytes from 192.168.10,1 icmp_seq=1 ttl=255 time=10.865 ms
34 bytes from 192.168.10,1 icmp_seq=2 ttl=255 time=5.471 ms
34 bytes from 192.168.10,1 icmp_seq=3 ttl=255 time=5.238 ms
34 bytes from 192.168.10,1 icmp_seq=4 ttl=255 time=6.277 ms
34 bytes from 192.168.10,1 icmp_seq=5 ttl=255 time=5.656 ms

PC5> ping 192.168.20,1

34 bytes from 192.168.20,1 icmp_seq=1 ttl=255 time=14.068 ms
34 bytes from 192.168.20,1 icmp_seq=2 ttl=255 time=6.209 ms
34 bytes from 192.168.20,1 icmp_seq=3 ttl=255 time=6.640 ms
34 bytes from 192.168.20,1 icmp_seq=4 ttl=255 time=5.796 ms
34 bytes from 192.168.20,1 icmp_seq=5 ttl=255 time=6.097 ms

PC5> ping 192.168.30,1

34 bytes from 192.168.30,1 icmp_seq=1 ttl=255 time=4.461 ms
34 bytes from 192.168.30,1 icmp_seq=2 ttl=255 time=5.377 ms
34 bytes from 192.168.30,1 icmp_seq=3 ttl=255 time=4.353 ms
34 bytes from 192.168.30,1 icmp_seq=4 ttl=255 time=6.095 ms
34 bytes from 192.168.30,1 icmp_seq=5 ttl=255 time=6.014 ms

PC5> ping 192.168.35,1

34 bytes from 192.168.35,1 icmp_seq=1 ttl=255 time=10.427 ms
34 bytes from 192.168.35,1 icmp_seq=2 ttl=255 time=5.817 ms
34 bytes from 192.168.35,1 icmp_seq=3 ttl=255 time=6.254 ms
34 bytes from 192.168.35,1 icmp_seq=4 ttl=255 time=6.157 ms
34 bytes from 192.168.35,1 icmp_seq=5 ttl=255 time=5.822 ms

PC5> ping 192.168.99,1

34 bytes from 192.168.99,1 icmp_seq=1 ttl=255 time=12.771 ms
34 bytes from 192.168.99,1 icmp_seq=2 ttl=255 time=6.518 ms
34 bytes from 192.168.99,1 icmp_seq=3 ttl=255 time=5.785 ms
34 bytes from 192.168.99,1 icmp_seq=4 ttl=255 time=5.337 ms
34 bytes from 192.168.99,1 icmp_seq=5 ttl=255 time=5.342 ms

PC5> █

```

Fig. 31. PC5

```

Windows Server 2019 x
Administrator: Command Prompt

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

C:\Users\Administrator>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:
Reply from 192.168.10.1: bytes=32 time=13ms TTL=255
Reply from 192.168.10.1: bytes=32 time=9ms TTL=255
Reply from 192.168.10.1: bytes=32 time=10ms TTL=255
Reply from 192.168.10.1: bytes=32 time=11ms TTL=255

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 9ms, Maximum = 13ms, Average = 10ms

C:\Users\Administrator>ping 192.168.1\0.1
Ping request could not find host 192.168.1\0.1. Please check the name and try again.

C:\Users\Administrator>ping 192.168.100.1

Pinging 192.168.100.1 with 32 bytes of data:
Reply from 192.168.100.1: bytes=32 time=8ms TTL=255
Reply from 192.168.100.1: bytes=32 time=7ms TTL=255
Reply from 192.168.100.1: bytes=32 time=8ms TTL=255
Reply from 192.168.100.1: bytes=32 time=10ms TTL=255

Ping statistics for 192.168.100.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 7ms, Maximum = 10ms, Average = 8ms

C:\Users\Administrator>ping 192.168.100\1
Ping request could not find host 192.168.100\1. Please check the name and try again.

C:\Users\Administrator>ping 192.168.30.1

Pinging 192.168.30.1 with 32 bytes of data:
Reply from 192.168.30.1: bytes=32 time=8ms TTL=255
Reply from 192.168.30.1: bytes=32 time=8ms TTL=255
Reply from 192.168.30.1: bytes=32 time=4ms TTL=255
Reply from 192.168.30.1: bytes=32 time=6ms TTL=255

Ping statistics for 192.168.30.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

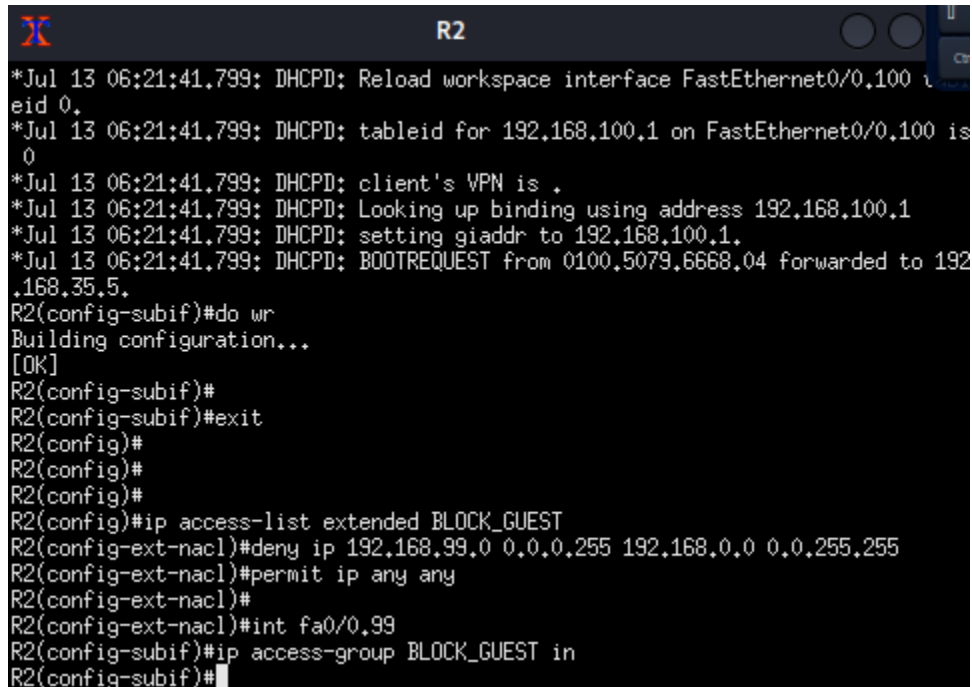
```

Fig. 32. AD/DNS server

Now, we configure ACL to make that:

- Engineering can access all servers.
- Guest cannot access internal resources.
- Sales/Admin cannot reach AD server.
- IT Admin can reach every VLAN.

The configuration is done on Router 2 and we ping to see if it has been applied



```
R2
*Jul 13 06:21:41.799: DHCPD: Reload workspace interface FastEthernet0/0.100 u
eid 0.
*Jul 13 06:21:41.799: DHCPD: tableid for 192.168.100.1 on FastEthernet0/0.100 is
0
*Jul 13 06:21:41.799: DHCPD: client's VPN is .
*Jul 13 06:21:41.799: DHCPD: Looking up binding using address 192.168.100.1
*Jul 13 06:21:41.799: DHCPD: setting giaddr to 192.168.100.1.
*Jul 13 06:21:41.799: DHCPD: BOOTREQUEST from 0100.5079.6668.04 forwarded to 192
.168.35.5.
R2(config-subif)#do wr
Building configuration...
[OK]
R2(config-subif)#
R2(config-subif)#exit
R2(config)#
R2(config)#
R2(config)#
R2(config)#ip access-list extended BLOCK_GUEST
R2(config-ext-nacl)#deny ip 192.168.99,0 0,0,0,255 192,168,0,0 0,0,255,255
R2(config-ext-nacl)#permit ip any any
R2(config-ext-nacl)#
R2(config-ext-nacl)#int fa0/0.99
R2(config-subif)#ip access-group BLOCK_GUEST in
R2(config-subif)#
```

Fig 33. Blocking Guest Network (VLAN 99) from accessing internal resources, therefore we block the whole Guest subnet so we use extended ACL

```

PC4> ping 192.168.10.1
*192.168.99.1 icmp_seq=1 ttl=255 time=20.302 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=2 ttl=255 time=6.468 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=3 ttl=255 time=5.829 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=4 ttl=255 time=5.913 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=5 ttl=255 time=6.603 ms (ICMP type:3, code:13, Communication administratively prohibited)

PC4> ping 192.168.20.1
*192.168.99.1 icmp_seq=1 ttl=255 time=9.904 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=2 ttl=255 time=5.045 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=3 ttl=255 time=7.266 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=4 ttl=255 time=6.475 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=5 ttl=255 time=5.548 ms (ICMP type:3, code:13, Communication administratively prohibited)

PC4> ping 192.168.35.1
*192.168.99.1 icmp_seq=1 ttl=255 time=5.156 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=2 ttl=255 time=5.666 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=3 ttl=255 time=5.799 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=4 ttl=255 time=6.670 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=5 ttl=255 time=5.459 ms (ICMP type:3, code:13, Communication administratively prohibited)

PC4> ping 192.168.99.1
*192.168.99.1 icmp_seq=1 ttl=255 time=14.822 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=2 ttl=255 time=7.013 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=3 ttl=255 time=15.418 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=4 ttl=255 time=5.646 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=5 ttl=255 time=6.965 ms (ICMP type:3, code:13, Communication administratively prohibited)

PC4> ping 192.168.100.1
*192.168.99.1 icmp_seq=1 ttl=255 time=14.020 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=2 ttl=255 time=8.152 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=3 ttl=255 time=6.283 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=4 ttl=255 time=8.909 ms (ICMP type:3, code:13, Communication administratively prohibited)
*192.168.99.1 icmp_seq=5 ttl=255 time=7.962 ms (ICMP type:3, code:13, Communication administratively prohibited)

PC4> █

```

Fig. 34. After ACL, the Guest network can't access any internal resources

```

R2(config-subif)#
R2(config-subif)#ip access-list extended BLOCK_AD_ACCESS
R2(config-ext-nacl)#deny ip 192.168.10.0 0.0.0.255 host 192.168.35.5
R2(config-ext-nacl)#deny ip 192.168.20.0 0.0.0.255 host 192.168.35.5
R2(config-ext-nacl)#
R2(config-ext-nacl)#permit any any
^
% Invalid input detected at '^' marker.

R2(config-ext-nacl)#permit ip any any
R2(config-ext-nacl)#
R2(config-ext-nacl)#int fa0/0.10
R2(config-subif)#
R2(config-subif)#ip access-group BLOCK_AD_ACCESS in
R2(config-subif)#
R2(config-subif)#int fa0/0.20
R2(config-subif)#
R2(config-subif)#ip access-group BLOCK_AD_ACCESS in
R2(config-subif)#
R2(config-subif)#do wr
Building configuration...
[OK]
R2(config-subif)#
R2(config-subif)#
*Jul 13 06:38:04.259: DHCPD: Reload workspace interface FastEthernet0/0.35 table
id 0.

```

Fig. 35. ACL so that Sales/Admin cannot reach AD server.

```

PC1> ping 192.168.35.5

*192.168.10.1 icmp_seq=1 ttl=255 time=9.016 ms (ICMP type:3, code:13, Communicat
ion administratively prohibited)
*192.168.10.1 icmp_seq=2 ttl=255 time=5.861 ms (ICMP type:3, code:13, Communicat
ion administratively prohibited)
*192.168.10.1 icmp_seq=3 ttl=255 time=5.922 ms (ICMP type:3, code:13, Communicat
ion administratively prohibited)
*192.168.10.1 icmp_seq=4 ttl=255 time=7.145 ms (ICMP type:3, code:13, Communicat
ion administratively prohibited)
*192.168.10.1 icmp_seq=5 ttl=255 time=5.893 ms (ICMP type:3, code:13, Communicat
ion administratively prohibited)

PC1>

```

Fig. 36. PC1 (ADMIN) not being able to access the AD/DNS server

```

PC2> ping 192.168.35.5

*192.168.20.1 icmp_seq=1 ttl=255 time=9.586 ms (ICMP type:3, code:13, Communicat
ion administratively prohibited)
*192.168.20.1 icmp_seq=2 ttl=255 time=6.462 ms (ICMP type:3, code:13, Communicat
ion administratively prohibited)
*192.168.20.1 icmp_seq=3 ttl=255 time=8.657 ms (ICMP type:3, code:13, Communicat
ion administratively prohibited)
*192.168.20.1 icmp_seq=4 ttl=255 time=8.333 ms (ICMP type:3, code:13, Communicat
ion administratively prohibited)
*192.168.20.1 icmp_seq=5 ttl=255 time=8.599 ms (ICMP type:3, code:13, Communicat
ion administratively prohibited)

PC2>

```

Fig. 37. PC2 (Sales) not being able to access the AD/DNS server

Now, configuring the Web and FTP servers

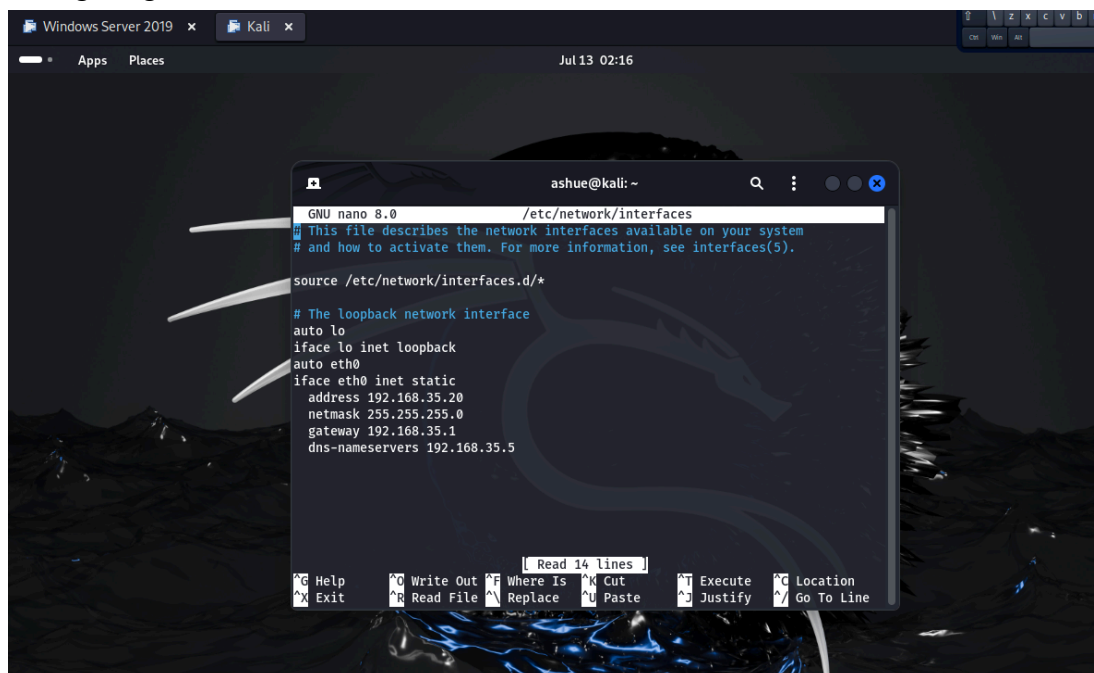


Fig. 38 Setting the static ip of the server

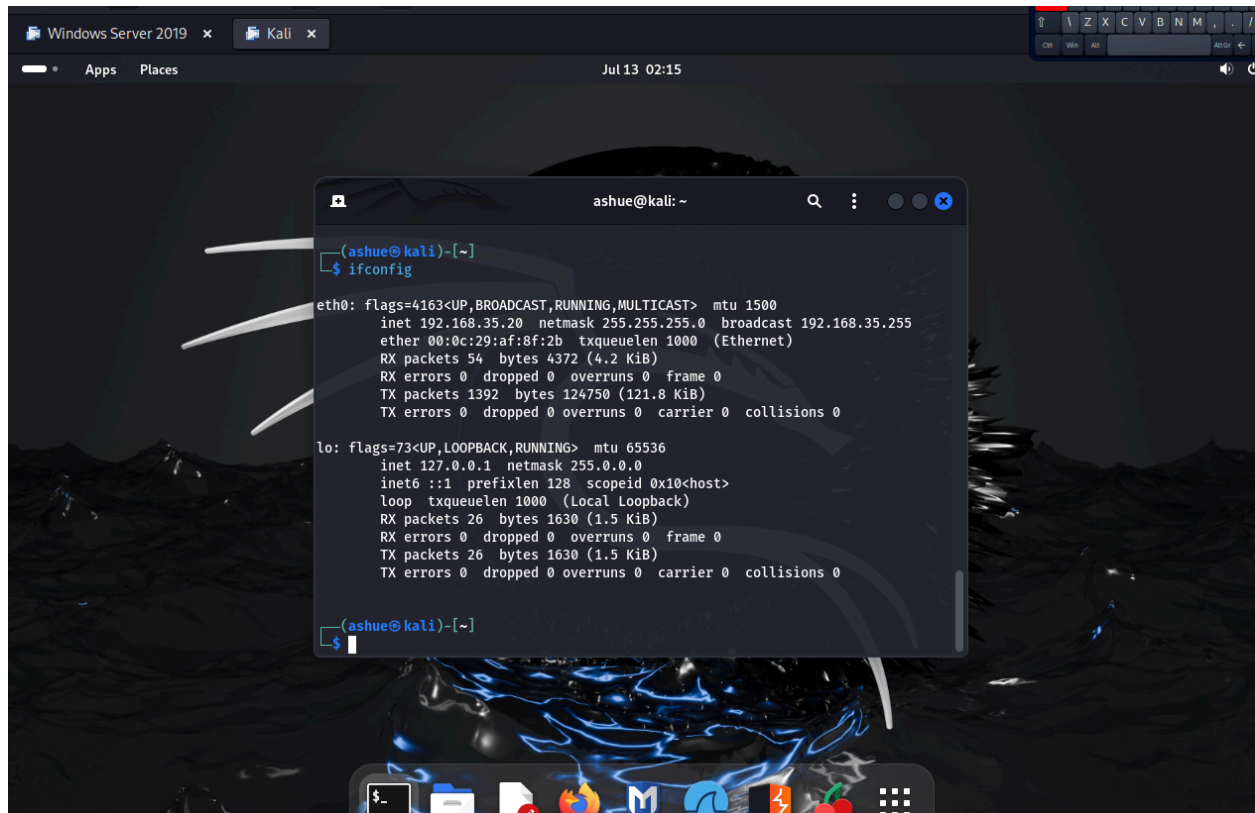


Fig. 39. Making sure the IP is correctly set