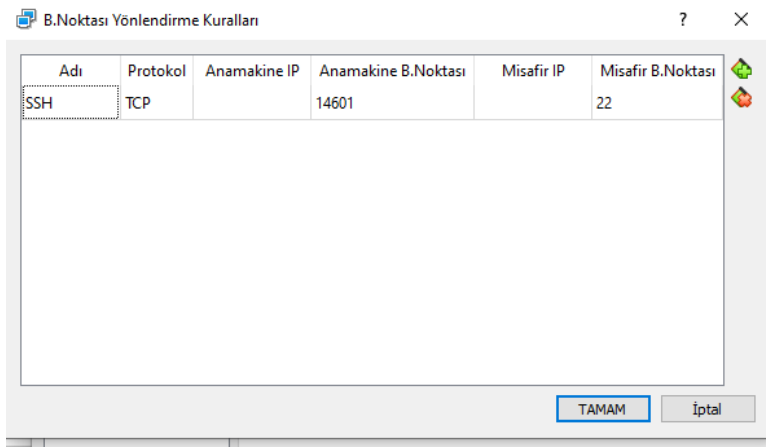

Linux Ağ Yönetimi Final Projesi

Mahmut Yüncü 170202115

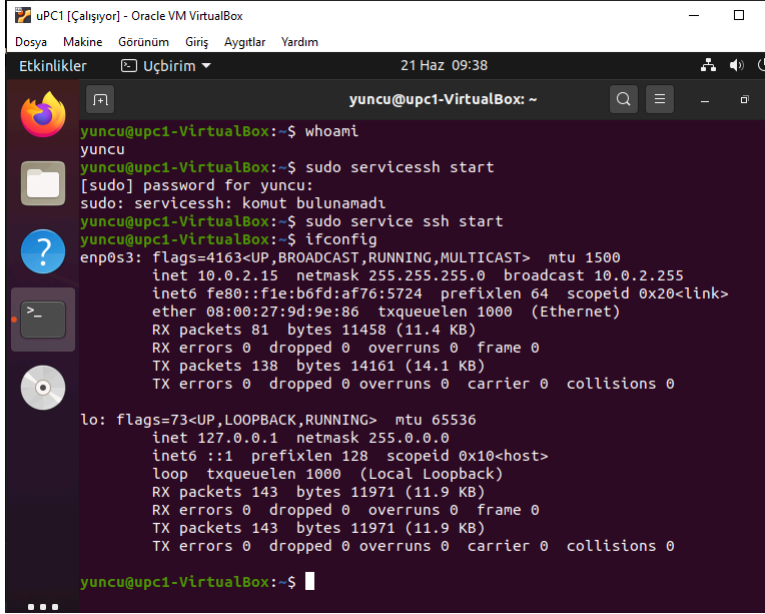
1. Senaryo Bir

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.



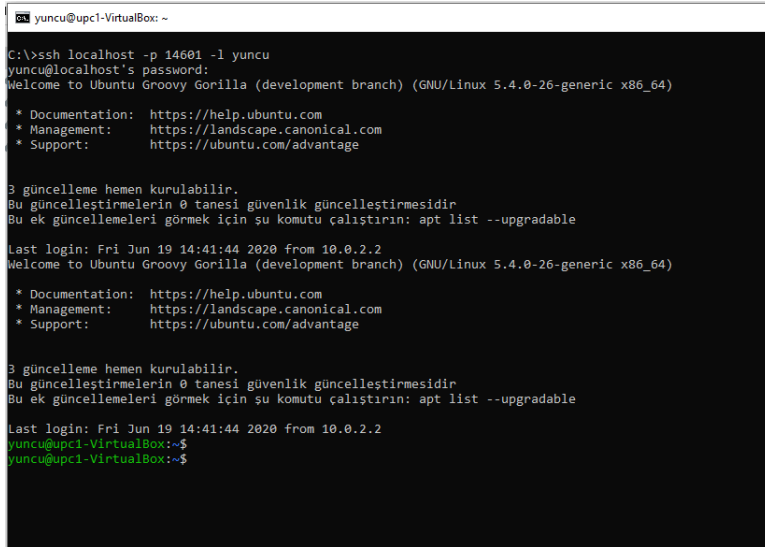
- uPC1 için ifconfig in kullanılması için "sudo apt-get install net-tools" komutu ile net-tools ve ssh bağlantısı için "sudo apt install openssh-server" komutu ile ssh servisi yüklenildi. Yükleme tamamlandıktan sonra "sudo service ssh start" komutu ile ssh servisi başlatıldı. Ardından "ifconfig" komutu 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 linkinden "VBoxGuestAdditions_6.1.0.iso" dosyası indirilip upc1 e kuruldu. Kurulma işleminin ardından upc1 rebootlandı ve artık kopyalama işlemi yapılabilir haldeydi.

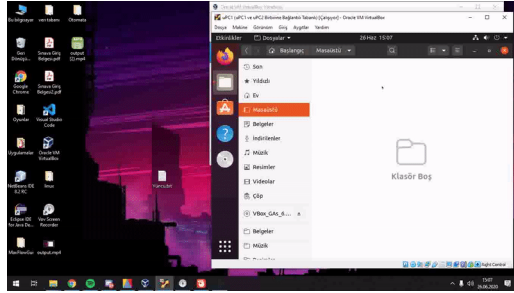
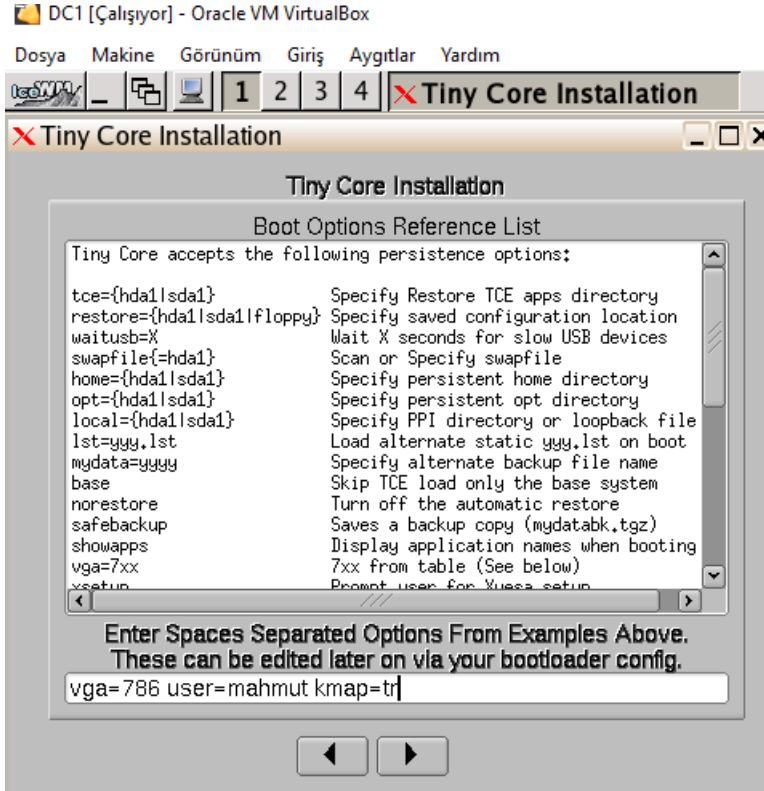


Figure 4. Host'tan Guest'e dosya kopyalama işlemi

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.

```

XTerminal
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 ssh_config.orig ssh_config
sudo: ssh_config.orig: command not found
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.orig  sshd_config.orig
mahmut@box:~$ cd /usr/local/etc/ssh$ ssh_config
mahmut@box:~$ cd /usr/local/etc/ssh$ sshd_config
mahmut@box:~$ cd /usr/local/etc/ssh$

```

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

```

X Terminal
lo += ..S .      =|
|.. 0.0.000 .    E|
|... 000+.0.     |
|lo. 0=.00       |
|lo ..0+=.       |
+-----[SHA256]-----+
mahmut@box:/usr/local/etc/ssh$ 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:/usr/local/etc/ssh$

```

- 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 SHA256:4MYz8Md0guSTJzr5X01+4jYq1MUDc/aiQy3G8EhQEA.
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:
    ( ' ')
    /) TC (\ Core is distributed with ABSOLUTELY NO WARRANTY.
    (/ _ _ _ \)      www.tinycorelinux.net

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:\>
```

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:GR+mem8/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 9.7GB 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.

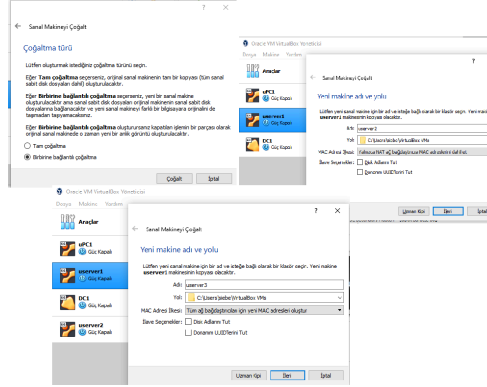


Figure 5. Server 1 den server2 ve server3' ün klonlanması

- 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
```

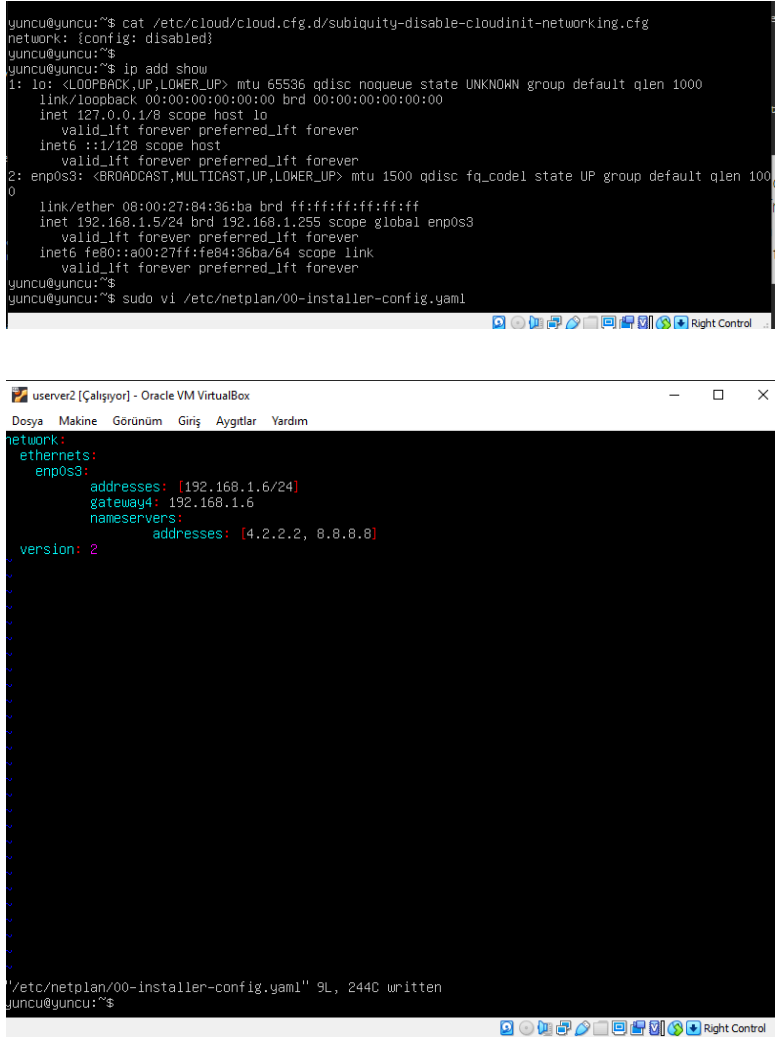
#netplan dosyasının editi yapıldı

```
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 6. 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 7. 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 8. 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 9. 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 10. 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 11. 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 12. 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 13. 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 14. 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 15. 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:\>
```

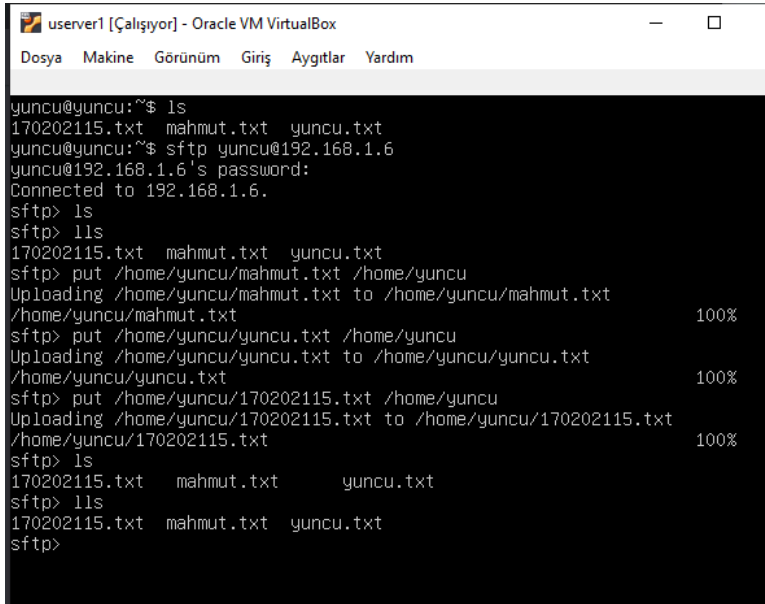
Figure 16. Host → userver1/userver2/userver3 ping

- 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 image shows a terminal window titled "userver1 [Çalışıyor] - Oracle VM VirtualBox". The terminal displays a series of commands and their outputs. First, the user runs 'ls' and lists three files: 170202115.txt, mahmut.txt, and yuncu.txt. Then, they initiate an SFTP session with 'sftp yuncu@192.168.1.6'. After entering the password, they are connected to 192.168.1.6. Inside the SFTP session, they run 'ls' and 'lls' to confirm the file list. Then, they use the 'put' command to transfer each file from the local path '/home/yuncu/' to the remote path '/home/yuncu/'. Each transfer is shown with a progress bar reaching 100%. Finally, they run 'ls' and 'lls' again to verify the files are now on the remote server.

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

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> lls
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> lls
170202115.txt mahmut.txt yuncu.txt
sftp>
```

Figure 17. 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.

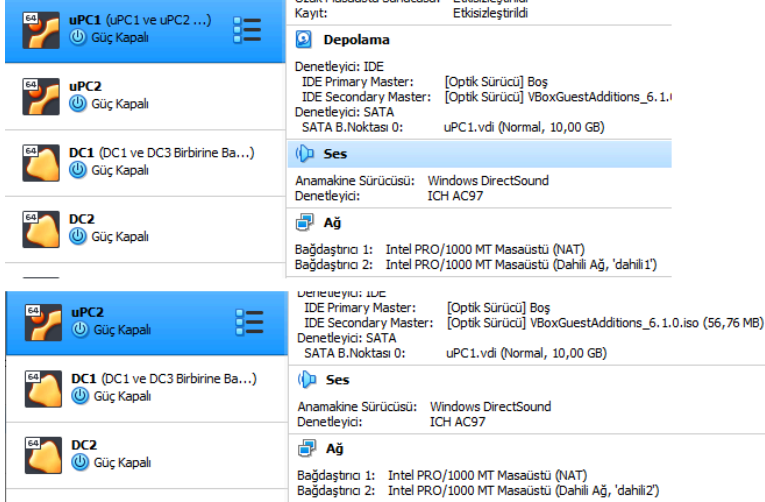


Figure 18. uPC1 ve uPC2 Ağ Ayarları

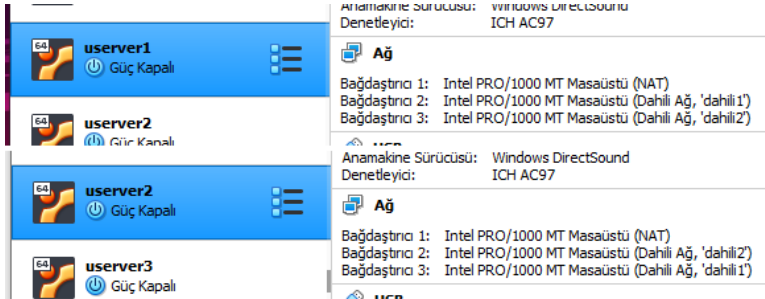


Figure 19. userver1 ve userver2 Ağ Ayarları

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

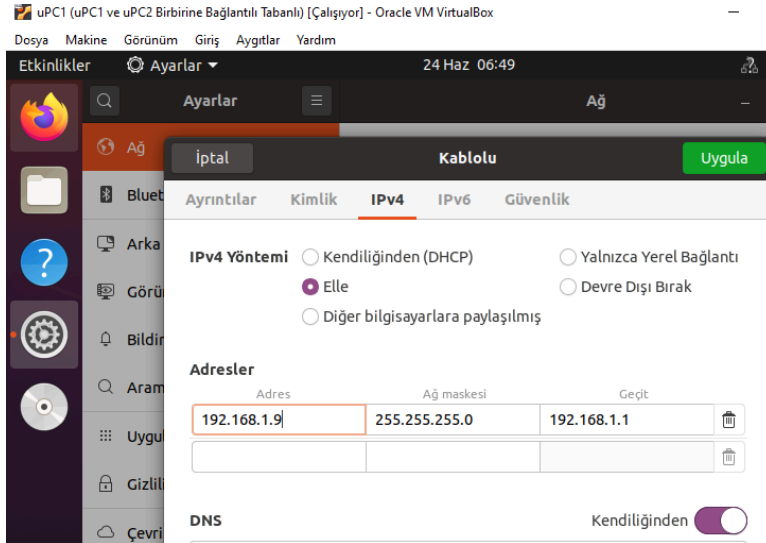


Figure 20. uPc1 statik ip verildi

```
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:/$
```

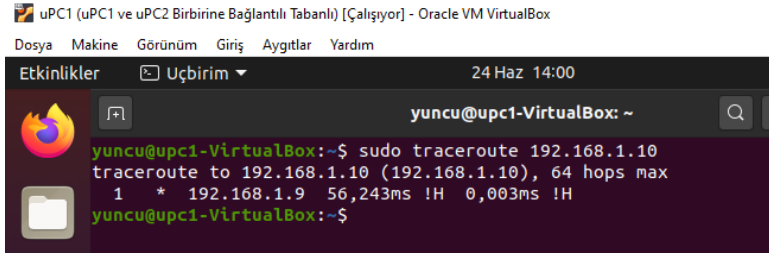
Figure 21. Ubuntu Server1 ip

```
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 22. Ubuntu Server2 ip

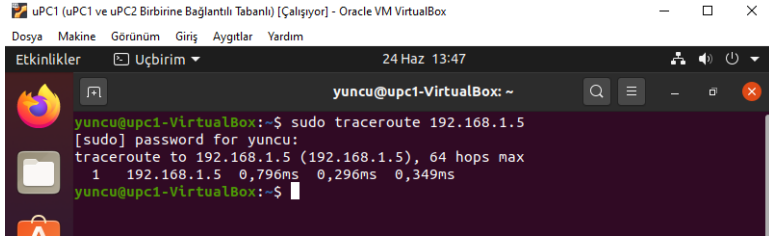
- traceroute komutu sonuçları



The screenshot shows a terminal window titled "uPC1 (uPC1 ve uPC2 Birbirine Bağlantılı Tabanlı) [Çalışıyor] - Oracle VM VirtualBox". The terminal prompt is "yuncu@upc1-VirtualBox: ~". The user has entered the command "sudo traceroute 192.168.1.10". The output shows a single hop to 192.168.1.10 with a maximum of 64 hops. The terminal also shows the user's name "yuncu" and the time "24 Haz 14:00".

```
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:~$
```

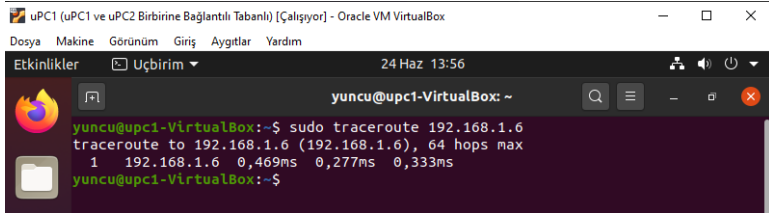
Figure 23. uPC1 → uPC2



The screenshot shows a terminal window titled "uPC1 (uPC1 ve uPC2 Birbirine Bağlantılı Tabanlı) [Çalışıyor] - Oracle VM VirtualBox". The terminal prompt is "yuncu@upc1-VirtualBox: ~". The user has entered the command "sudo traceroute 192.168.1.5". The output shows a single hop to 192.168.1.5 with a maximum of 64 hops. The terminal also shows the user's name "yuncu" and the time "24 Haz 13:47".

```
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 24. uPC1 → Server1



The screenshot shows a terminal window titled "uPC1 (uPC1 ve uPC2 Birbirine Bağlantılı Tabanlı) [Çalışıyor] - Oracle VM VirtualBox". The terminal prompt is "yuncu@upc1-VirtualBox: ~". The user has entered the command "sudo traceroute 192.168.1.6". The output shows a single hop to 192.168.1.6 with a maximum of 64 hops. The terminal also shows the user's name "yuncu" and the time "24 Haz 13:56".

```
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 25. uPC1 → Server2

