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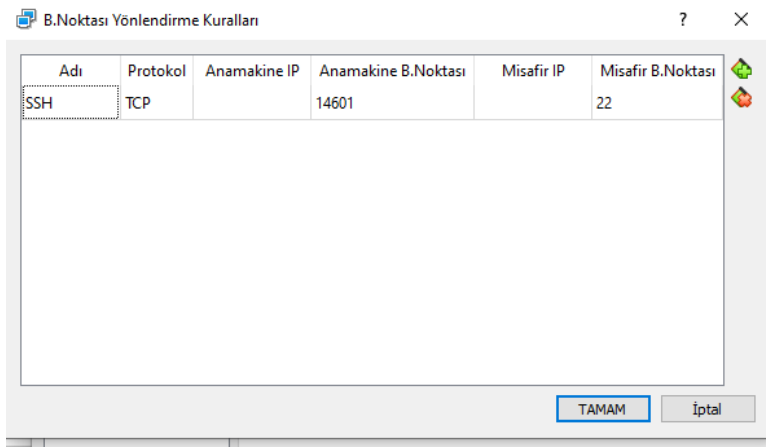
# Linux Ağ Yönetimi Final Projesi

Mahmut Yüncü 170202115

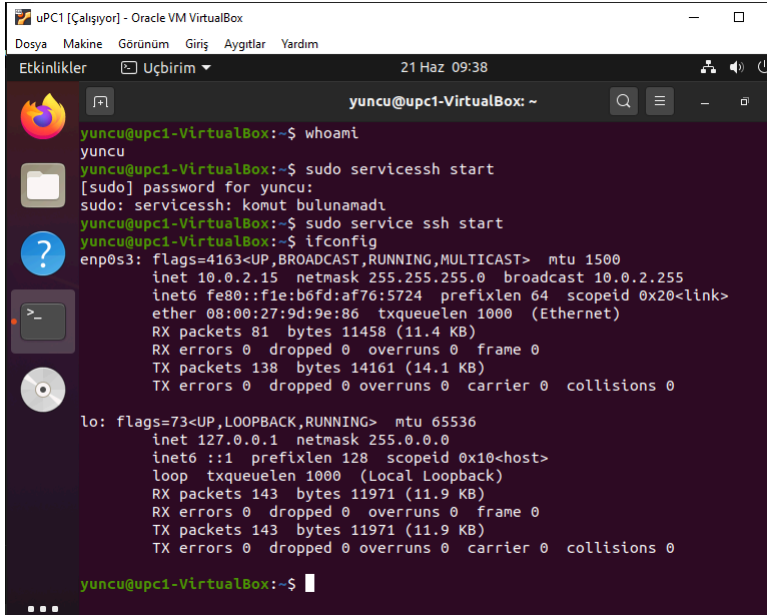
## 1. Senaryo Bir

### Aşama 1 : NAT ile Anamakine-Misafir Ubuntu Pc Bağlantısı

- Kurulan Nat bağlantılı Ubuntu desktop (uPC1) için yeni bir bağlantı noktası kuralı belirtildi. Belirtilen kuralın Anamakine Bağlantı Noktası "14601" Misafir Bağlantı Noktası "22" olarak girildi.



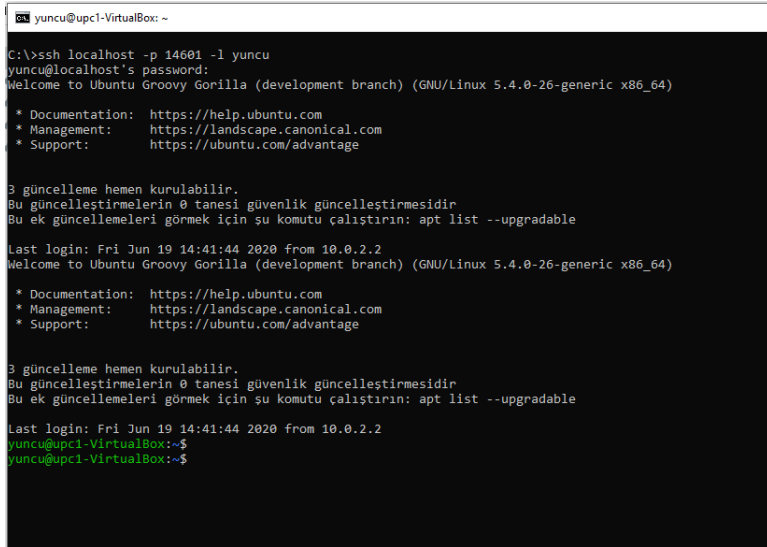
- uPC1 için ifconfig in kullanılması için "sudo apt-get install net-tools" komutu ile net-tools ve ssh bağlantısı için "sudo apt install openssh-server" komutu ile ssh servisi yüklenildi.Yüklenme tamamlandıktan sonra "sudo service ssh start" komutu ile ssh servisi başlatıldı. Ardından "ifconfig" komutu komutu girilip upc1'in ip'si bulundu.



```
yuncu@upc1-VirtualBox: ~  
yuncu@upc1-VirtualBox:~$ whoami  
yuncu  
yuncu@upc1-VirtualBox:~$ sudo service ssh start  
[sudo] password for yuncu:  
sudo: service ssh: komut bulunamadı  
yuncu@upc1-VirtualBox:~$ sudo service ssh start  
yuncu@upc1-VirtualBox:~$ ifconfig  
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255  
inet6 fe80::f1e:b6fd:af76:5724 prefixlen 64 scopeid 0x20<link>  
ether 08:00:27:9d:9e:86 txqueuelen 1000 (Ethernet)  
RX packets 81 bytes 11458 (11.4 KB)  
RX errors 0 dropped 0 overruns 0 frame 0  
TX packets 138 bytes 14161 (14.1 KB)  
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536  
inet 127.0.0.1 netmask 255.0.0.0  
inet6 ::1 prefixlen 128 scopeid 0x10<host>  
loop txqueuelen 1000 (Local Loopback)  
RX packets 143 bytes 11971 (11.9 KB)  
RX errors 0 dropped 0 overruns 0 frame 0  
TX packets 143 bytes 11971 (11.9 KB)  
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
yuncu@upc1-VirtualBox:~$
```

Figure 1. "ifconfig" komutunun sonucu

- Host üzerinden "ssh localhost -p 14601 -l yuncu" komutu girilerek uPC1' e ssh bağlantısı sağlandı.



```
C:\>ssh localhost -p 14601 -l yuncu  
yuncu@localhost's password:  
Welcome to Ubuntu Groovy Gorilla (development branch) (GNU/Linux 5.4.0-26-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:        https://ubuntu.com/advantage  
  
3 güncelleme hemen kurulabilir.  
Bu güncelleştirmelerin 0 tanesi güvenlik güncelleştirmesidir  
Bu ek güncellemeleri görmek için şu komutu çalıştırın: apt list --upgradable  
  
Last login: Fri Jun 19 14:41:44 2020 from 10.0.2.2  
Welcome to Ubuntu Groovy Gorilla (development branch) (GNU/Linux 5.4.0-26-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:        https://ubuntu.com/advantage  
  
3 güncelleme hemen kurulabilir.  
Bu güncelleştirmelerin 0 tanesi güvenlik güncelleştirmesidir  
Bu ek güncellemeleri görmek için şu komutu çalıştırın: apt list --upgradable  
  
Last login: Fri Jun 19 14:41:44 2020 from 10.0.2.2  
yuncu@upc1-VirtualBox:~$  
yuncu@upc1-VirtualBox:~$
```

Figure 2. SSH bağlantısı başarılı bir şekilde sağlandı

- Host üzerinden uPC1' e "ping 10.0.2.15" komutu ile ping atılması denendi.

```
Komut İstemi

C:\>ping 10.0.2.15

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),

C:\>
```

Figure 3. Ping denemesi başarısız olundu.

- Host üzerinden bir dosyanın sanal makine olan upc1 e kopyalanması için öncelikle sanal makinenin aygıtlar → paylaşılan pano ve aygıtlar → sürükleyip bırak seçenekleri çift yönlü olarak değiştirildi. Ardından uPC1 kapatılıp [http://download.virtualbox.org/virtualbox/6.1.0/VBoxGuestAdditions\\_6.1.0](http://download.virtualbox.org/virtualbox/6.1.0/VBoxGuestAdditions_6.1.0) linkinden "VBoxGuestAdditions\_6.1.0.iso" dosyası indirilip upc1 e kuruldu. Kurulma işleminin ardından upc1 rebootlandı ve artık kopyalama işlemi yapılabilir.

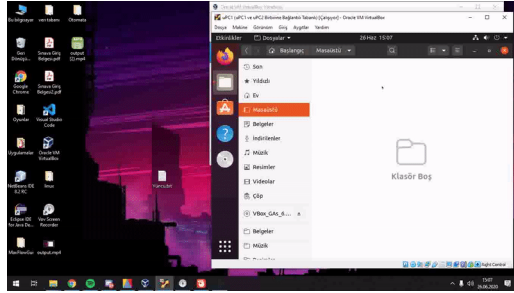
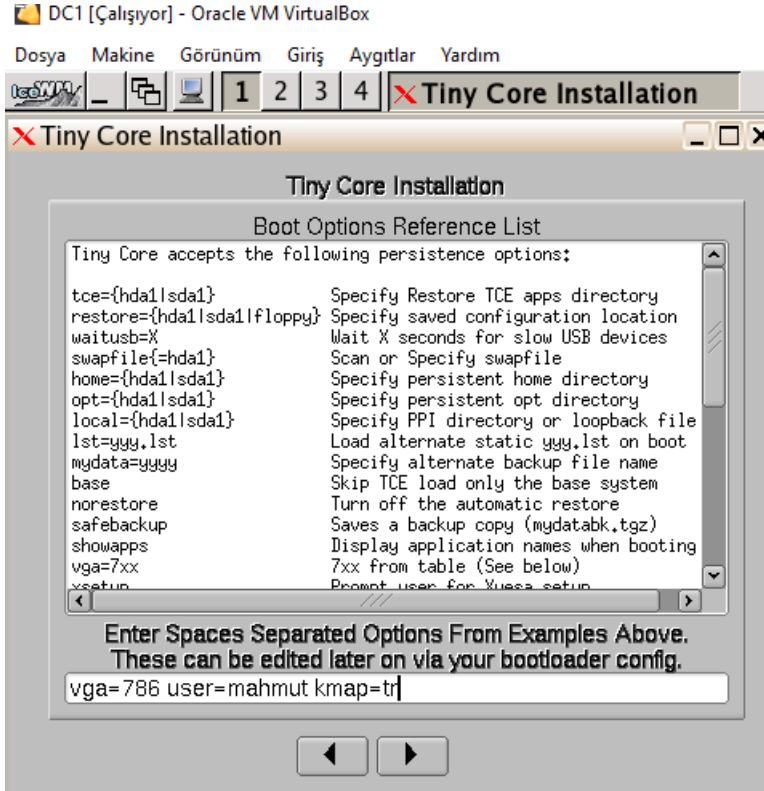


Figure 4. Host'tan Guest'e dosya kopyalama işlemi

## Aşama 2 : TinyCore bağlantısı sağlanması

- TinyCore kurulumu yapıldı ve bağdaştırıcı tipi Köprü Bağdaştırıcısı seçildi.



- TinyCore sistemine "tce-load -wi openssh.tcz" komutu ile ssh servisi indirildi.

```
cd /usr/local/etc/ssh
```

```
sudo cp ssh_config.orig ssh_config
```

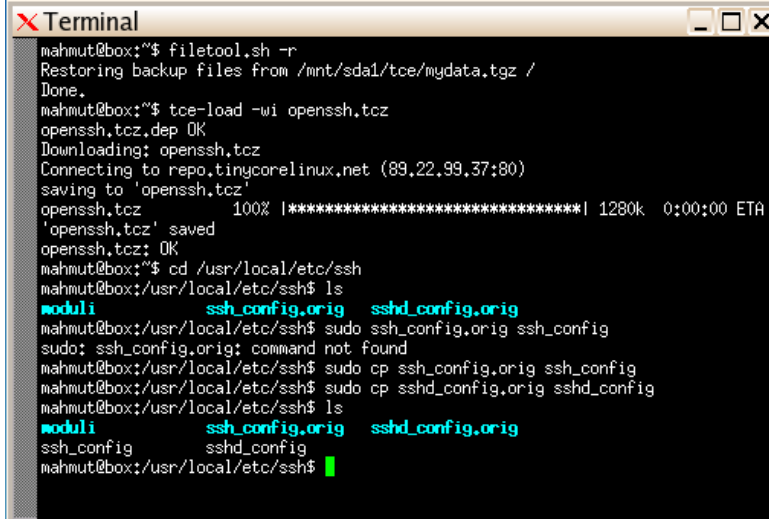
```
sudo cp sshd_config.orig sshd_config
```

```
echo "mahmut:"yenisifre | sudo chpasswd
```

```
sudo echo "mahmut:"yenisifre | sudo chpasswd
```

```
sudo /usr/local/etc/init.d/openssh start
```

komutları sırası ile girilerek ssh servisi aktif hale getirildi.

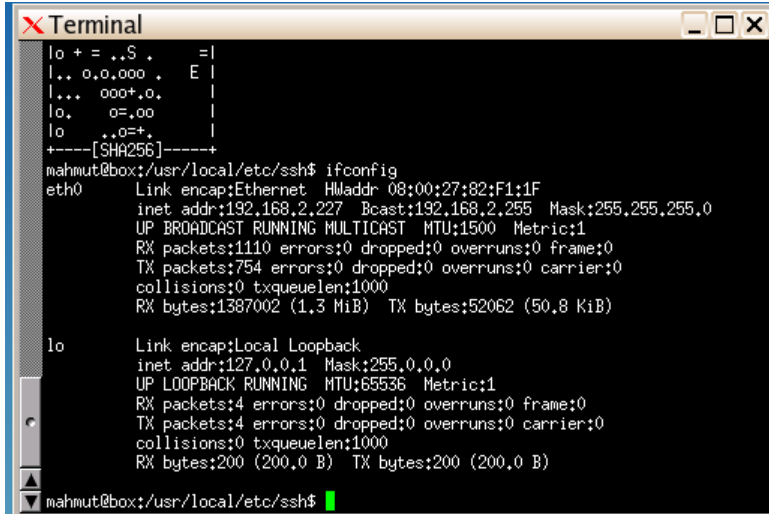


```

mahmut@box:~$ filetool.sh -r
Restoring backup files from /mnt/sda1/tce/mydata.tgz /
Done.
mahmut@box:~$ tce-load -wi openssh.tcz
openssh.tcz.dep OK
Downloading: openssh.tcz
Connecting to repo.tinycorelinux.net (89.22.99.37:80)
saving to 'openssh.tcz'
openssh.tcz 100% |*****| 1280k 0:00:00 ETA
'openssh.tcz' saved
openssh.tcz: OK
mahmut@box:~$ cd /usr/local/etc/ssh
mahmut@box:~$ cd /usr/local/etc/ssh$ ls
moduli      ssh_config.orig  sshd_config.orig
mahmut@box:~$ cd /usr/local/etc/ssh$ sudo cp ssh_config.orig ssh_config
mahmut@box:~$ cd /usr/local/etc/ssh$ sudo cp sshd_config.orig sshd_config
mahmut@box:~$ cd /usr/local/etc/ssh$ ls
moduli      ssh_config      sshd_config
mahmut@box:~$ cd /usr/local/etc/ssh$

```

- TinyCore sisteminin ip adresi "ifconfig" komutu ile bulundu.



```

mahmut@box:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:82:F1:1F
          inet addr:192.168.2.227  Bcast:192.168.2.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1110 errors:0 dropped:0 overruns:0 frame:0
          TX packets:754 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1387002 (1.3 MiB)  TX bytes:52062 (50.8 KiB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:4 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:200 (200.0 B)  TX bytes:200 (200.0 B)

mahmut@box:~$

```

- Host bilgisayardan TinyCore sistemine ssh bağlantısı yapıldı ve ping atıldı.

```
Komut İstemi

C:\>ssh 192.168.2.227 -l mahmut
The authenticity of host '192.168.2.227 (192.168.2.227)' can't be established.
ECDSA key fingerprint is SHA256:4MYz8MdQgu5TJzr5X01+4jYoq1MUDc/aiQy3GBEhQEA.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.2.227' (ECDSA) to the list of known hosts.
mahmut@192.168.2.227's password:
mahmut@box:~$
mahmut@box:~$ Connection to 192.168.2.227 closed.
C:\>ping 192.168.2.227

Pinging 192.168.2.227 with 32 bytes of data:
Reply from 192.168.2.227: bytes=32 time<1ms TTL=64
Reply from 192.168.2.227: bytes=32 time<1ms TTL=64
Reply from 192.168.2.227: bytes=32 time<1ms TTL=64
Reply from 192.168.2.227: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.2.227:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Figure 5. SSH bağlantısı başarı ile sağlandı, Host üzerinden sanal makineye ping atılabildi

### Aşama 3 : Yalnızca Anamakine Bağdaştırıcısı ile Host, Ubuntu server Bağlantısı

- Kurulumu yapılan serverin ip'si "ifconfig" komutu ile bulundu.

```
Last login: Sat Jun 20 12:48:40 UTC 2020 on tty1
yuncu@yuncu:~$ sudo server ssh start
[sudo] password for yuncu:
sudo: server: command not found
yuncu@yuncu:~$ sudo service ssh start
yuncu@yuncu:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.56.101 netmask 255.255.255.0 broadcast 192.168.56.255
    inet6 fe80::a00:27ff:fe27:98a8 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:27:98:a8 txqueuelen 1000 (Ethernet)
    RX packets 7 bytes 1741 (1.7 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 12 bytes 1470 (1.4 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 240 bytes 17280 (17.2 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 240 bytes 17280 (17.2 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

yuncu@yuncu:~$ _
```

- Bulunan ip adresine HOST üzerinden

```
ssh 192.168.50.181 -l yuncu
```

komutu girilerek HOST - server ssh bağlantısı yapıldı.

```
yuncu@yuncu-
ssh: connect to host 10.0.2.155 port 22: Connection timed out
C:\>ssh 192.168.56.101 -l yuncu
The authenticity of host '192.168.56.101 (192.168.56.101)' can't be established.
ECDSA key fingerprint is SHA256:GK+wem8/FG4IP/1YzMyNt0U4VwqZK9TJtosVZt6Ek.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.56.101' (ECDSA) to the list of known hosts.
yuncu@192.168.56.101's password:
Welcome to Ubuntu 20.04 LTS (GNU/Linux 5.4.0-37-generic x86_64)

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

System information as of Sat 20 Jun 2020 01:10:21 PM UTC

System load:  0.11               Processes:    108
Usage of /:   43.5% of 9.78GB     Users logged in: 1
Memory usage: 19%               IPv4 address for enp0s3: 192.168.56.101
Swap usage:  0%

 * "If you've been waiting for the perfect Kubernetes dev solution for
   macOS, the wait is over. Learn how to install Microk8s on macOS."
   https://www.techrepublic.com/article/how-to-install-microk8s-on-macos/

34 updates can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Last login: Sat Jun 20 13:06:10 2020
yuncu@yuncu:~$
```

- "ping 192.168.50.181" komut ile Host üzerinde servera ping atıldı.

```
Komut istemi

C:\>ping 10.0.2.15

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),

C:\>ping 192.168.56.101

Pinging 192.168.56.101 with 32 bytes of data:
Reply from 192.168.56.101: bytes=32 time<1ms TTL=64
Reply from 192.168.56.101: bytes=32 time<1ms TTL=64
Reply from 192.168.56.101: bytes=32 time<1ms TTL=64
Reply from 192.168.56.101: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.56.101:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

## 2. Senaryo İki

### Dahili Ağ ile Serverlar arası ve Server-Host Bağlantısı

Senaryo gereği elimizde üç adet server olması lazım bu yüzden serverlar klonlandı.

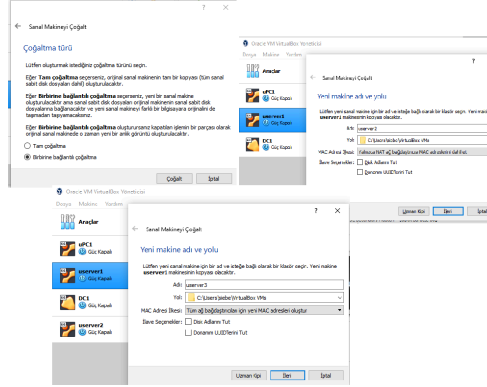


Figure 6. Server 1 den server2 ve server3' ün klonlanması

- 3 serverında Bağdaştırıcı tipini DAhili Ağ olarak ayarlıyoruz.
- Senaryo da bizden istenilene aşağıda verilen ip'lere göre her servera statik bir ip verelim:

```
userver1 :192.168.1.5
userver1 :192.168.1.6
userver1 :192.168.1.7
```

- Ip adreslerini statik olarak belirlemek için serverların netplanlarının değiştirilme gerekiyor bunun için aşağıdaki komutlar izlenildi.

```
cat /etc/cloud/cloud.cfg.d/subiquity-disable-cloudinit-networking.cfg
```

#netplan dosyasının editi yapıldı

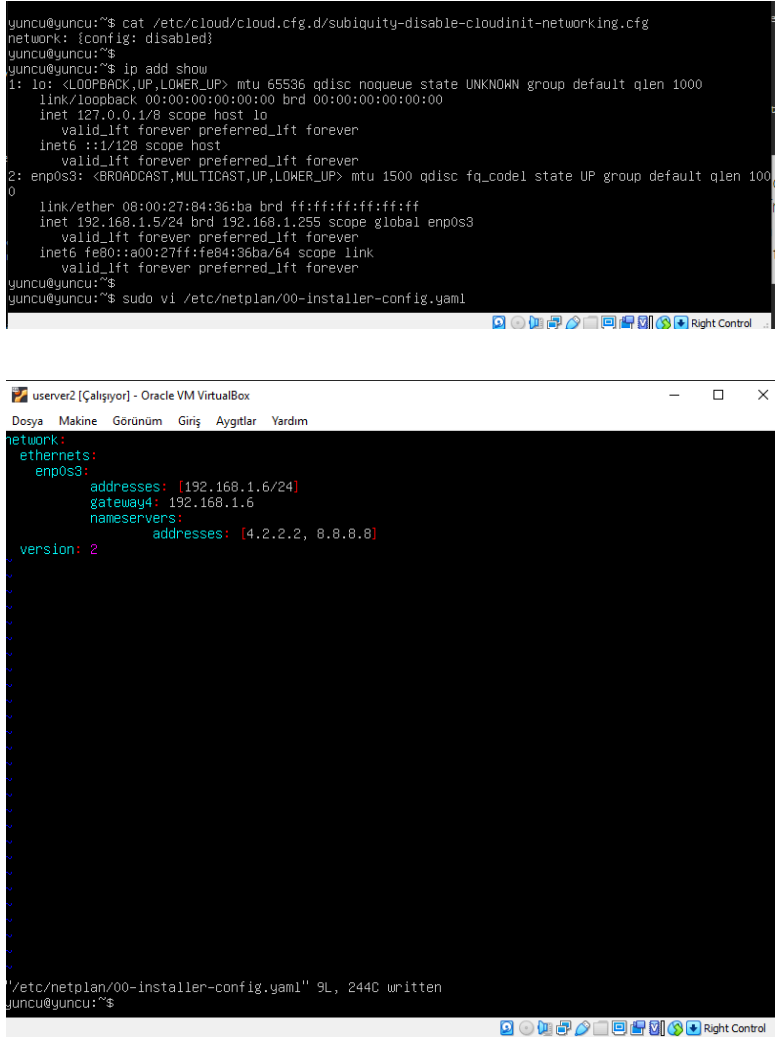
```
sudo vi /etc/netplan/00-installer-config.yaml
```

#yapılan plan server a uygulandı



```
sudo netplan apply
```

- Yapılan adımlardan bazı görseller aşağıda verilmiştir



```
yuncu@yuncu:~$ cat /etc/cloud/cloud.cfg.d/subiquity-disable-cloudinit-networking.cfg
network: {config: disabled}
yuncu@yuncu:~$
yuncu@yuncu:~$ ip add show
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 08:00:27:84:36:ba brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.5/24 brd 192.168.1.255 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe84:36ba/64 scope link
        valid_lft forever preferred_lft forever
yuncu@yuncu:~$
yuncu@yuncu:~$ sudo vi /etc/netplan/00-installer-config.yaml

userver2 [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım
network:
  ethernets:
    enp0s3:
      addresses: [192.168.1.6/24]
      gateway4: 192.168.1.6
      nameservers:
        addresses: [4.2.2.2, 8.8.8.8]
  version: 2

/etc/netplan/00-installer-config.yaml" 9L, 244C written
yuncu@yuncu:~$
```

Figure 7. netplan editi

```
yuncu@yuncu:~$ sudo netplan apply
yuncu@yuncu:~$
yuncu@yuncu:~$ ip add show
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 08:00:27:84:36:ba brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.6/24 brd 192.168.1.255 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe84:36ba/64 scope link
        valid_lft forever preferred_lft forever
yuncu@yuncu:~$ ip route show
default via 192.168.1.6 dev enp0s3 proto static
192.168.1.0/24 dev enp0s3 proto kernel scope link src 192.168.1.6
yuncu@yuncu:~$
```

Figure 8. Değiştirilen ip

```
userver3 [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım

network:
  ethernets:
    enp0s3:
      addresses: [192.168.1.7/24]
      gateway4: 192.168.1.7
      nameservers:
        addresses: [4.2.2.2, 8.8.8.8]

version: 2

yuncu@yuncu:~$
yuncu@yuncu:~$ sudo netplan apply
yuncu@yuncu:~$ ip add show
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 08:00:27:13:08:8c brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.7/24 brd 192.168.1.255 scope global enp0s3
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe13:88c/64 scope link
        valid_lft forever preferred_lft forever
yuncu@yuncu:~$ ip route show
default via 192.168.1.7 dev enp0s3 proto static
192.168.1.0/24 dev enp0s3 proto kernel scope link src 192.168.1.7
yuncu@yuncu:~$
```

Figure 9. Örnek 2

- Dahili ağda olan bu üç serverın kendi aralarında ssh bağlantısı yapabildiği ve ping atabildikleri gösterilmiştir.

```
userver1 [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım

yuncu@192.168.1.6's password:
Welcome to Ubuntu 20.04 LTS (GNU/Linux 5.4.0-37-generic x86_64)

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

System information as of Tue 23 Jun 2020 07:53:10 PM UTC

System load:  0.01          Processes:      108
Usage of /:   44.4% of 9.78GB Users logged in: 1
Memory usage: 39%          IPv4 address for enp0s3: 192.168.1.6
Swap usage:   0%

34 updates can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection
or proxy settings

Last login: Tue Jun 23 19:52:29 2020
yuncu@userver2:~$ logout
Connection to 192.168.1.6 closed.
yuncu@userver1:~$ ping 192.168.1.6
PING 192.168.1.6 (192.168.1.6) 56(84) bytes of data:
64 bytes from 192.168.1.6: icmp_seq=1 ttl=64 time=0.456 ms
64 bytes from 192.168.1.6: icmp_seq=2 ttl=64 time=0.604 ms
64 bytes from 192.168.1.6: icmp_seq=3 ttl=64 time=0.623 ms
64 bytes from 192.168.1.6: icmp_seq=4 ttl=64 time=0.606 ms
^C
--- 192.168.1.6 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3049ms
rtt min/avg/max/mdev = 0.456/0.572/0.623/0.067 ms
yuncu@userver1:~$ _
```

Figure 10. userver1'den userver2 ye ssh bağlantısı ve ping

```
userver1 [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım

yuncu@192.168.1.7's password:
Welcome to Ubuntu 20.04 LTS (GNU/Linux 5.4.0-37-generic x86_64)

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

System information as of Tue 23 Jun 2020 08:17:13 PM UTC

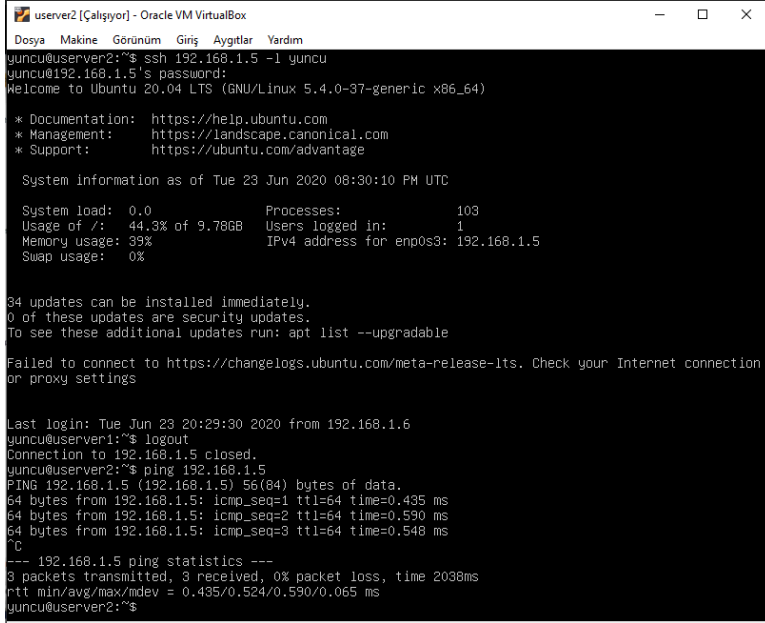
System load:  0.71          Processes:      107
Usage of /:   44.3% of 9.78GB Users logged in: 1
Memory usage: 19%          IPv4 address for enp0s3: 192.168.1.7
Swap usage:   0%

34 updates can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection
or proxy settings

Last login: Tue Jun 23 20:16:30 2020
yuncu@userver3:~$ logout
Connection to 192.168.1.7 closed.
yuncu@userver1:~$ ping 192.168.1.7
PING 192.168.1.7 (192.168.1.7) 56(84) bytes of data:
64 bytes from 192.168.1.7: icmp_seq=1 ttl=64 time=0.497 ms
64 bytes from 192.168.1.7: icmp_seq=2 ttl=64 time=0.573 ms
64 bytes from 192.168.1.7: icmp_seq=3 ttl=64 time=0.510 ms
64 bytes from 192.168.1.7: icmp_seq=4 ttl=64 time=0.522 ms
^C
--- 192.168.1.7 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3049ms
rtt min/avg/max/mdev = 0.497/0.525/0.573/0.028 ms
yuncu@userver1:~$ _
```

Figure 11. userver1'den userver3 e ssh bağlantısı ve ping



```
userver2 [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım
yuncu@userver2:~$ ssh 192.168.1.5 -l yuncu
yuncu@192.168.1.5's password:
Welcome to Ubuntu 20.04 LTS (GNU/Linux 5.4.0-37-generic x86_64)

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

System information as of Tue 23 Jun 2020 08:30:10 PM UTC

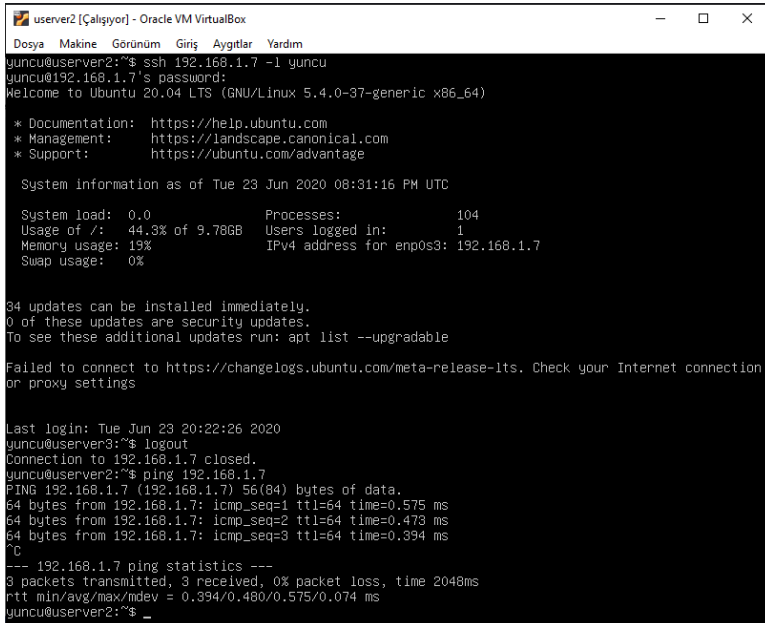
System load:  0.0               Processes:    103
Usage of /:   44.3% of 9.78GB   Users logged in: 1
Memory usage: 39%             IPv4 address for enp0s3: 192.168.1.5
Swap usage:  0%

34 updates can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection
or proxy settings

Last login: Tue Jun 23 20:29:30 2020 from 192.168.1.6
yuncu@userver1:~$ logout
Connection to 192.168.1.5 closed.
yuncu@userver2:~$ ping 192.168.1.5
PING 192.168.1.5 (192.168.1.5) 56(84) bytes of data.
64 bytes from 192.168.1.5: icmp_seq=1 ttl=64 time=0.435 ms
64 bytes from 192.168.1.5: icmp_seq=2 ttl=64 time=0.590 ms
64 bytes from 192.168.1.5: icmp_seq=3 ttl=64 time=0.548 ms
^C
--- 192.168.1.5 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2038ms
rtt min/avg/max/mdev = 0.435/0.524/0.590/0.065 ms
yuncu@userver2:~$
```

Figure 12. userver2'den userver1 e ssh bağlantısı ve ping



```
userver2 [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım
yuncu@userver2:~$ ssh 192.168.1.7 -l yuncu
yuncu@192.168.1.7's password:
Welcome to Ubuntu 20.04 LTS (GNU/Linux 5.4.0-37-generic x86_64)

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

System information as of Tue 23 Jun 2020 08:31:16 PM UTC

System load:  0.0               Processes:    104
Usage of /:   44.3% of 9.78GB   Users logged in: 1
Memory usage: 19%             IPv4 address for enp0s3: 192.168.1.7
Swap usage:  0%

34 updates can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection
or proxy settings

Last login: Tue Jun 23 20:22:26 2020
yuncu@userver3:~$ logout
Connection to 192.168.1.7 closed.
yuncu@userver2:~$ ping 192.168.1.7
PING 192.168.1.7 (192.168.1.7) 56(84) bytes of data.
64 bytes from 192.168.1.7: icmp_seq=1 ttl=64 time=0.575 ms
64 bytes from 192.168.1.7: icmp_seq=2 ttl=64 time=0.473 ms
64 bytes from 192.168.1.7: icmp_seq=3 ttl=64 time=0.394 ms
^C
--- 192.168.1.7 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2048ms
rtt min/avg/max/mdev = 0.394/0.480/0.575/0.074 ms
yuncu@userver2:~$ _
```

Figure 13. userver2'den userver3 e ssh bağlantısı ve ping

```
userver3 [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım
yuncu@userver3:~$ ssh 192.168.1.5 -l yuncu
yuncu@192.168.1.5's password:
Welcome to Ubuntu 20.04 LTS (GNU/Linux 5.4.0-37-generic x86_64)

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

System information as of Tue 23 Jun 2020 08:23:17 PM UTC

System load: 0.0          Processes:            103
Usage of /:  44.3% of 9.78GB Users logged in:          1
Memory usage: 39%         IPv4 address for enp0s3: 192.168.1.5
Swap usage:  0%

34 updates can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection
or proxy settings

Last login: Tue Jun 23 20:16:21 2020
yuncu@userver1:~$ logout
Connection to 192.168.1.5 closed.
yuncu@userver3:~$ ping 192.168.1.5
PING 192.168.1.5 (192.168.1.5) 56(84) bytes of data:
64 bytes from 192.168.1.5: icmp_seq=1 ttl=64 time=0.354 ms
64 bytes from 192.168.1.5: icmp_seq=2 ttl=64 time=0.310 ms
64 bytes from 192.168.1.5: icmp_seq=3 ttl=64 time=0.566 ms
^C
--- 192.168.1.5 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2021ms
rtt min/avg/max/mdev = 0.310/0.410/0.566/0.111 ms
yuncu@userver3:~$
```

Figure 14. userver3'ten userver1 e ssh bağlantısı ve ping

```
userver3 [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım
yuncu@userver3:~$ ssh 192.168.1.6 -l yuncu
yuncu@192.168.1.6's password:
Welcome to Ubuntu 20.04 LTS (GNU/Linux 5.4.0-37-generic x86_64)

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

System information disabled due to load higher than 1.0

34 updates can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection
or proxy settings

Last login: Tue Jun 23 20:25:04 2020
yuncu@userver2:~$ logout
Connection to 192.168.1.6 closed.
yuncu@userver3:~$ ping 192.168.1.6
PING 192.168.1.6 (192.168.1.6) 56(84) bytes of data:
64 bytes from 192.168.1.6: icmp_seq=1 ttl=64 time=0.577 ms
64 bytes from 192.168.1.6: icmp_seq=2 ttl=64 time=0.519 ms
64 bytes from 192.168.1.6: icmp_seq=3 ttl=64 time=0.492 ms
64 bytes from 192.168.1.6: icmp_seq=4 ttl=64 time=0.599 ms
^C
--- 192.168.1.6 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3051ms
rtt min/avg/max/mdev = 0.492/0.546/0.599/0.043 ms
yuncu@userver3:~$
```

Figure 15. userver3'ten userver2' ye ssh bağlantısı ve ping

- Dahili ağdaki serverlar birbirleriyle iletişim kurabilse de host için durum aynı değildir. Host, dahili ağdaki serverlar ile ssh bağlantısı kuramaz.

```
Komut İstemi

C:\>ssh 192.168.1.5 -l yuncu
ssh: connect to host 192.168.1.5 port 22: Connection timed out

C:\>ssh 192.168.1.6 -l yuncu
ssh: connect to host 192.168.1.6 port 22: Connection timed out

C:\>ssh 192.168.1.7 -l yuncu
ssh: connect to host 192.168.1.7 port 22: Connection timed out

C:\>
```

Figure 16. Host → userver1/userver2/userver3 ssh bağlantısı

- Aynı şekilde Host serverlara ping te atamaz.

```
Komut İstemi

C:\>ping 192.168.1.5

Pinging 192.168.1.5 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.1.5:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.1.6

Pinging 192.168.1.6 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.1.6:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.1.7

Pinging 192.168.1.7 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.1.7:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

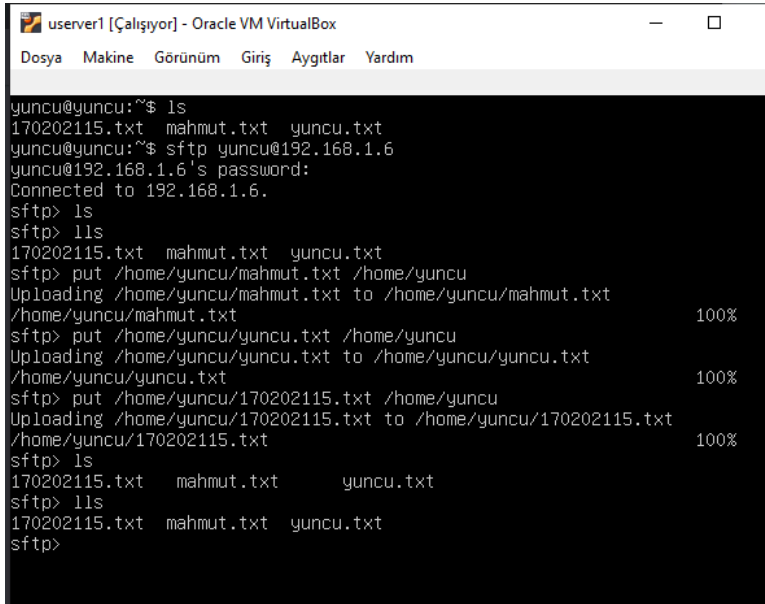
Figure 17. Host → userver1/userver2/userver3 ping

- Senaryoda userver1 ve userver2 arasında dosya transferi istenilmektedir. Bunun için sftp den yararlanılmıştır. Aşağıda ki komutlar istenilen dosyaları server1de yaratmak için sırası ile uygulanmıştır.

```
cat > 170202115.txt
cat > mahmut.txt
cat > yuncu.txt
```

\*SFTP bağlantısı ve dosyaları yollamak için

```
sftp yuncu@192.168.1.6
put /home/yuncu/mahmut.txt /home/yuncu
put /home/yuncu/yuncu.txt /home/yuncu
put /home/yuncu/170202115.txt /home/yuncu
```



The screenshot shows a terminal window titled "userver1 [Çalışıyor] - Oracle VM VirtualBox". The terminal displays the following commands and output:

```
yuncu@yuncu:~$ ls
170202115.txt mahmut.txt yuncu.txt
yuncu@yuncu:~$ sftp yuncu@192.168.1.6
yuncu@192.168.1.6's password:
Connected to 192.168.1.6.
sftp> ls
sftp> ll
170202115.txt mahmut.txt yuncu.txt
sftp> put /home/yuncu/mahmut.txt /home/yuncu
Uploading /home/yuncu/mahmut.txt to /home/yuncu/mahmut.txt
/home/yuncu/mahmut.txt 100%
sftp> put /home/yuncu/yuncu.txt /home/yuncu
Uploading /home/yuncu/yuncu.txt to /home/yuncu/yuncu.txt
/home/yuncu/yuncu.txt 100%
sftp> put /home/yuncu/170202115.txt /home/yuncu
Uploading /home/yuncu/170202115.txt to /home/yuncu/170202115.txt
/home/yuncu/170202115.txt 100%
sftp> ls
170202115.txt mahmut.txt yuncu.txt
sftp> ll
170202115.txt mahmut.txt yuncu.txt
sftp>
```

Figure 18. SFTP ile userver1'den userver2'ye dosya transferi

### 3. Senaryo Üç

- Senaryo üç gereği upc1, upc2, userver1 ve userver3 ün ağ ayarları aşağıda ki gibi değiştirilmiştir.

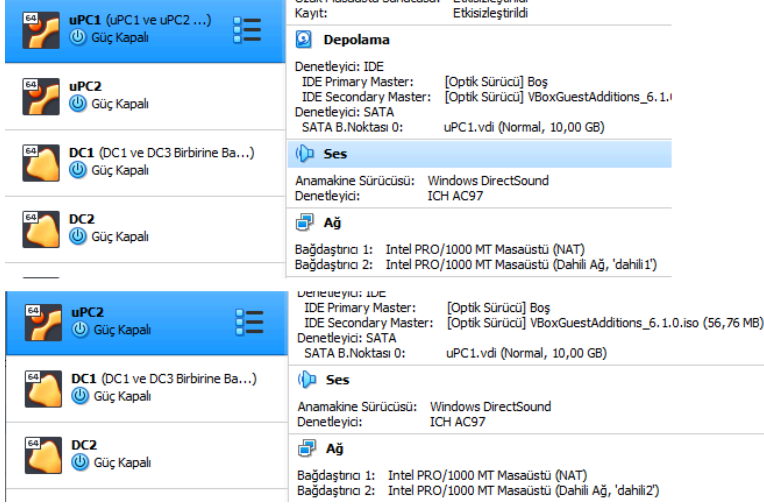


Figure 19. uPC1 ve uPC2 Ağ Ayarları

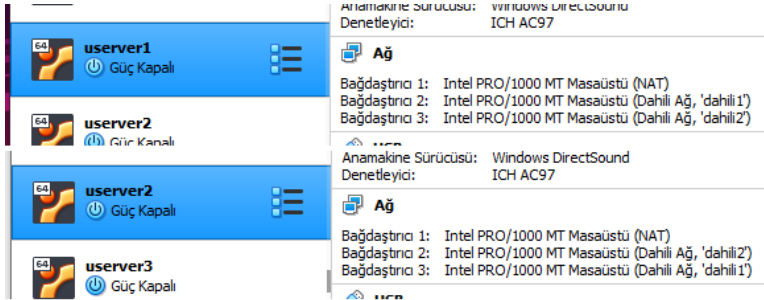


Figure 20. userver1 ve userver2 Ağ Ayarları



## Network Şeması

dahili1

uPc1 NAT, dahili 192.162.1.9

userver1 NAT, dahili 192.168.1.5

userver2 NAT, dahili 192.168.1.6

dahili2

uPc2 NAT, dahili 192.162.1.10

userver1 NAT, dahili 192.168.1.5

userver2 NAT, dahili 192.168.1.6

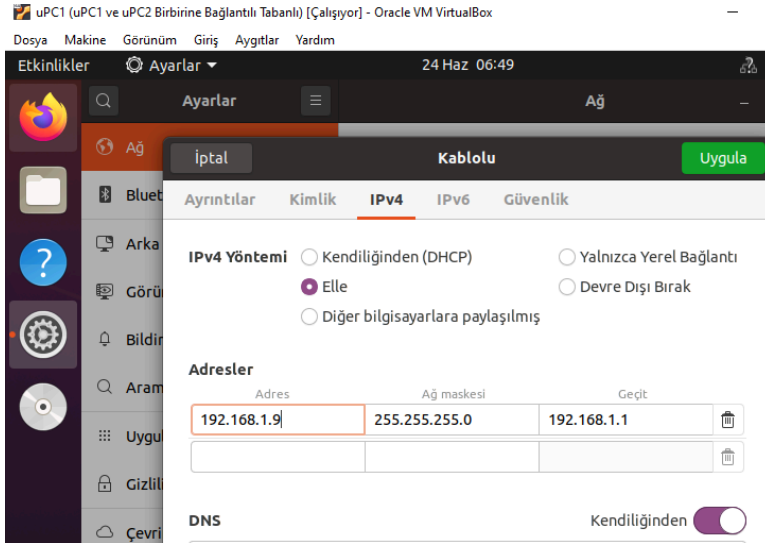


Figure 21. uPc1 statik ip verildi

```
userver1 [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım

"/etc/netplan/00-installer-config.yaml" 12L, 387C written
yuncu@userver1:/$ sudo netplan apply
yuncu@userver1:/$ 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 08:00:27:98:a8:bd brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
        valid_lft 86599sec preferred_lft 86599sec
    inet6 fe80::a00:27ff:fe27:98a8/64 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 08:00:27:98:7a:bd brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.5/24 brd 192.168.1.255 scope global enp0s8
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe57:9c7a/64 scope link
        valid_lft forever preferred_lft forever
4: enp0s9: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:01:93:2f brd ff:ff:ff:ff:ff:ff
    inet 192.168.206.5/24 brd 192.168.206.255 scope global enp0s9
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe01:932f/64 scope link
        valid_lft forever preferred_lft forever
yuncu@userver1:/$
```

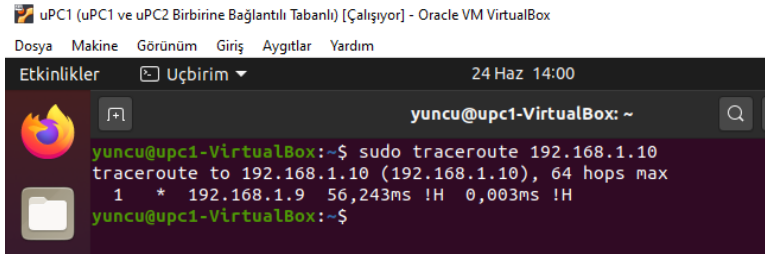
Figure 22. Ubuntu Server1 ip

```
userver2 [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım

"/etc/netplan/00-installer-config.yaml" 10L, 227C written
yuncu@userver2:/$ sudo netplan apply
yuncu@userver2:/$ 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 08:00:27:84:36:ba brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
        valid_lft 86398sec preferred_lft 86398sec
    inet6 fe80::a00:27ff:fe84:36ba/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 08:00:27:1e:c9:d5 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.6/24 brd 192.168.1.255 scope global enp0s8
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe1e:c9d5/64 scope link
        valid_lft forever preferred_lft forever
4: enp0s9: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:f3:0f:01 brd ff:ff:ff:ff:ff:ff
    inet 192.168.206.6/24 brd 192.168.206.255 scope global enp0s9
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fef3:f01/64 scope link
        valid_lft forever preferred_lft forever
yuncu@userver2:/$ _
```

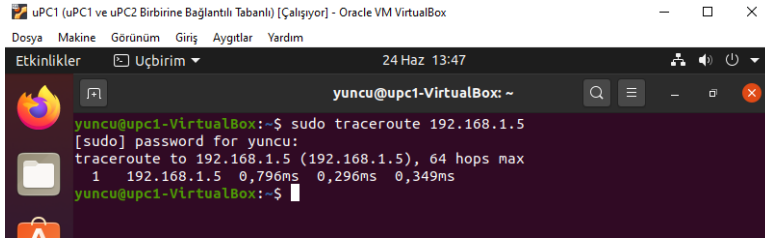
Figure 23. Ubuntu Server2 ip

- traceroute komutu sonuçları



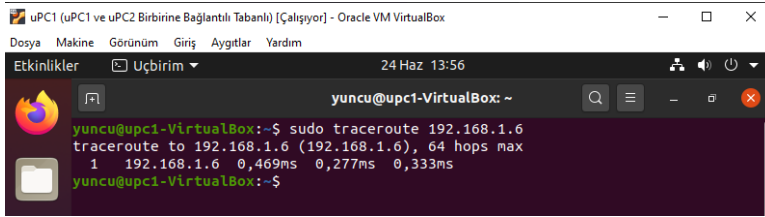
```
uPC1 (uPC1 ve uPC2 Birbirine Bağlantılı Tabanlı) [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım
Etkinlikler Uçbirim 24 Haz 14:00
yuncu@upc1-VirtualBox: ~
yuncu@upc1-VirtualBox:~$ sudo traceroute 192.168.1.10
traceroute to 192.168.1.10 (192.168.1.10), 64 hops max
1 * 192.168.1.9 56,243ms !H 0,003ms !H
yuncu@upc1-VirtualBox:~$
```

Figure 24. uPC1 → uPC2



```
uPC1 (uPC1 ve uPC2 Birbirine Bağlantılı Tabanlı) [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım
Etkinlikler Uçbirim 24 Haz 13:47
yuncu@upc1-VirtualBox: ~
yuncu@upc1-VirtualBox:~$ sudo traceroute 192.168.1.5
[sudo] password for yuncu:
traceroute to 192.168.1.5 (192.168.1.5), 64 hops max
1 192.168.1.5 0,796ms 0,296ms 0,349ms
yuncu@upc1-VirtualBox:~$
```

Figure 25. uPC1 → Server1



```
uPC1 (uPC1 ve uPC2 Birbirine Bağlantılı Tabanlı) [Çalışıyor] - Oracle VM VirtualBox
Dosya Makine Görünüm Giriş Aygıtlar Yardım
Etkinlikler Uçbirim 24 Haz 13:56
yuncu@upc1-VirtualBox: ~
yuncu@upc1-VirtualBox:~$ sudo traceroute 192.168.1.6
traceroute to 192.168.1.6 (192.168.1.6), 64 hops max
1 192.168.1.6 0,469ms 0,277ms 0,333ms
yuncu@upc1-VirtualBox:~$
```

Figure 26. uPC1 → Server2

## 4. Senaryo Üç Yeni

- Senaryo üç gereği upc1, upc2, userver1 ve userver3 ün ağ ayarları aşağıda ki gbi değiştirilmiştir.

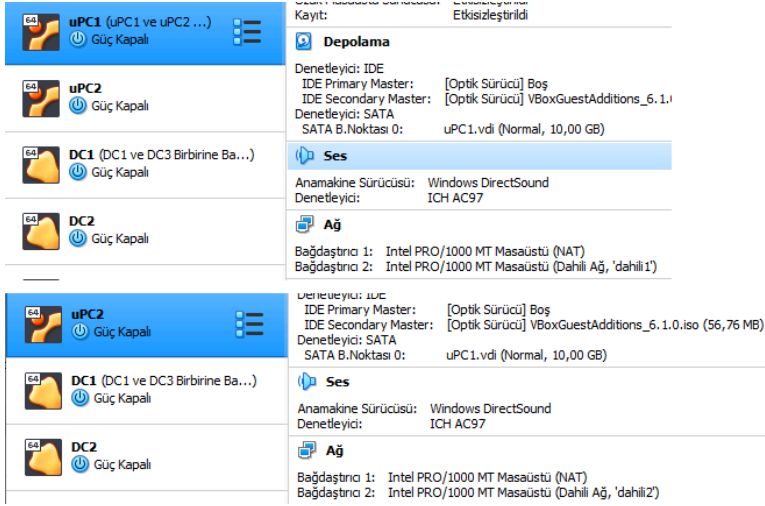


Figure 27. uPC1 ve uPC2 Ağ Ayarları

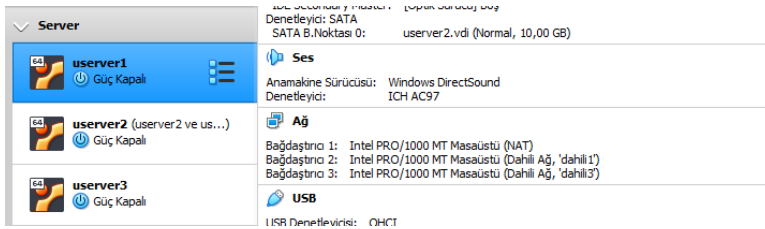


Figure 28. userver1 Ağ Ayarları

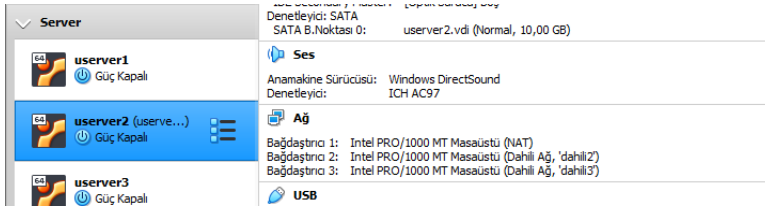


Figure 29. userver2 Ağ Ayarları

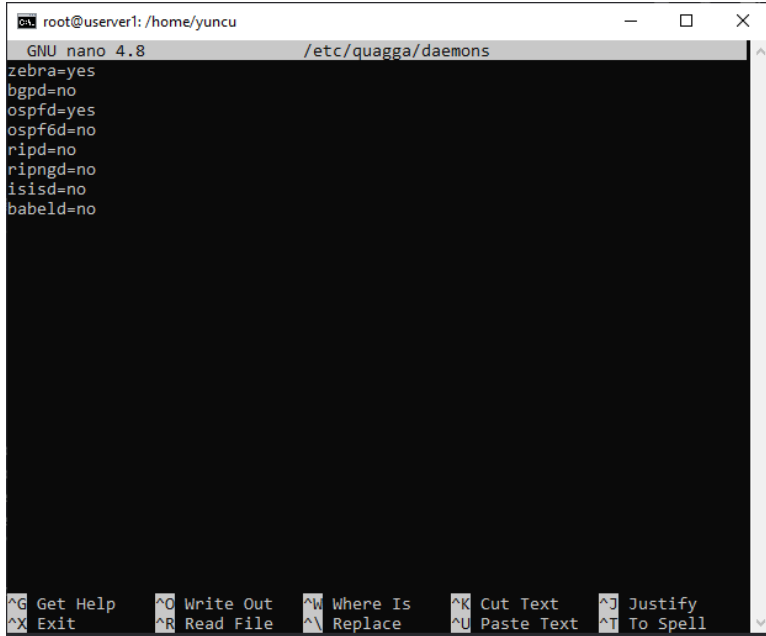
- Serverlara quagga yüklenmesi için aşağıdaki komutlar girildi.Öncelikle root moduna geçildi.

```
sudo su
apt-get update
apt-get install quagga quagga-doc
```

- Ardından gerekli olan kütüphaneler iki server için de indirildi. İndirilen kütüphane içersindeki quagga/daemons dosyası için gerekli ayarları tanımlamak için dosyayı nano formatında açıyoruz.

```
nano /etc/quagga/daemons
```

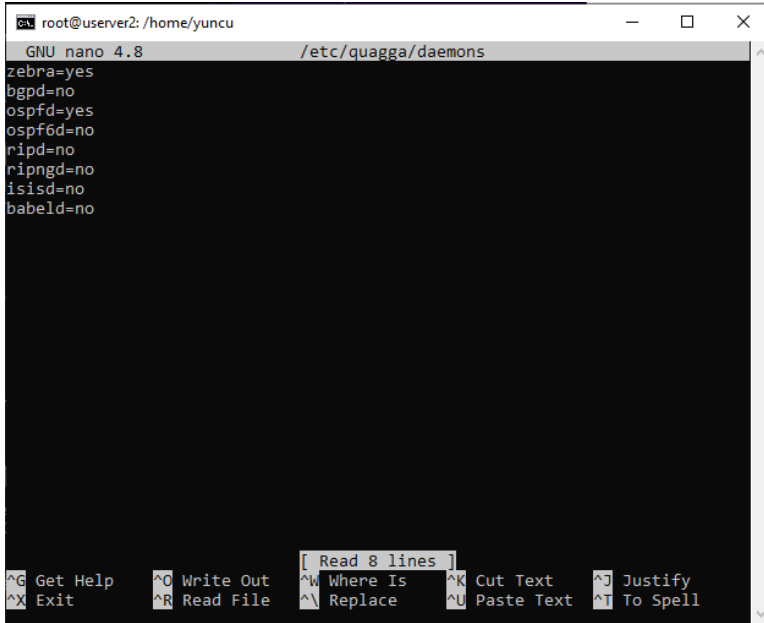
- Dosyalar açıldığında gerekli eklemeleri yapıyoruz.



```
root@userver1: /home/yuncu
GNU nano 4.8 /etc/quagga/daemons
zebra=yes
bgpd=no
ospfd=yes
ospf6d=no
ripd=no
ripngd=no
isisd=no
babeld=no

^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify
^X Exit      ^R Read File  ^\ Replace   ^U Paste Text ^T To Spell
```

Figure 30. userver1 Daemons config ayarları



```
root@userver2: /home/yuncu
GNU nano 4.8 /etc/quagga/daemons
zebra=yes
bgpd=no
ospfd=yes
ospf6d=no
ripd=no
ripngd=no
isisd=no
babeld=no
[ Read 8 lines ]
^G Get Help  ^O Write Out  ^W Where Is   ^K Cut Text   ^J Justify
^X Exit      ^R Read File  ^\ Replace    ^U Paste Text ^T To Spell
```

Figure 31. userver2 Daemons config ayarları

- Router yapılan serverlar için enp0s8 ve enp0s9 donanımlarının ayarları yapıldı.

```
cp /usr/share/doc/quagga-core/examples/zebra.conf.sample /etc/
quagga/zebra.conf
cp /usr/share/doc/quagga-core/examples/ospfd.conf.sample /etc/quagga/
ospfd.conf
sed -i s'/zebra=no/zebra=yes/' /etc/quagga/daemons
sed -i s'/ospfd=no/ospfd=yes/' /etc/quagga/daemons
echo 'VTYSH_PAGER=more' >>/etc/environment
echo 'export VTYSH_PAGER=more' >>/etc/bash.bashrc
cat >> /etc/quagga/ospfd.conf << EOF
interface enp0s8
interface enp0s9
interface lo
router ospf
  passive-interface enp0s8
  network 192.168.1.0/24 area 0.0.0.0
  network 192.168.100.0/24 area 0.0.0.0
line vty
EOF
cat >> /etc/quagga/zebra.conf << EOF
interface enp0s8
```

```

ip address 192.168.1.254/24
ipv6 nd suppress-ra
interface enp0s9
ip address 192.168.100.1/24
ipv6 nd suppress-ra
interface lo
ip forwarding
line vty
EOF

```

```

root@userver1:/home/yuncu
root@userver1:/home/yuncu# root@userver1:/home/yuncu#
root@userver1:/home/yuncu# cp /usr/share/doc/quagga-core/examples/zebra.conf.sample /etc/quagga/zebra.conf
cp /usr/share/doc/quagga-core/examples/ospfd.conf.sample /etc/quagga/ospfd.conf
sed -i s'/zebra=no/zebra=yes/' root@userver1:/home/yuncu# cp /usr/share/doc/quagga-core/examples/ospfd.conf.sample /etc/quagga/ospfd.conf
/etc/quagga/daemons
seroot@userver1:/home/yuncu# sed -i s'/zebra=no/zebra=yes/' /etc/quagga/daemons
i s'/ospfd=no/ospfd=yes/' root@userver1:/home/yuncu# sed -i s'/ospfd=no/ospfd=yes/' /etc/quagga/daemons
echo 'VTYSH_PAGER=more' >>/etc/eroot@userver1:/home/yuncu# echo 'VTYSH_PAGER=more' >>/etc/environment
choroot@userver1:/home/yuncu# echo 'export VTYSH_PAGER=more' >>/etc/bash.bashrc
chr
t root@userver1:/home/yuncu# cat >> /etc/quagga/ospfd.conf << EOF
> interface enp0s8
> interface enp0s9
> interface lo
> router ospf
> passive-interface enp0s8
> network 192.168.1.0/24 area 0.0.0.0
> network 192.168.100.0/24 area 0.0.0.0
> line vty
> EOF
root@userver1:/home/yuncu# cat >> /etc/quagga/zebra.conf << EOF
> interface enp0s8
> ip address 192.168.1.254/24
> ipv6 nd suppress-ra
> interface enp0s9
> ip address 192.168.100.1/24
> ipv6 nd suppress-ra
> interface lo
> ip forwarding
> line vty
> EOF

```

Figure 32. userver1-router için ip ayarları

```

cp /usr/share/doc/quagga-core/examples/zebra.conf.sample /etc/quagga/zebra.conf
cp /usr/share/doc/quagga-core/examples/ospfd.conf.sample /etc/quagga/ospfd.conf

```

```
sed -i s'/zebra=no/zebra=yes/' /etc/quagga/daemons
sed -i s'/ospfd=no/ospfd=yes/' /etc/quagga/daemons
echo 'VTYSH_PAGER=more' >>/etc/environment
echo 'export VTYSH_PAGER=more' >>/etc/bash.bashrc
cat >> /etc/quagga/ospfd.conf << EOF
interface enp0s8
interface enp0s9
interface lo
router ospf
  passive-interface enp0s8
  network 192.168.2.0/24 area 0.0.0.0
  network 192.168.100.0/24 area 0.0.0.0
line vty
EOF
cat >> /etc/quagga/zebra.conf << EOF
interface enp0s8
  ip address 192.168.2.254/24
  ipv6 nd suppress-ra
interface enp0s9
  ip address 192.168.100.2/24
  ipv6 nd suppress-ra
interface lo
ip forwarding
line vty
EOF
```



```
root@userver2: /home/yuncu
root@userver2:/home/yuncu# cp /usr/share/doc/quagga-core/examples/zebra.conf
.sample /etc/quagga/zebra.conf
cp /usr/share/doc/quagga-core/examproot@userver2:/home/yuncu# cp /usr/share/
.sample /etc/quagga/ospfd.conf.conf
sedroot@userver2:/home/yuncu# sed -i s'/zebra=no/zebra=yes/' /etc/quagga/dae
mons
s'/ospfd=no/ospfd=yesroot@userver2:/home/yuncu# sed -i s'/ospfd=no/ospfd=yes
s' /etc/quagga/daemon
SH_PAGER=more' >>/eroot@userver2:/home/yuncu# echo 'VTYSH_PAGER=more' >>/etc
/environment
cho root@userver2:/home/yuncu# echo 'export VTYSH_PAGER=more' >>/etc/bash.bc
root@userver2:/home/yuncu# cat >> /etc/quagga/ospfd.conf << EOF
> interface enp0s8
> interface enp0s9
> interface lo
> router ospf
> passive-interface enp0s8
> network 192.168.2.0/24 area 0.0.0.0
> network 192.168.100.0/24 area 0.0.0.0
> line vty
> EOF
root@userver2:/home/yuncu# cat >> /etc/quagga/zebra.conf << EOF
> interface enp0s8
> ip address 192.168.2.254/24
> ipv6 nd suppress-ra
> interface enp0s9
> ip address 192.168.100.2/24
> ipv6 nd suppress-ra
> interface lo
> ip forwarding
> line vty
> EOF
root@userver2:/home/yuncu#
```

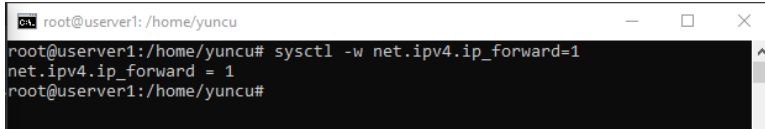
Figure 33. userver2-router için ip ayarları

- Aşağıdaki komut ile Ipv4 forwarding aktif hale getirildi ;

```
sysctl -w net.ipv4.ip_forward=1
```

```
root@userver2: /home/yuncu
root@userver2:/home/yuncu# sysctl -w net.ipv4.ip_forward=1
net.ipv4.ip_forward = 1
root@userver2:/home/yuncu#
```

Figure 34. userver1

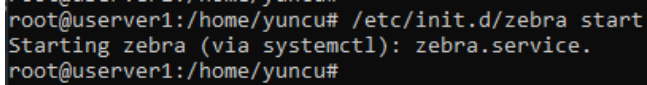
A terminal window titled 'root@userver1: /home/yuncu' with standard window controls. The terminal shows the execution of the command 'sysctl -w net.ipv4.ip\_forward=1', which sets 'net.ipv4.ip\_forward = 1'. The prompt returns to 'root@userver1: /home/yuncu#'.

```
root@userver1: /home/yuncu# sysctl -w net.ipv4.ip_forward=1
net.ipv4.ip_forward = 1
root@userver1: /home/yuncu#
```

Figure 35. userver2

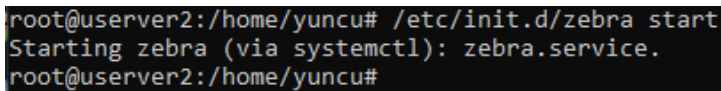
- Zebra servisi serverlar için aktif hale getirildi.

```
sudo /etc/init.d/zebra start
```

A terminal window showing the command '/etc/init.d/zebra start' being executed. The output is 'Starting zebra (via systemctl): zebra.service.'. The prompt returns to 'root@userver1: /home/yuncu#'.

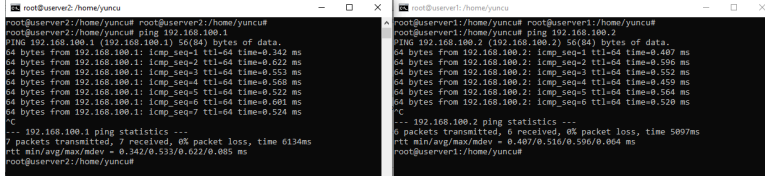
```
root@userver1: /home/yuncu# /etc/init.d/zebra start
Starting zebra (via systemctl): zebra.service.
root@userver1: /home/yuncu#
```

Figure 36. userver1

A terminal window showing the command '/etc/init.d/zebra start' being executed. The output is 'Starting zebra (via systemctl): zebra.service.'. The prompt returns to 'root@userver2: /home/yuncu#'.

```
root@userver2: /home/yuncu# /etc/init.d/zebra start
Starting zebra (via systemctl): zebra.service.
root@userver2: /home/yuncu#
```

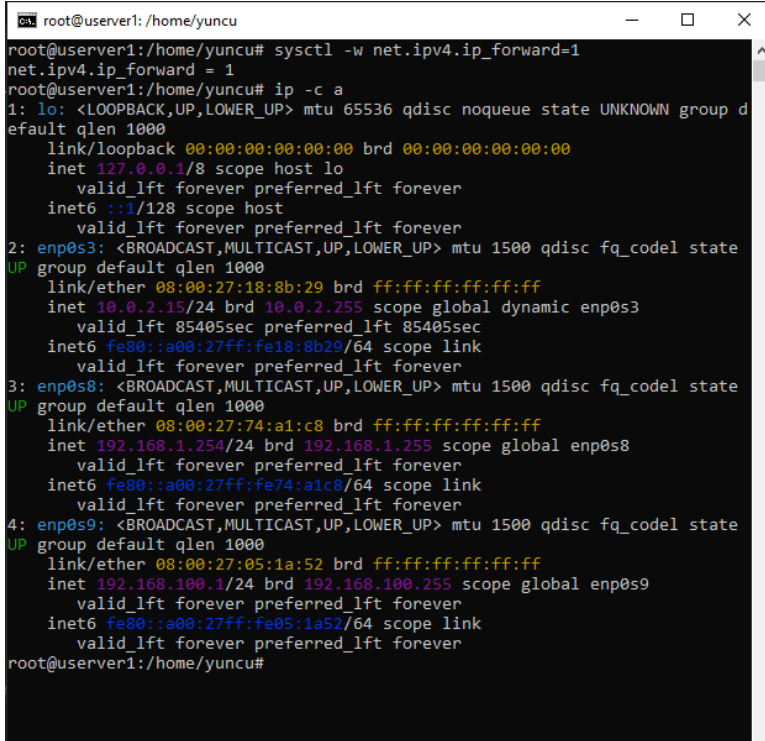
Figure 37. userver2



The image shows two terminal windows side-by-side. The left window is titled 'root@userver2:/home/yuncu' and shows the command 'root@userver2:/home/yuncu# ping 192.168.100.1'. The output shows 7 successful ping requests to 192.168.100.1 with varying times. The right window is titled 'root@userver1:/home/yuncu' and shows the command 'root@userver1:/home/yuncu# ping 192.168.100.2'. The output shows 6 successful ping requests to 192.168.100.2 with varying times. Both windows also show a 'ping statistics' summary at the bottom.

Figure 38. userver1 - userver2 enp0s9 donanımı üzerinden ping

- quagga kurulumundan sonra değişmiş olan ipler



The image shows a terminal window titled 'root@userver1:/home/yuncu'. The user has entered the command 'root@userver1:/home/yuncu# sysctl -w net.ipv4.ip\_forward=1'. Below this, the user has entered 'root@userver1:/home/yuncu# ip -c a'. The output shows the network configuration for the system, including the loopback interface 'lo' and three ethernet interfaces: 'enp0s3', 'enp0s8', and 'enp0s9'. Each interface is shown with its link/ether address, inet address, valid\_lft, preferred\_lft, and other details.

Figure 39. userver1

```

root@userver2: /home/yuncu
root@userver2:/home/yuncu# sysctl -w net.ipv4.ip_forward=1
net.ipv4.ip_forward = 1
root@userver2:/home/yuncu# ip -c a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group de
fault 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 U
P group default qlen 1000
    link/ether 08:00:27:84:36:ba brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
        valid_lft 85852sec preferred_lft 85852sec
    inet6 fe80::a00:27ff:fe84:36ba/64 scope link
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state U
P group default qlen 1000
    link/ether 08:00:27:1e:c9:d5 brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.254/24 brd 192.168.2.255 scope global enp0s8
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe1e:c9d5/64 scope link
        valid_lft forever preferred_lft forever
4: enp0s9: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state U
P group default qlen 1000
    link/ether 08:00:27:f3:0f:01 brd ff:ff:ff:ff:ff:ff
    inet 192.168.100.2/24 brd 192.168.100.255 scope global enp0s9
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fef3:f01/64 scope link
        valid_lft forever preferred_lft forever
root@userver2:/home/yuncu#

```

Figure 40. userver2

- PC1 ve PC2 için statik ip tanımlaması yeni bir netplan tanımlanarak, gedit ile de düzenlenilerek yapıldı.

```
sudo gedit /etc/netplan/50-cloud-init.yaml
```

\*Açılan yaml dosyasına aşağıdaki network ayarları atıldı.

```

network:
version: 2
ethernets:
  enp0s3:
    dhcp4: yes
  enp0s8:
    dhcp4: no
    addresses: [192.168.1.1/24]
    gateway4: 192.168.1.254
    nameservers:
      addresses: [208.67.222.222, 208.67.220.220]

```

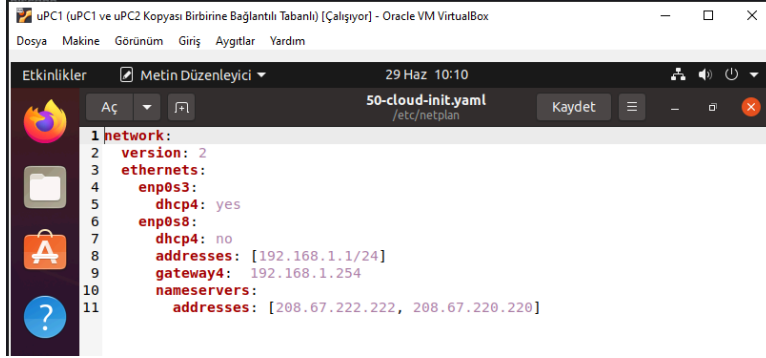


Figure 41. upc1

```
network:
version: 2
ethernet:
  enp0s3:
    dhcp4: yes
  enp0s8:
    dhcp4: no
    addresses: [192.168.2.1/24]
    gateway4: 192.168.2.254
    nameservers:
      addresses: [208.67.222.222, 208.67.220.220]
```

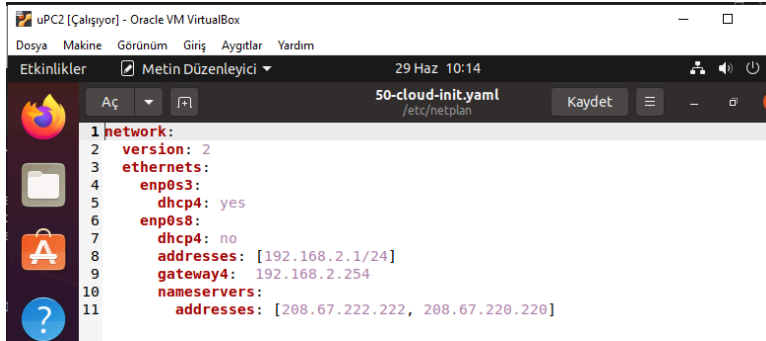


Figure 42. upc2

- pclere route adresleri eklendi

```
sudo ip route add 192.168.0.0/16 via 192.168.1.254 dev enp0s8
```

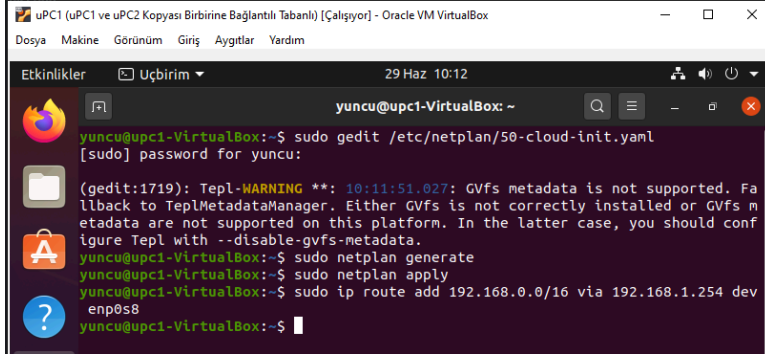


Figure 43. upc1

```
sudo ip route add 192.168.0.0/16 via 192.168.2.254 dev enp0s8
```

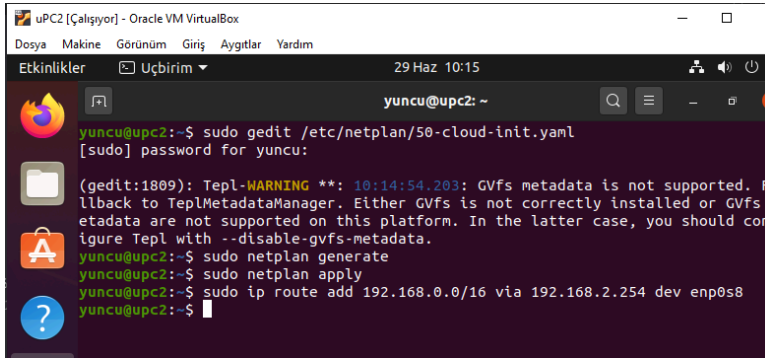


Figure 44. upc2

- Verilen statik ip başarıyla eklenmiş mi kontrol edilir.

```

yuncu@upc1-VirtualBox:~$ ip -c a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt 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 g
roup default qlen 1000
    link/ether 08:00:27:9d:9e:86 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 86136sec preferred_lft 86136sec
    inet6 fe80::a00:27ff:fe9d:9e86/64 scope link
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:5e:56:b5 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.1/24 brd 192.168.1.255 scope global noprefixroute enp0s8
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe5e:56b5/64 scope link
        valid_lft forever preferred_lft forever
yuncu@upc1-VirtualBox:~$

```

Figure 45. upc1 if -c a sonucu

```

yuncu@upc2:~$ ip -c a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt 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 g
roup default qlen 1000
    link/ether 08:00:27:c2:52:9a brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 86245sec preferred_lft 86245sec
    inet6 fe80::a00:27ff:fec2:529a/64 scope link
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
roup default qlen 1000
    link/ether 08:00:27:5b:fb:4b brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.1/24 brd 192.168.2.255 scope global noprefixroute enp0s8
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe5b:fb4b/64 scope link
        valid_lft forever preferred_lft forever
yuncu@upc2:~$

```

Figure 46. upc2 if -c a sonucu

- Şu anda bütün kurulum işlemleri tamamlanmıştır.

```

yuncu@upc1-VirtualBox:~$ ping 192.168.2.1
PING 192.168.2.1 (192.168.2.1) 56(84) bytes of data.
64 bytes from 192.168.2.1: icmp_seq=1 ttl=62 time=1.54 ms
64 bytes from 192.168.2.1: icmp_seq=2 ttl=62 time=1.56 ms
64 bytes from 192.168.2.1: icmp_seq=3 ttl=62 time=1.07 ms
64 bytes from 192.168.2.1: icmp_seq=4 ttl=62 time=1.53 ms
64 bytes from 192.168.2.1: icmp_seq=5 ttl=62 time=1.72 ms
^C
--- 192.168.2.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4007ms
rtt min/avg/max/mdev = 1.068/1.483/1.722/0.219 ms
yuncu@upc1-VirtualBox:~$

yuncu@upc1-VirtualBox:~$ ping 192.168.1.254
PING 192.168.1.254 (192.168.1.254) 56(84) bytes of data.
64 bytes from 192.168.1.254: icmp_seq=1 ttl=64 time=0.517 ms
64 bytes from 192.168.1.254: icmp_seq=2 ttl=64 time=0.495 ms
64 bytes from 192.168.1.254: icmp_seq=3 ttl=64 time=0.585 ms
64 bytes from 192.168.1.254: icmp_seq=4 ttl=64 time=0.521 ms
^C
--- 192.168.1.254 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3054ms
rtt min/avg/max/mdev = 0.495/0.529/0.585/0.033 ms
yuncu@upc1-VirtualBox:~$

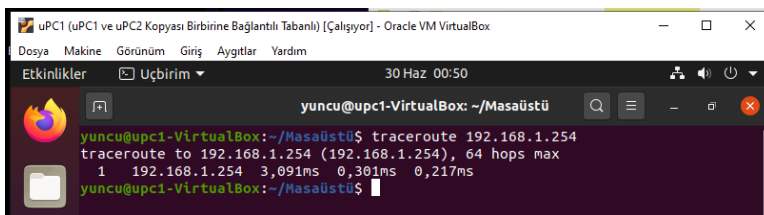
yuncu@upc1-VirtualBox:~$ ping 192.168.2.254
PING 192.168.2.254 (192.168.2.254) 56(84) bytes of data.
64 bytes from 192.168.2.254: icmp_seq=1 ttl=63 time=1.05 ms
64 bytes from 192.168.2.254: icmp_seq=2 ttl=63 time=1.02 ms
64 bytes from 192.168.2.254: icmp_seq=3 ttl=63 time=0.990 ms
64 bytes from 192.168.2.254: icmp_seq=4 ttl=63 time=1.01 ms
64 bytes from 192.168.2.254: icmp_seq=5 ttl=63 time=1.11 ms
^C
--- 192.168.2.254 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 0.990/1.032/1.105/0.040 ms
yuncu@upc1-VirtualBox:~$

```

Figure 47. pc1 den pc2, server1 ve server2 ye ping atıldı

- "traceroute" komutu sonuçları

```
traceroute 192.168.1.254
```



```

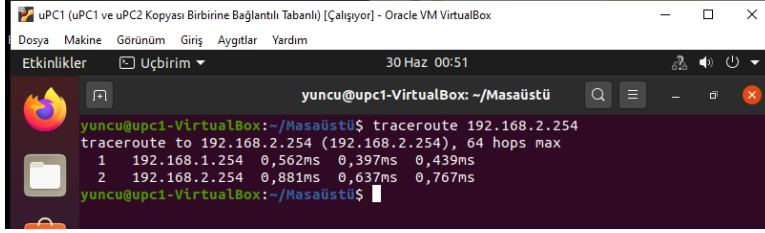
yuncu@upc1-VirtualBox: ~/Masaüstü
yuncu@upc1-VirtualBox:~/Masaüstü$ traceroute 192.168.1.254
traceroute to 192.168.1.254 (192.168.1.254), 64 hops max
 1  192.168.1.254  3.091ms  0.301ms  0.217ms
yuncu@upc1-VirtualBox:~/Masaüstü$

```

Figure 48. pc1 → server1(enp0s8)



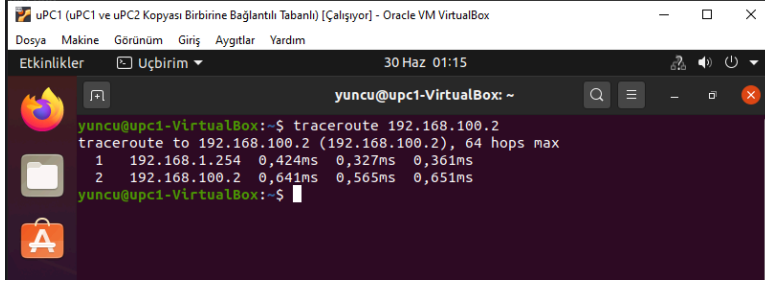
```
traceroute 192.168.2.254
```



```
yuncu@upc1-VirtualBox: ~/Masaüstü
yuncu@upc1-VirtualBox:~/Masaüstü$ traceroute 192.168.2.254
traceroute to 192.168.2.254 (192.168.2.254), 64 hops max
 1  192.168.1.254  0,562ms  0,397ms  0,439ms
 2  192.168.2.254  0,881ms  0,637ms  0,767ms
yuncu@upc1-VirtualBox:~/Masaüstü$
```

Figure 49. pc1 → server2(enp0s8)

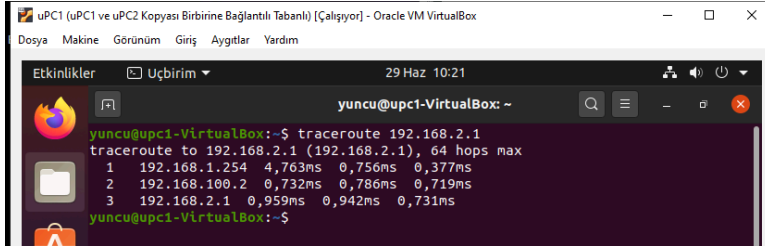
```
traceroute 192.168.100.2
```



```
yuncu@upc1-VirtualBox: ~
yuncu@upc1-VirtualBox:~$ traceroute 192.168.100.2
traceroute to 192.168.100.2 (192.168.100.2), 64 hops max
 1  192.168.1.254  0,424ms  0,327ms  0,361ms
 2  192.168.100.2  0,641ms  0,565ms  0,651ms
yuncu@upc1-VirtualBox:~$
```

Figure 50. pc1 → server2(enp0s9)

```
traceroute 192.168.2.1
```



```
yuncu@upc1-VirtualBox: ~
yuncu@upc1-VirtualBox:~$ traceroute 192.168.2.1
traceroute to 192.168.2.1 (192.168.2.1), 64 hops max
 1  192.168.1.254  4,763ms  0,756ms  0,377ms
 2  192.168.100.2  0,732ms  0,786ms  0,719ms
 3  192.168.2.1  0,959ms  0,942ms  0,731ms
yuncu@upc1-VirtualBox:~$
```

Figure 51. pc1 → pc2

## 4.1. Senaryo Üç Network Diyagramı

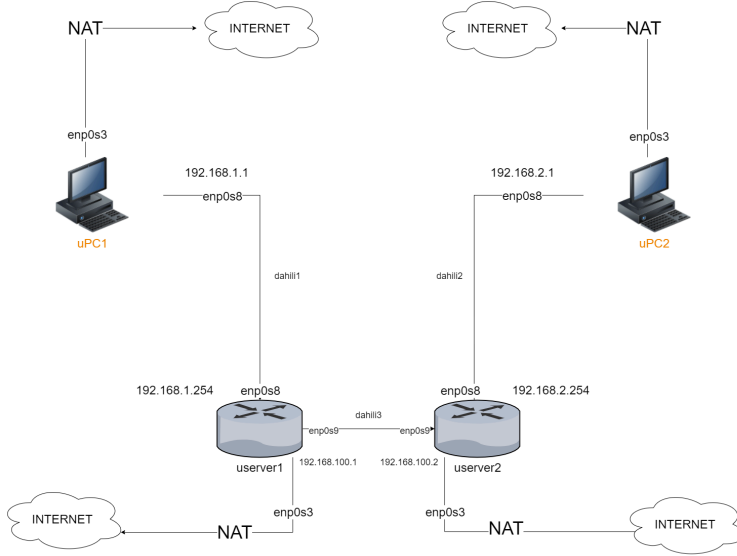


Figure 52. networkDiagram

## 4.2. IP Tablosu

	uPC1	uPC2	userver1	userver2
enp0s8	192.168.1.1	192.168.2.1	192.168.1.254	192.168.2.254
enp0s9	X	X	192.168.100.1	192.168.100.2

Figure 53. ip table