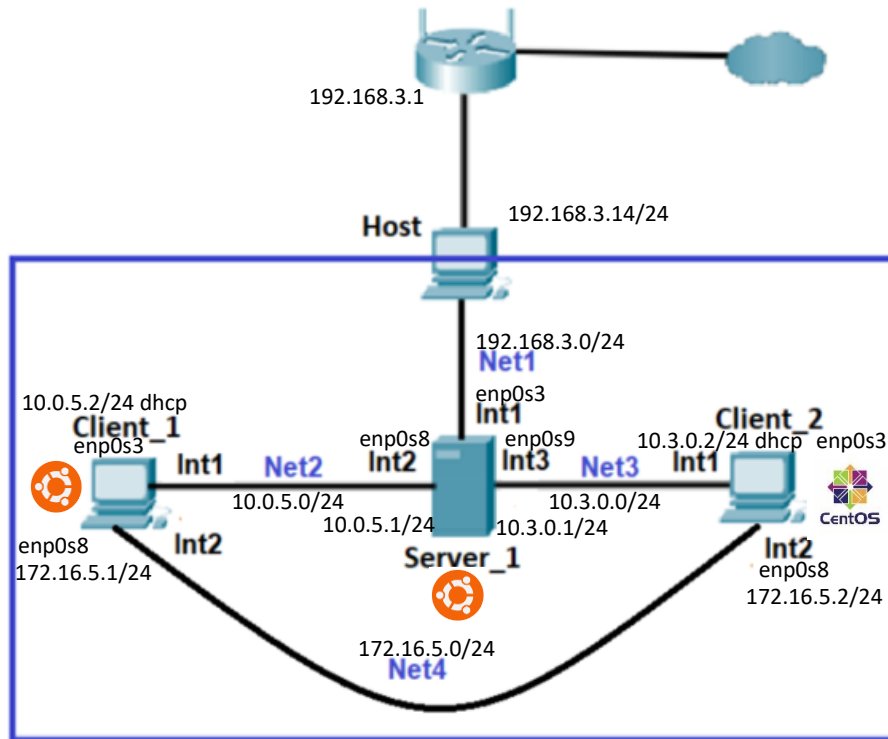# Linux Networking task result



## Client_2 IP address configuration (enp0s8 and enp0s3):

```
TYPE=Ethernet
PROXY_METHOD=none
BROWSER_ONLY=no
BOOTPROTO=none
DEFROUTE=yes
IPV4_FAILURE_FATAL=no
IPV6INIT=yes
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_FAILURE_FATAL=no
IPV6_ADDR_GEN_MODE=eui64
NAME=enp0s8
UUID=70d5b747-f9e5-46ec-ac3d-e64962113a5e
DEVICE=enp0s8
ONBOOT=yes
IPADDR=172.16.5.2
PREFIX=24_
```

```
TYPE=Ethernet
PROXY_METHOD=none
BROWSER_ONLY=no
BOOTPROTO=dhcp
DEFROUTE=yes
IPV4_FAILURE_FATAL=no
IPV6INIT=yes
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_FAILURE_FATAL=no
IPV6_ADDR_GEN_MODE=eui64
NAME=enp0s3
UUID=de6b6a44-b967-4387-b1fd-2f75a60679a2
DEVICE=enp0s3
ONBOOT=yes_
```

```
localhost login: root
Password:
Last login: Sun Oct 23 10:01:16 on tty1
[root@localhost ~]# sudo hostnamectl
    Static hostname: localhost.localdomain
          Icon name: computer-vm
            Chassis: vm
         Machine ID: a2c83dc4b76547a5887256c075c1988d
            Boot ID: 2ef4e8baf15148549360b652e0302b8c
     Virtualization: oracle
   Operating System: CentOS Stream 8
        CPE OS Name: cpe:/o:centos:centos:8
             Kernel: Linux 4.18.0-408.el8.x86_64
       Architecture: x86-64
[root@localhost ~]# sudo hostnamectl set-hostname client-2
[root@localhost ~]# sudo hostnamectl
    Static hostname: client-2
          Icon name: computer-vm
            Chassis: vm
         Machine ID: a2c83dc4b76547a5887256c075c1988d
            Boot ID: 2ef4e8baf15148549360b652e0302b8c
     Virtualization: oracle
   Operating System: CentOS Stream 8
        CPE OS Name: cpe:/o:centos:centos:8
             Kernel: Linux 4.18.0-408.el8.x86_64
       Architecture: x86-64
[root@localhost ~]# _
```

# Server_1 IP configuration:
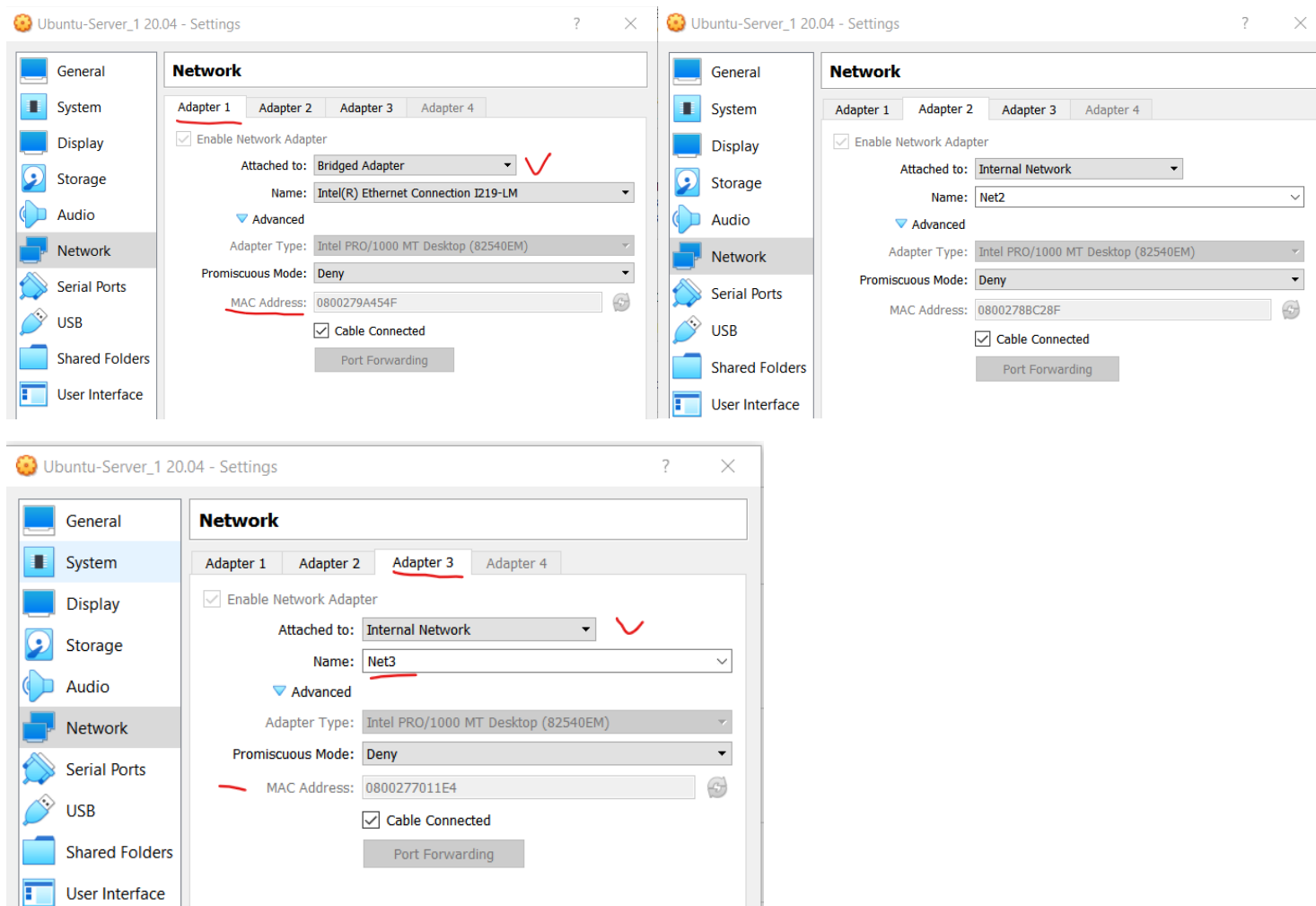






# IP settings for Server-1 in /etc/netplan/00-installer-config.yaml

```
GNU nano 4.8                                    00-installer-config.yaml
# This is the network config written by 'subiquity'
network:
  ethernets:
    enp0s3:
      addresses:
      - 192.168.3.151/24
      gateway4: 192.168.3.1
      nameservers:
        addresses:
        - 192.168.3.1
        search:
        - 192.168.3.1
    enp0s8:
      addresses: [10.0.5.1/24]
    enp0s9:
      addresses: [10.3.0.1/24]
  version: 2
```

**Accept new configuration and check it:**

```
root@usrv1:/etc/netplan# sudo netplan try
Do you want to keep these settings?


Press ENTER before the timeout to accept the new configuration


Changes will revert in 112 seconds
Configuration accepted.
root@usrv1:/etc/netplan# ip addr
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 08:00:27:9a:45:4f brd ff:ff:ff:ff:ff:ff
    inet 192.168.3.151/24 brd 192.168.3.255 scope global enp0s3
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe9a:454f/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 08:00:27:8b:c2:8f brd ff:ff:ff:ff:ff:ff
    inet 10.0.5.1/24 brd 10.0.5.255 scope global enp0s8
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe8b:c28f/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 08:00:27:70:11:e4 brd ff:ff:ff:ff:ff:ff
    inet 10.3.0.1/24 brd 10.3.0.255 scope global enp0s9
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe70:11e4/64 scope link
       valid_lft forever preferred_lft forever
root@usrv1:/etc/netplan#
```

**Set hostname (server-1):**

```
rvv@usrv1:~$ sudo hostnamectl
    Static hostname: usrv1
          Icon name: computer-vm
            Chassis: vm
         Machine ID: cb601415d35548da81012faf5d4acc7a
            Boot ID: c4c60d96321b45209dfe2007e20e3281
      Virtualization: oracle
  Operating System: Ubuntu 20.04.5 LTS
             Kernel: Linux 5.4.0-131-generic
       Architecture: x86-64
rvv@usrv1:~$ sudo hostnamectl set-hostname server-1
rvv@usrv1:~$ sudo hostnamectl
    Static hostname: server-1
          Icon name: computer-vm
            Chassis: vm
         Machine ID: cb601415d35548da81012faf5d4acc7a
            Boot ID: c4c60d96321b45209dfe2007e20e3281
      Virtualization: oracle
  Operating System: Ubuntu 20.04.5 LTS
             Kernel: Linux 5.4.0-131-generic
       Architecture: x86-64
rvv@usrv1:~$
```

## Ubuntu DHCP server installation

```
root@usrv1:/etc/netplan# sudo apt install isc-dhcp-server
Reading package lists ... Done
Building dependency tree
Reading state information ... Done
The following additional packages will be installed:
  libirs-export161 libisccfg-export163
Suggested packages:
  isc-dhcp-server-ldap policycoreutils
The following NEW packages will be installed:
  isc-dhcp-server libirs-export161 libisccfg-export163
0 upgraded, 3 newly installed, 0 to remove and 12 not upgraded.
Need to get 519 kB of archives.
After this operation, 1,865 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ua.archive.ubuntu.com/ubuntu focal-updates/main amd64 libisccfg-export163 amd64 1:9.11.16+dfsg-3~ubuntu1 [45.9 kB]
Get:2 http://ua.archive.ubuntu.com/ubuntu focal-updates/main amd64 libirs-export161 amd64 1:9.11.16+dfsg-3~ubuntu1 [18.6 kB]
Get:3 http://ua.archive.ubuntu.com/ubuntu focal-updates/main amd64 isc-dhcp-server amd64 4.4.1-2.1ubuntu5.20.04.4 [454 kB]
Fetched 519 kB in 0s (2,408 kB/s)
Preconfiguring packages ...
Selecting previously unselected package libisccfg-export163.
(Reading database ... 72454 files and directories currently installed.)
Preparing to unpack .../libisccfg-export163_1%3a9.11.16+dfsg-3~ubuntu1_amd64.deb ...
Unpacking libisccfg-export163 (1:9.11.16+dfsg-3~ubuntu1) ...
Selecting previously unselected package libirs-export161.
Preparing to unpack .../libirs-export161_1%3a9.11.16+dfsg-3~ubuntu1_amd64.deb ...
Unpacking libirs-export161 (1:9.11.16+dfsg-3~ubuntu1) ...
Selecting previously unselected package isc-dhcp-server.
Preparing to unpack .../isc-dhcp-server_4.4.1-2.1ubuntu5.20.04.4_amd64.deb ...
Unpacking isc-dhcp-server (4.4.1-2.1ubuntu5.20.04.4) ...
Setting up libisccfg-export163 (1:9.11.16+dfsg-3~ubuntu1) ...
Setting up libirs-export161 (1:9.11.16+dfsg-3~ubuntu1) ...
Setting up isc-dhcp-server (4.4.1-2.1ubuntu5.20.04.4) ...
Generating /etc/default/isc-dhcp-server ...
Created symlink /etc/systemd/system/multi-user.target.wants/isc-dhcp-server.service → /lib/systemd/system/isc-dhcp-server.service.
Created symlink /etc/systemd/system/multi-user.target.wants/isc-dhcp-server6.service → /lib/systemd/system/isc-dhcp-server6.service.
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.9) ...
Processing triggers for systemd (245.4-4ubuntu3.17) ...
```

## Setup dhcpd.conf

```
  GNU nano 4.8                                        /etc/dhcp/dhcpd.conf
# dhcpd.conf
#
# Sample configuration file for ISC dhcpd
#
# Attention: If /etc/ltsp/dhcpd.conf exists, that will be used as
# configuration file instead of this file.
#

# option definitions common to all supported networks...
option domain-name "server-1";
option domain-name-servers dns.google;

default-lease-time 600;
max-lease-time 7200;

# The ddns-updates-style parameter controls whether or not the server will
# attempt to do a DNS update when a lease is confirmed. We default to the
# behavior of the version 2 packages ('none', since DHCP v2 didn't
# have support for DDNS.)
ddns-update-style none;

# If this DHCP server is the official DHCP server for the local
# network, the authoritative directive should be uncommented.
authoritative;
```

```
subnet 10.0.5.0 netmask 255.255.255.0 {
    range 10.0.5.2 10.0.5.10;
    option routers 10.0.5.1;
}

subnet 10.3.0.0 netmask 255.255.255.0 {
    range 10.3.0.2 10.3.0.10;
    option routers 10.3.0.1;
}
```

**and change some sittings in isc-dhcp-server because we have 2 interfeces**

```
  GNU nano 4.8                                    /etc/default/isc-dhcp-server
# Defaults for isc-dhcp-server (sourced by /etc/init.d/isc-dhcp-server)

# Path to dhcpd's config file (default: /etc/dhcp/dhcpd.conf).
#DHCPDv4_CONF=/etc/dhcp/dhcpd.conf
#DHCPDv6_CONF=/etc/dhcp/dhcpd6.conf

# Path to dhcpd's PID file (default: /var/run/dhcpd.pid).
#DHCPDv4_PID=/var/run/dhcpd.pid
#DHCPDv6_PID=/var/run/dhcpd6.pid

# Additional options to start dhcpd with.
#       Don't use options -cf or -pf here; use DHCPD_CONF/ DHCPD_PID instead
#OPTIONS=""

# On what interfaces should the DHCP server (dhcpd) serve DHCP requests?
#       Separate multiple interfaces with spaces, e.g. "eth0 eth1".
INTERFACESv4="enp0s8 enp0s9"
INTERFACESv6=""
```

**Restart DHCP server and check it status:**

```
root@server-1:/etc/dhcp# sudo systemctl start isc-dhcp-server
root@server-1:/etc/dhcp# sudo systemctl status isc-dhcp-server
● isc-dhcp-server.service - ISC DHCP IPv4 server
     Loaded: loaded (/lib/systemd/system/isc-dhcp-server.service; enabled; vendor preset: enabled)
     Active: active (running) since Tue 2022-10-25 07:45:22 UTC; 6s ago
       Docs: man:dhcpd(8)
   Main PID: 2253 (dhcpd)
      Tasks: 4 (limit: 2274)
     Memory: 4.5M
     CGroup: /system.slice/isc-dhcp-server.service
             └─2253 dhcpd -user dhcpd -group dhcpd -f -4 -pf /run/dhcp-server/dhcpd.pid -cf /etc/dhcp/dhcpd.conf enp0s8 enp0s9

Oct 25 07:45:22 server-1 sh[2253]: Listening on LPF/enp0s9/08:00:27:70:11:e4/10.3.0.0/24
Oct 25 07:45:22 server-1 sh[2253]: Sending on   LPF/enp0s9/08:00:27:70:11:e4/10.3.0.0/24
Oct 25 07:45:22 server-1 sh[2253]: Listening on LPF/enp0s8/08:00:27:8b:c2:8f/10.0.5.0/24
Oct 25 07:45:22 server-1 sh[2253]: Sending on   LPF/enp0s8/08:00:27:8b:c2:8f/10.0.5.0/24
Oct 25 07:45:22 server-1 dhcpd[2253]: Sending on   LPF/enp0s9/08:00:27:70:11:e4/10.3.0.0/24
Oct 25 07:45:22 server-1 dhcpd[2253]: Listening on LPF/enp0s8/08:00:27:8b:c2:8f/10.0.5.0/24
Oct 25 07:45:22 server-1 dhcpd[2253]: Sending on   LPF/enp0s8/08:00:27:8b:c2:8f/10.0.5.0/24
Oct 25 07:45:22 server-1 dhcpd[2253]: Sending on   Socket/fallback/fallback-net
Oct 25 07:45:22 server-1 sh[2253]: Sending on   Socket/fallback/fallback-net
Oct 25 07:45:22 server-1 dhcpd[2253]: Server starting service.
```

**Restart network on Client-2 and check ping to server-1**

```
[root@localhost network-scripts]# sudo systemctl restart NetworkManager.service
[root@localhost network-scripts]# ip addr
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 100
0
    link/ether 08:00:27:65:5d:ce brd ff:ff:ff:ff:ff:ff
    inet 10.3.0.2/24 brd 10.3.0.255 scope global dynamic noprefixroute enp0s3
       valid_lft 594sec preferred_lft 594sec
    inet6 fe80::a00:27ff:fe65:5dce/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 100
0
    link/ether 08:00:27:54:0c:c4 brd ff:ff:ff:ff:ff:ff
    inet 172.16.5.2/24 brd 172.16.5.255 scope global noprefixroute enp0s8
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe54:cc4/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
[root@localhost network-scripts]# ping 10.3.0.1
PING 10.3.0.1 (10.3.0.1) 56(84) bytes of data.
64 bytes from 10.3.0.1: icmp_seq=1 ttl=64 time=0.440 ms
64 bytes from 10.3.0.1: icmp_seq=2 ttl=64 time=0.478 ms
64 bytes from 10.3.0.1: icmp_seq=3 ttl=64 time=0.560 ms
^C
--- 10.3.0.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 0.440/0.492/0.560/0.056 ms
[root@localhost network-scripts]#
```

**Client-1 hostname:**

```
rvv@client-1:~$ sudo hostnamectl set-hostname client-1
rvv@client-1:~$ sudo hostnamectl
    Static hostname: client-1
          Icon name: computer-vm
            Chassis: vm
         Machine ID: cb601415d35548da81012faf5d4acc7a
            Boot ID: abd1e7696dfa41828a1c3a07e835f1d1
     Virtualization: oracle
   Operating System: Ubuntu 20.04.5 LTS
             Kernel: Linux 5.4.0-131-generic
       Architecture: x86-64
rvv@client-1:~$ _
```

**IP settings for Client-1 in /etc/netplan/00-installer-config.yaml (enp0s8 and enp0s3)**

```
# This is the network config written by 'subiquity'
network:
  ethernets:
    enp0s3:
      dhcp4: yes
      #addresses:
      #- 192.168.3.151/24
      #gateway4: 192.168.3.1
      #nameservers:
      #  addresses:
      #  - 192.168.3.1
      #  search:
      #  - 192.168.3.1
    enp0s8:
      addresses: [172.16.5.1/24]
  version: 2
```

**Apply netplan and get results setup ip and ping to server-1**

```
rvv@usrv1:/etc/netplan$ sudo netplan apply
rvv@usrv1:/etc/netplan$ ip addr
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 100
0
    link/ether 08:00:27:ae:ed:33 brd ff:ff:ff:ff:ff:ff
    inet 10.0.5.2/24 brd 10.0.5.255 scope global dynamic enp0s3
       valid_lft 597sec preferred_lft 597sec
    inet6 fe80::a00:27ff:feae:ed33/64 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 100
0
    link/ether 08:00:27:18:c2:e7 brd ff:ff:ff:ff:ff:ff
    inet 172.16.5.1/24 brd 172.16.5.255 scope global enp0s8
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe18:c2e7/64 scope link
       valid_lft forever preferred_lft forever
rvv@usrv1:/etc/netplan$ ping 10.0.5.1
PING 10.0.5.1 (10.0.5.1) 56(84) bytes of data.
64 bytes from 10.0.5.1: icmp_seq=1 ttl=64 time=0.381 ms
64 bytes from 10.0.5.1: icmp_seq=2 ttl=64 time=0.453 ms
64 bytes from 10.0.5.1: icmp_seq=3 ttl=64 time=0.557 ms
^C
--- 10.0.5.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 0.381/0.463/0.557/0.072 ms
rvv@usrv1:/etc/netplan$
```

**Switch on routing is needed only on transit devices such as Server-1, for switch "on" or "off" routing we are edit /etc/sysctl.conf file and restart network or server-1**

```
  GNU nano 4.8                                              /etc/sysctl.conf
# /etc/sysctl.conf - Configuration file for setting system variables.
# See /etc/sysctl.d/ for additional system variables.
# See sysctl.conf (5) for information.
#

#kernel.domainname = example.com

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

##############################################################3
# Functions previously found in netbase
#

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

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

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

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

**Check ping form Client-1 to Client-2 and forward:**

**For enable access to Internet from Client-1 and Client-2 we are must have routing rule on my Home Router (mask /14 = 11111111.11111100.00000000.00000000) :**

```
Route List                                                              □X
 Routes  Nexthops  Rules  VRF
 +  −  ✔  ✖  ◻  ▽                              Find        all    ⬓
       Dst. Address      △ Gateway                    Distance  Routing Mark  Pref. Source   ▼
 DAS    ▷ 0.0.0.0/0         100.83.255.254 reachable ether1        1                                    ⬓
   ::: For VM Client1 and Client2
 AS     ▷ 10.0.0.0/14       192.168.3.151 reachable bridge         1
 DAC    ▷ 100.83.0.0/16     ether1 reachable                       0                   100.83.152.158
 DAC    ▷ 192.168.3.0/24    bridge reachable                       0                   192.168.3.1
 DAC    ▷ 192.168.11.0/24   bridge_bambarbia reachable             0                   192.168.11.1
```

```
Route <10.0.0.0/14>                                                     □X
 General  Attributes                                                    OK

      Dst. Address: 10.0.0.0/14                                        Cancel

         Gateway: 192.168.3.151          ⬓  reachable bridge   ⬍        Apply

    Check Gateway:                                          ▼          Disable

           Type: unicast                                    ⬓          Comment

 5 items   Distance: 1                                      ▲          Copy

           Scope: 30                                                   Remove

      Target Scope: 10

      Routing Mark:                                         ▼

       Pref. Source:                                        ▼


 enabled                             active            static
```

**On Client-1 host add 2 IP addr (172.17.15.1/24  and 172.17.25.1/24) on LoopBack intf. Check it.**

```
  GNU nano 4.8                    /etc/netplan/00-installer-config.yaml
# This is the network config written by 'subiquity'
network:
  ethernets:
    enp0s3:
      dhcp4: yes
      #addresses:
      #- 192.168.3.151/24
      #gateway4: 192.168.3.1
      #nameservers:
      #  addresses:
      #  - 192.168.3.1
      #  search:
      #  - 192.168.3.1
    enp0s8:
      addresses: [172.16.5.1/24]
    lo:
      addresses: [172.17.15.1/24]
      addresses: [172.17.25.1/24]
  version: 2
```

```
rvv@client-1:~$ sudo netplan try
[sudo] password for rvv:
Do you want to keep these settings?


Press ENTER before the timeout to accept the new configuration


Changes will revert in 119 seconds
Configuration accepted.
```

```
root@client-1:/etc/netplan# ip addr
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
    inet 172.17.15.1/24 brd 172.17.15.255 scope global lo
       valid_lft forever preferred_lft forever
    inet 172.17.25.1/24 brd 172.17.25.255 scope global 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:ae:ed:33 brd ff:ff:ff:ff:ff:ff
    inet 10.0.5.2/24 brd 10.0.5.255 scope global dynamic enp0s3
       valid_lft 513sec preferred_lft 513sec
    inet6 fe80::a00:27ff:feae:ed33/64 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 08:00:27:18:c2:e7 brd ff:ff:ff:ff:ff:ff
    inet 172.16.5.1/24 brd 172.16.5.255 scope global enp0s8
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe18:c2e7/64 scope link
       valid_lft forever preferred_lft forever
root@client-1:/etc/netplan# _
```

**4.** *На віртуальному інтерфейсу lo Client_1 призначити дві IP адреси за таким правилом: 172.17.15.1/24 та 172.17.25.1/24. Налаштувати маршрутизацію таким чином, щоб трафік з Client_2 до 172.17.15.1 проходив через Server_1, а до 172.17.25.1 через Net4. Для перевірки використати traceroute.*

**On host Client-2 add route rule and check by traceroute and ping:**

```
[root@client-2 ~]# route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         10.3.0.1        0.0.0.0         UG    100    0        0 enp0s3
10.3.0.0        0.0.0.0         255.255.255.0   U     100    0        0 enp0s3
172.16.5.0      0.0.0.0         255.255.255.0   U     101    0        0 enp0s8
[root@client-2 ~]# sudo ip route add 172.17.25.0/24 via 172.16.5.2
[root@client-2 ~]# traceroute 172.17.25.1
traceroute to 172.17.25.1 (172.17.25.1), 30 hops max, 60 byte packets
 1  172.17.25.1 (172.17.25.1)  1.678 ms  1.578 ms  1.456 ms
[root@client-2 ~]# ping 172.17.25.1
PING 172.17.25.1 (172.17.25.1) 56(84) bytes of data.
64 bytes from 172.17.25.1: icmp_seq=1 ttl=64 time=0.947 ms
64 bytes from 172.17.25.1: icmp_seq=2 ttl=64 time=0.708 ms
^C
--- 172.17.25.1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 0.708/0.827/0.947/0.122 ms
[root@client-2 ~]# route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         10.3.0.1        0.0.0.0         UG    100    0        0 enp0s3
10.3.0.0        0.0.0.0         255.255.255.0   U     100    0        0 enp0s3
172.16.5.0      0.0.0.0         255.255.255.0   U     101    0        0 enp0s8
172.17.25.0     172.16.5.2      255.255.255.0   UG    0      0        0 enp0s8
```

**Host Client-2 has default gateway is 10.3.0.1 (Server-1), but Server-1 doesn't know about 172.17.15.1. So add route on Server-1:**

```
rvv@server-1:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         192.168.3.1     0.0.0.0         UG    0      0        0 enp0s3
10.0.5.0        0.0.0.0         255.255.255.0   U     0      0        0 enp0s8
10.3.0.0        0.0.0.0         255.255.255.0   U     0      0        0 enp0s9
192.168.3.0     0.0.0.0         255.255.255.0   U     0      0        0 enp0s3
rvv@server-1:~$ sudo ip route add 172.17.15.0/24 via 10.0.5.1
[sudo] password for rvv:
rvv@server-1:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         192.168.3.1     0.0.0.0         UG    0      0        0 enp0s3
10.0.5.0        0.0.0.0         255.255.255.0   U     0      0        0 enp0s8
10.3.0.0        0.0.0.0         255.255.255.0   U     0      0        0 enp0s9
172.17.15.0     10.0.5.1        255.255.255.0   UG    0      0        0 enp0s8
192.168.3.0     0.0.0.0         255.255.255.0   U     0      0        0 enp0s3
rvv@server-1:~$ 
```

**And test our results on Client-2 host:**

```
[root@client-2 ~]# ping 172.17.15.1
PING 172.17.15.1 (172.17.15.1) 56(84) bytes of data.
64 bytes from 172.17.15.1: icmp_seq=1 ttl=63 time=1.06 ms
64 bytes from 172.17.15.1: icmp_seq=2 ttl=63 time=1.08 ms
64 bytes from 172.17.15.1: icmp_seq=3 ttl=63 time=1.03 ms
^C
--- 172.17.15.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 1.031/1.058/1.081/0.042 ms
[root@client-2 ~]# traceroute 172.17.15.1
traceroute to 172.17.15.1 (172.17.15.1), 30 hops max, 60 byte packets
 1  _gateway (10.3.0.1)  1.924 ms  1.857 ms  1.831 ms
 2  172.17.15.1 (172.17.15.1)  1.697 ms  1.651 ms  1.518 ms
[root@client-2 ~]# _
```

**So, and check 172.17.25.1 (all fine)**

```
[root@client-2 ~]# traceroute 172.17.25.1
traceroute to 172.17.25.1 (172.17.25.1), 30 hops max, 60 byte packets
 1  172.17.25.1 (172.17.25.1)  1.307 ms  1.242 ms  1.224 ms
[root@client-2 ~]# _
```

*5. Розрахувати спільну адресу та маску (summarizing) адрес 172.17.D+10.1 та 172.17.D+20.1, при чому префікс має бути максимально можливим. Видалити маршрути, встановлені на попередньому кроці та замінити їх об'єднаним маршрутом, якій має проходити через Server_1*

**Next questions is Del out 2 routes:**

```
rvv@server-1:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         192.168.3.1     0.0.0.0         UG    0      0        0 enp0s3
10.0.5.0        0.0.0.0         255.255.255.0   U     0      0        0 enp0s8
10.3.0.0        0.0.0.0         255.255.255.0   U     0      0        0 enp0s9
172.17.15.0     10.0.5.1        255.255.255.0   UG    0      0        0 enp0s8
192.168.3.0     0.0.0.0         255.255.255.0   U     0      0        0 enp0s3
rvv@server-1:~$ sudo ip route del 172.17.15.0/24 via 10.0.5.1
rvv@server-1:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         192.168.3.1     0.0.0.0         UG    0      0        0 enp0s3
10.0.5.0        0.0.0.0         255.255.255.0   U     0      0        0 enp0s8
10.3.0.0        0.0.0.0         255.255.255.0   U     0      0        0 enp0s9
192.168.3.0     0.0.0.0         255.255.255.0   U     0      0        0 enp0s3
rvv@server-1:~$ 
```

**And Client-2**

```
[root@client-2 ~]# route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         10.3.0.1        0.0.0.0         UG    100    0        0 enp0s3
10.3.0.0        0.0.0.0         255.255.255.0   U     100    0        0 enp0s3
172.16.5.0      0.0.0.0         255.255.255.0   U     101    0        0 enp0s8
172.17.25.0     172.16.5.2      255.255.255.0   UG    0      0        0 enp0s8
[root@client-2 ~]# sudo ip route del 172.17.25.0/24 via 172.16.5.2
[root@client-2 ~]# route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         10.3.0.1        0.0.0.0         UG    100    0        0 enp0s3
10.3.0.0        0.0.0.0         255.255.255.0   U     100    0        0 enp0s3
172.16.5.0      0.0.0.0         255.255.255.0   U     101    0        0 enp0s8
[root@client-2 ~]#
```

**Set SUMMARIZING route on Server-1  (/19)**

**172.17.15.1 = 10101100. 00010001. 000**01111.00000001

**172.17.25.1 = 10101100. 00010001. 000**11001.00000001

```
rvv@server-1:~$ sudo ip route add 172.17.0.0/19 via 10.0.5.1
[sudo] password for rvv:
Sorry, try again.
[sudo] password for rvv:
rvv@server-1:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         192.168.3.1     0.0.0.0         UG    0      0        0 enp0s3
10.0.5.0        0.0.0.0         255.255.255.0   U     0      0        0 enp0s8
10.3.0.0        0.0.0.0         255.255.255.0   U     0      0        0 enp0s9
172.17.0.0      10.0.5.1        255.255.224.0   UG    0      0        0 enp0s8
192.168.3.0     0.0.0.0         255.255.255.0   U     0      0        0 enp0s3
rvv@server-1:~$
```

**and try traceroute from Client-2**

```
[root@client-2 ~]# ping 172.17.15.1
PING 172.17.15.1 (172.17.15.1) 56(84) bytes of data.
64 bytes from 172.17.15.1: icmp_seq=1 ttl=63 time=0.983 ms
64 bytes from 172.17.15.1: icmp_seq=2 ttl=63 time=1.24 ms
64 bytes from 172.17.15.1: icmp_seq=3 ttl=63 time=1.29 ms
64 bytes from 172.17.15.1: icmp_seq=4 ttl=63 time=1.34 ms
^C
--- 172.17.15.1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3004ms
rtt min/avg/max/mdev = 0.983/1.214/1.338/0.139 ms
[root@client-2 ~]# ping 172.17.25.1
PING 172.17.25.1 (172.17.25.1) 56(84) bytes of data.
64 bytes from 172.17.25.1: icmp_seq=1 ttl=63 time=1.13 ms
64 bytes from 172.17.25.1: icmp_seq=2 ttl=63 time=1.06 ms
64 bytes from 172.17.25.1: icmp_seq=3 ttl=63 time=1.45 ms
^C
--- 172.17.25.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 1.056/1.210/1.447/0.174 ms
[root@client-2 ~]# traceroute 172.17.25.1
traceroute to 172.17.25.1 (172.17.25.1), 30 hops max, 60 byte packets
 1  _gateway (10.3.0.1)  1.665 ms  1.668 ms  1.648 ms
 2  172.17.25.1 (172.17.25.1)  1.568 ms  1.472 ms  1.306 ms
[root@client-2 ~]# traceroute 172.17.15.1
traceroute to 172.17.15.1 (172.17.15.1), 30 hops max, 60 byte packets
 1  _gateway (10.3.0.1)  2.189 ms  2.231 ms  2.210 ms
 2  172.17.15.1 (172.17.15.1)  2.110 ms  1.817 ms  1.684 ms
[root@client-2 ~]# _
```

**6. Налаштувати SSH сервіс таким чином, щоб Client_1 та Client_2 могли підключатись до Server_1 та один до одного.**

**Client-2 to Server-1:**

```
[root@client-2 ~]# ssh rvv@10.3.0.1
The authenticity of host '10.3.0.1 (10.3.0.1)' can't be established.
ECDSA key fingerprint is SHA256:LRR3CJtqsHEdW++hgw3Ep0OMr9lbTLm66Rt6HSK8LTI.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added '10.3.0.1' (ECDSA) to the list of known hosts.
rvv@10.3.0.1's password:
Welcome to Ubuntu 20.04.5 LTS (GNU/Linux 5.4.0-131-generic x86_64)

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

  System information as of Tue 25 Oct 2022 01:03:05 PM UTC

  System load:  0.0                Users logged in:          1
  Usage of /:   45.7% of 9.00GB    IPv4 address for enp0s3: 192.168.3.151
  Memory usage: 11%                IPv4 address for enp0s8: 10.0.5.1
  Swap usage:   0%                 IPv4 address for enp0s9: 10.3.0.1
  Processes:    121

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

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

12 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

New release '22.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.


Last login: Tue Oct 25 12:00:11 2022 from 192.168.3.14
rvv@server-1:~$
```

**Client-1 to Server-1**

```
rvv@client-1:~$ systemctl is-active ssh
active
rvv@client-1:~$ ssh rvv@10.0.5.1
The authenticity of host '10.0.5.1 (10.0.5.1)' can't be established.
ECDSA key fingerprint is SHA256:LRR3CJtqsHEdW++hgw3Ep0OMr9lbTLm66Rt6HSK8LTI.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.0.5.1' (ECDSA) to the list of known hosts.
rvv@10.0.5.1's password:
Welcome to Ubuntu 20.04.5 LTS (GNU/Linux 5.4.0-131-generic x86_64)

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

  System information as of Tue 25 Oct 2022 01:05:58 PM UTC

  System load:  0.0                Users logged in:          1
  Usage of /:   45.7% of 9.00GB    IPv4 address for enp0s3: 192.168.3.151
  Memory usage: 12%                IPv4 address for enp0s8: 10.0.5.1
  Swap usage:   0%                 IPv4 address for enp0s9: 10.3.0.1
  Processes:    123

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

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

12 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

New release '22.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.


Last login: Tue Oct 25 13:03:06 2022 from 10.3.0.2
rvv@server-1:~$
```

## Client-2 to Client-1

```
[root@client-2 ~]# ssh rvv@10.0.5.2
The authenticity of host '10.0.5.2 (10.0.5.2)' can't be established.
ECDSA key fingerprint is SHA256:LRR3CJtqsHEdW++hgw3Ep0OMr91bTLm66Rt6HSK8LTI.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added '10.0.5.2' (ECDSA) to the list of known hosts.
rvv@10.0.5.2's password:
Welcome to Ubuntu 20.04.5 LTS (GNU/Linux 5.4.0-131-generic x86_64)

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

  System information as of Tue 25 Oct 2022 01:08:24 PM UTC

  System load:  0.0               Processes:             114
  Usage of /:   45.8% of 9.00GB   Users logged in:       1
  Memory usage: 11%               IPv4 address for enp0s3: 10.0.5.2
  Swap usage:   0%                IPv4 address for enp0s8: 172.16.5.1


12 updates can be applied immediately.
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 Oct 25 09:51:00 2022
rvv@client-1:~$
```

## Client-1 to Client-2

```
rvv@client-1:~$ ssh root@10.3.0.2
root@10.3.0.2's password:
Activate the web console with: systemctl enable --now cockpit.socket

Last login: Mon Oct 24 02:01:50 2022
[root@client-2 ~]#
```

*7. Налаштуйте на Server_1 firewall таким чином:*
*• Дозволено підключатись через SSH з Client_1 та заборонено з Client_2*
*• З Client_2 на 172.17.D+10.1 ping проходив, а на 172.17.D+20.1 не проходив*

**On Server-1 add 2 rules in IPTABLES**

```
rvv@server-1:~$ sudo iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source               destination

Chain FORWARD (policy ACCEPT)
target     prot opt source               destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination
rvv@server-1:~$ sudo iptables -A INPUT -p tcp -s 10.0.5.2/24 --dport ssh -j ACCEPT
rvv@server-1:~$ sudo iptables -A INPUT -p tcp -s 10.3.0.2/24 --dport ssh -j DROP
rvv@server-1:~$ sudo iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source               destination
ACCEPT     tcp  --  10.0.5.0/24          anywhere             tcp dpt:ssh
DROP       tcp  --  10.3.0.0/24          anywhere             tcp dpt:ssh

Chain FORWARD (policy ACCEPT)
target     prot opt source               destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination
rvv@server-1:~$
```

**Try connecting over SSH from Clien-1 (success)**

```
rvv@client-1:~$ ssh rvv@10.0.5.1
rvv@10.0.5.1's password:
Welcome to Ubuntu 20.04.5 LTS (GNU/Linux 5.4.0-131-generic x86_64)

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

  System information as of Tue 25 Oct 2022 08:31:39 PM UTC

  System load:  0.0               Users logged in:          1
  Usage of /:   45.8% of 9.00GB   IPv4 address for enp0s3: 192.168.3.151
  Memory usage: 12%               IPv4 address for enp0s8: 10.0.5.1
  Swap usage:   0%                IPv4 address for enp0s9: 10.3.0.1
  Processes:    120

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

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

12 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

New release '22.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.


Last login: Tue Oct 25 20:18:34 2022 from 192.168.3.14
rvv@server-1:~$ _
```

**Try connecting over SSH from Client-2 (something wrong)))**

```
[root@client-2 ~]# ip addr
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 100
0
    link/ether 08:00:27:65:5d:ce brd ff:ff:ff:ff:ff:ff
    inet 10.3.0.2/24 brd 10.3.0.255 scope global dynamic noprefixroute enp0s3
       valid_lft 483sec preferred_lft 483sec
    inet6 fe80::a00:27ff:fe65:5dce/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 100
0
    link/ether 08:00:27:54:0c:c4 brd ff:ff:ff:ff:ff:ff
    inet 172.16.5.2/24 brd 172.16.5.255 scope global noprefixroute enp0s8
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe54:cc4/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
[root@client-2 ~]# ssh rvv@10.3.0.1
ssh: connect to host 10.3.0.1 port 22: Connection timed out
[root@client-2 ~]#
```

**Delete our rules (and try do it by UFW):**

```
rvv@server-1:~$ sudo iptables -D INPUT 1
rvv@server-1:~$ sudo iptables -D INPUT -p tcp -s 10.3.0.2/24 --dport ssh -j DROP
rvv@server-1:~$ sudo iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source               destination

Chain FORWARD (policy ACCEPT)
target     prot opt source               destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination
```

**Try use UFW:**

```
rvv@server-1:~$ sudo ufw status
Status: inactive
rvv@server-1:~$ sudo ufw enable
Command may disrupt existing ssh connections. Proceed with operation (y|n)? y
Firewall is active and enabled on system startup
rvv@server-1:~$ sudo ufw status
Status: active
```

**After set active status Client-1 and Client-2 doesn't access over SSH co Server-1 by default:**

```
rvv@client-1:~$ ssh rvv@10.0.5.1
ssh: connect to host 10.0.5.1 port 22: Connection timed out
rvv@client-1:~$
```

```
[root@client-2 ~]# ssh rvv@10.3.0.1
ssh: connect to host 10.3.0.1 port 22: Connection timed out
[root@client-2 ~]#
```

**Add 2 rules:**

```
rvv@server-1:~$ sudo ufw deny from 10.3.0.2 to 10.3.0.1 port ssh
Rule added
rvv@server-1:~$ sudo ufw allow from 10.0.5.2 to 10.0.5.1 port ssh
Rule added
rvv@server-1:~$ sudo ufw status numbered
Status: active

     To                     Action      From
     --                     ------      ----
[ 1] 10.3.0.1 22/tcp        DENY IN     10.3.0.2
[ 2] 10.0.5.1 22/tcp        ALLOW IN    10.0.5.2

rvv@server-1:~$
```

**Try now**

```
rvv@client-1:~$ ssh rvv@10.0.5.1
rvv@10.0.5.1's password:
Welcome to Ubuntu 20.04.5 LTS (GNU/Linux 5.4.0-131-generic x86_64)

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

  System information as of Wed 26 Oct 2022 12:28:48 AM UTC

  System load:  0.0            Users logged in:          1
  Usage of /:   45.8% of 9.00GB    IPv4 address for enp0s3: 192.168.3.151
  Memory usage: 12%            IPv4 address for enp0s8: 10.0.5.1
  Swap usage:   0%             IPv4 address for enp0s9: 10.3.0.1
  Processes:    119


12 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

New release '22.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.


Last login: Tue Oct 25 20:39:58 2022 from 10.3.0.2
rvv@server-1:~$
```

**And Client-2**

```
Connection to 10.3.0.1 closed.
[root@client-2 ~]# ssh rvv@10.3.0.1
ssh: connect to host 10.3.0.1 port 22: Connection timed out
[root@client-2 ~]# ssh rvv@10.3.0.1
ssh: connect to host 10.3.0.1 port 22: Connection timed out
[root@client-2 ~]#
```

**Accept and Drop PINGs from Client-2 to lo interface 172.17.15.1 and 172.17.25.1**

```
rvv@server-1:~$ sudo iptables -A FORWARD -s 10.3.0.2 -d 172.17.25.1 -p icmp -j DROP
rvv@server-1:~$ sudo iptables -A FORWARD -s 10.3.0.2 -d 172.17.15.1 -p icmp -j ACCEPT
rvv@server-1:~$ sudo iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source               destination

Chain FORWARD (policy ACCEPT)
target     prot opt source               destination
DROP       icmp --  10.3.0.2             172.17.25.1
ACCEPT     icmp --  10.3.0.2             172.17.15.1

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination
```

**Check it**

```
[root@client-2 ~]# ping 172.17.15.1
PING 172.17.15.1 (172.17.15.1) 56(84) bytes of data.
64 bytes from 172.17.15.1: icmp_seq=1 ttl=63 time=0.843 ms
64 bytes from 172.17.15.1: icmp_seq=2 ttl=63 time=1.34 ms
64 bytes from 172.17.15.1: icmp_seq=3 ttl=63 time=1.21 ms
^C
--- 172.17.15.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2008ms
rtt min/avg/max/mdev = 0.843/1.132/1.343/0.211 ms
[root@client-2 ~]# ping 172.17.25.1
PING 172.17.25.1 (172.17.25.1) 56(84) bytes of data.
^C
--- 172.17.25.1 ping statistics ---
27 packets transmitted, 0 received, 100% packet loss, time 26634ms

[root@client-2 ~]# _
```

**For uses UFW we must edit file /etc/ufw/before.rules:**

```
  GNU nano 4.8                                    /etc/ufw/before.rules

# ok icmp code for FORWARD
-A ufw-before-forward -p icmp --icmp-type destination-unreachable -s 10.3.0.2 -d 172.17.15.1 -j ACCEPT
-A ufw-before-forward -p icmp --icmp-type time-exceeded -s 10.3.0.2 -d 172.17.15.1 -j ACCEPT
-A ufw-before-forward -p icmp --icmp-type parameter-problem -s 10.3.0.2 -d 172.17.15.1 -j ACCEPT
-A ufw-before-forward -p icmp --icmp-type echo-request -s 10.3.0.2 -d 172.17.15.1 -j ACCEPT

-A ufw-before-forward -p icmp --icmp-type destination-unreachable -s 10.3.0.2 -d 172.17.25.1 -j DROP
-A ufw-before-forward -p icmp --icmp-type time-exceeded -s 10.3.0.2 -d 172.17.25.1 -j DROP
-A ufw-before-forward -p icmp --icmp-type parameter-problem -s 10.3.0.2 -d 172.17.25.1 -j DROP
-A ufw-before-forward -p icmp --icmp-type echo-request -s 10.3.0.2 -d 172.17.25.1 -j DROP
```

**and then "sudo ufw reload" use for restart firewall and apply new settings. I check it and its works.**

*8. Якщо в п.3 була налаштована маршрутизація для доступу Client_1 та Client_2 до мережі Інтернет – видалити відповідні записи. На Server_1 налаштувати NAT сервіс таким чином, щоб з Client_1 та Client_2 проходив ping в мережу Інтернет*

| | Dst. Address | Gateway | Distance | Routing Mark | Pref. Source | |
|---|---|---|---|---|---|---|
| DAS | 0.0.0.0/0 | 100.83.255.254 reachable ether1 | 1 | | | |
| ;;; For VM Client1 and Client2 | | | | | | |
| XS | 10.0.0.0/14 | 192.168.3.151 | 1 | | | OFF |
| DAC | 100.83.0.0/16 | ether1 reachable | 0 | | 100.83.152.158 | |
| DAC | 192.168.3.0/24 | bridge reachable | 0 | | 192.168.3.1 | |
| DAC | 192.168.11.0/24 | bridge_bambarbia reachable | 0 | | 192.168.11.1 | |

Route List — Routes | Nexthops | Rules | VRF

```
rvv@server-1:~$ sudo iptables -t nat -A POSTROUTING -p icmp -s 10.0.0.0/14 -j SNAT --to-source 192.168.3.151
rvv@server-1:~$ sudo iptables -t nat -L
Chain PREROUTING (policy ACCEPT)
target     prot opt source               destination

Chain INPUT (policy ACCEPT)
target     prot opt source               destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination

Chain POSTROUTING (policy ACCEPT)
target     prot opt source               destination
SNAT       icmp --  10.0.0.0/14          anywhere             to:192.168.3.151
rvv@server-1:~$
```

**Check it. DNS doesn't work, only ping (icmp):**

```
[root@client-2 ~]# ping i.ua
^C
[root@client-2 ~]# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=116 time=23.7 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=116 time=23.7 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=116 time=23.6 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=116 time=23.7 ms
^C
--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3007ms
rtt min/avg/max/mdev = 23.566/23.653/23.724/0.056 ms
[root@client-2 ~]# _
```