CS751: Network Engineering

Lab task 4: Using Linux Bridge in netns

Subtask 1: Namespace talking to the outside world using the Linux bridge.

- Create two network namespaces

```
root@csedept-HP:/home/anandmk# ip netns add blue
root@csedept-HP:/home/anandmk# ip netns add red
root@csedept-HP:/home/anandmk# ip netns show
blue
red
root@csedept-HP:/home/anandmk#
```

- Create a bridge interface named v-net-0

```
root@csedept-HP:/home/anandmk# ip link add v-net-0 type bridge
root@csedept-HP:/home/anandmk# ip link set dev v-net-0 up
root@csedept-HP:/home/anandmk#
```

- Create two pairs of virtual Ethernet interfaces (veth pairs)

```
root@csedept-HP:/home/anandmk# ip link add veth-blue type veth peer name veth-blue-br
root@csedept-HP:/home/anandmk# ip link add veth-red type veth peer name veth-red-br
root@csedept-HP:/home/anandmk#
```

- Move one end of each veth pair to its respective namespace

```
root@csedept-HP:/home/anandmk# ip link set veth-blue netns blue
root@csedept-HP:/home/anandmk# ip link set veth-red netns red
root@csedept-HP:/home/anandmk#
```

- Attach the veth-blue-br to the bridge v-net-0. Attach the veth-red-br to the bridge v-net-0

```
root@csedept-HP:/home/anandmk# ip link set veth-blue-br master v-net-0
root@csedept-HP:/home/anandmk# ip link set veth-red-br master v-net-0
root@csedept-HP:/home/anandmk#
```

- Assign IP addresses to the interfaces in their respective namespaces.

```
root@csedept-HP:/home/anandmk# ip -n blue addr add 192.168.10.1/24 dev veth-blue
root@csedept-HP:/home/anandmk# ip -n red addr add 192.168.10.2/24 dev veth-red
root@csedept-HP:/home/anandmk#
```

- Bring up the interfaces in their respective namespaces.

```
root@csedept-HP:/home/anandmk# ip -n blue link set veth-blue up
root@csedept-HP:/home/anandmk# ip -n red link set veth-red up
root@csedept-HP:/home/anandmk#
```

- Bring up the bridge

```
root@csedept-HP:/home/anandmk# ip link set veth-blue-br up
root@csedept-HP:/home/anandmk# ip link set veth-red-br up
root@csedept-HP:/home/anandmk#
```

- Ping the other Google DNS (8.8.8.8) at this stage from the blue namespace.

```
root@csedept-HP:/home/anandmk# ip netns exec blue ping 8.8.8.8
ping: connect: Network is unreachable
root@csedept-HP:/home/anandmk#
```

- Set the gateway on the Linux bridge:

```
root@csedept-HP:/home/anandmk# ip addr add 192.168.10.10/24 dev v-net-0
root@csedept-HP:/home/anandmk# ip -n blue route add 8.8.8.0/24 via 192.168.10.10
root@csedept-HP:/home/anandmk# ip netns exec blue route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
8.8.8.0         192.168.10.10   255.255.255.0   UG    0      0        0 veth-blue
192.168.10.0    0.0.0.0         255.255.255.0   U     0      0        0 veth-blue
root@csedept-HP:/home/anandmk#
```

- Ping 8.8.8.8 from blue namespace

```
root@csedept-HP:/home/anandmk# ip netns exec blue ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
^C
--- 8.8.8.8 ping statistics ---
50 packets transmitted, 0 received, 100% packet loss, time 50197ms
```

- Set up the NAT rule in the NAT table

```
root@csedept-HP:/home/anandmk# iptables --table nat -A POSTROUTING -s 192.168.10.0/24 -j MASQUERADE
root@csedept-HP:/home/anandmk# echo 1 > /proc/sys/net/ipv4/ip_forward
root@csedept-HP:/home/anandmk#
```

- ping the google dns server

```
root@csedept-HP:/home/anandmk# ip netns exec blue ping 8.8.8.8 -c4
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=112 time=24.3 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=112 time=24.8 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=112 time=24.4 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=112 time=24.0 ms

--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3001ms
rtt min/avg/max/mdev = 24.028/24.393/24.829/0.286 ms
root@csedept-HP:/home/anandmk#
```
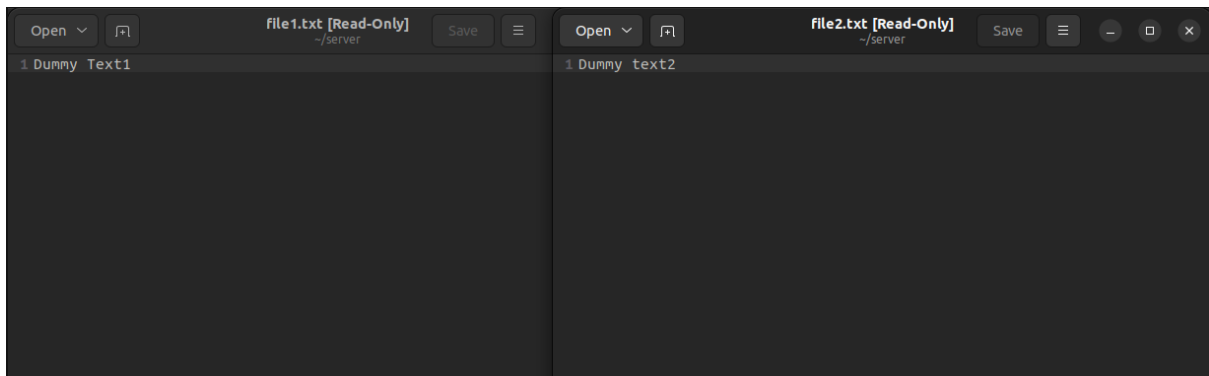
Subtask 2: Setting Up FTP Server in Network Namespace.

- Setup Directories

```
root@csedept-HP:/home/anandmk# mkdir /home/anandmk/server
root@csedept-HP:/home/anandmk# touch /home/anandmk/server/file1.txt
root@csedept-HP:/home/anandmk# touch /home/anandmk/server/file2.txt
root@csedept-HP:/home/anandmk#
```

- Add Dummy Text to Files

- Install FTP Server

```
root@csedept-HP:/home/anandmk# sudo apt install vsftpd
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
vsftpd is already the newest version (3.0.5-0ubuntu1.1).
The following packages were automatically installed and are no longer required:
  libgsoap-2.8.117 liblzf1 libwpe-1.0-1 libwpebackend-fdo-1.0-1 linux-headers-6.5.0-21-generic linux-hwe-6.5-headers-6.5.0-21 linux-image-6.5.0-21-generic
  linux-modules-6.5.0-21-generic linux-modules-extra-6.5.0-21-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 205 not upgraded.
root@csedept-HP:/home/anandmk# sudo systemctl status vsftpd
● vsftpd.service - vsftpd FTP server
     Loaded: loaded (/lib/systemd/system/vsftpd.service; enabled; vendor preset: enabled)
     Active: active (running) since Wed 2025-01-22 13:55:30 IST; 1h 35min ago
   Main PID: 1001 (vsftpd)
      Tasks: 1 (limit: 18752)
     Memory: 1.0M
        CPU: 9ms
     CGroup: /system.slice/vsftpd.service
             └─1001 /usr/sbin/vsftpd /etc/vsftpd.conf

Jan 22 13:55:30 csedept-HP systemd[1]: Starting vsftpd FTP server...
Jan 22 13:55:30 csedept-HP systemd[1]: Started vsftpd FTP server.
root@csedept-HP:/home/anandmk#
```

- Take Backup of vsftpd.service config file

```
sudo: command not round
root@csedept-HP:/home/anandmk# sudo cp /lib/systemd/system/vsftpd.service /lib/systemd/system/vsftpd.service.copy
root@csedept-HP:/home/anandmk# ls /lib/systemd/system/
```

- Add Network Namespace Path to Service File

```
  GNU nano 6.2                                    /lib/systemd/system/vsftpd.service
[Unit]
Description=vsftpd FTP server
After=network.target

[Service]
Type=simple
ExecStart=/usr/sbin/vsftpd /etc/vsftpd.conf
ExecReload=/bin/kill -HUP $MAINPID
ExecStartPre=-/bin/mkdir -p /var/run/vsftpd/empty
NetworkNamespacePath=/var/run/netns/blue

[Install]
WantedBy=multi-user.target
```

```
  GNU nano 6.2                                    /etc/vsftpd.conf
# chroot)
#chroot_local_user=YES
#chroot_list_enable=YES
# (default follows)
#chroot_list_file=/etc/vsftpd.chroot_list
#
# You may activate the "-R" option to the builtin ls. This is disabled by
# default to avoid remote users being able to cause excessive I/O on large
# sites. However, some broken FTP clients such as "ncftp" and "mirror" assume
# the presence of the "-R" option, so there is a strong case for enabling it.
#ls_recurse_enable=YES
#
# Customization
#
# Some of vsftpd's settings don't fit the filesystem layout by
# default.
#
# This option should be the name of a directory which is empty.  Also, the
# directory should not be writable by the ftp user. This directory is used
# as a secure chroot() jail at times vsftpd does not require filesystem
# access.
secure_chroot_dir=/var/run/vsftpd/empty
#
# This string is the name of the PAM service vsftpd will use.
pam_service_name=vsftpd
#
# This option specifies the location of the RSA certificate to use for SSL
# encrypted connections.
rsa_cert_file=/etc/ssl/certs/ssl-cert-snakeoil.pem
rsa_private_key_file=/etc/ssl/private/ssl-cert-snakeoil.key
ssl_enable=NO

#
# Uncomment this to indicate that vsftpd use a utf8 filesystem.
#utf8_filesystem=YES

local_root=/home/anandmk/server
chroot_local_user=YES
allow_writeable_chroot=YES
write_enable=YES
```

- Restart the Service

```
root@csedept-HP:/home/anandmk# systemctl daemon-reload
root@csedept-HP:/home/anandmk# systemctl restart vsftpd
root@csedept-HP:/home/anandmk# systemctl status vsftpd
● vsftpd.service - vsftpd FTP server
     Loaded: loaded (/lib/systemd/system/vsftpd.service; enabled; vendor preset: enabled)
     Active: active (running) since Wed 2025-01-22 15:51:47 IST; 13s ago
    Process: 7914 ExecStartPre=/bin/mkdir -p /var/run/vsftpd/empty (code=exited, status=0/SUCCESS)
   Main PID: 7916 (vsftpd)
      Tasks: 1 (limit: 18752)
     Memory: 868.0K
        CPU: 9ms
     CGroup: /system.slice/vsftpd.service
             └─7916 /usr/sbin/vsftpd /etc/vsftpd.conf

Jan 22 15:51:47 csedept-HP systemd[1]: Starting vsftpd FTP server...
Jan 22 15:51:47 csedept-HP systemd[1]: Started vsftpd FTP server.
root@csedept-HP:/home/anandmk# 
```

- Log in to the Server from the Red Namespace

```
root@csedept-HP:/home/anandmk# ip netns exec red ftp 192.168.10.1
Connected to 192.168.10.1.
220 (vsFTPd 3.0.5)
Name (192.168.10.1:anandmk): anandmk
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> ls
229 Entering Extended Passive Mode (|||53012|)
150 Here comes the directory listing.
-rw-r--r--    1 0         0              13 Jan 22 15:29 file1.txt
-rw-r--r--    1 0         0              12 Jan 22 15:29 file2.txt
226 Directory send OK.
ftp>
```

- Perform various FTP commands within the FTP session

```
ftp> get file1.txt /home/anandmk/server/file1.txt
local: /home/anandmk/server/file1.txt remote: file1.txt
229 Entering Extended Passive Mode (|||9476|)
150 Opening BINARY mode data connection for file1.txt (13 bytes).
100% |************************************************************************************************|    13     201.51 KiB/s    00:00 ETA
226 Transfer complete.
13 bytes received in 00:00 (25.04 KiB/s)
ftp>
```

```
ftp> put /home/anandmk/Desktop/file3.txt file3.txt
local: /home/anandmk/Desktop/file3.txt remote: file3.txt
229 Entering Extended Passive Mode (|||48461|)
150 Ok to send data.
100% |************************************************************************************************|     8      68.53 KiB/s    00:00 ETA
226 Transfer complete.
8 bytes sent in 00:00 (16.48 KiB/s)
ftp> ls
229 Entering Extended Passive Mode (|||57227|)
150 Here comes the directory listing.
-rw-r--r--    1 0         0              13 Jan 22  2025 file1.txt
-rw-r--r--    1 0         0              12 Jan 22 15:29 file2.txt
-rw-------    1 1003      1003            8 Jan 22 16:38 file3.txt
226 Directory send OK.
```

```
ftp> mkdir dummy
257 "/dummy" created
ftp> ls
229 Entering Extended Passive Mode (|||50037|)
150 Here comes the directory listing.
drwx------    2 1003      1003         4096 Jan 22 16:39 dummy
-rw-r--r--    1 0         0              13 Jan 22  2025 file1.txt
-rw-r--r--    1 0         0              12 Jan 22 15:29 file2.txt
-rw-------    1 1003      1003            8 Jan 22 16:38 file3.txt
226 Directory send OK.
```

```
ftp> rmdir dummy
250 Remove directory operation successful.
ftp> ls
229 Entering Extended Passive Mode (|||40424|)
150 Here comes the directory listing.
-rw-r--r--    1 0         0              13 Jan 22  2025 file1.txt
-rw-r--r--    1 0         0              12 Jan 22 15:29 file2.txt
-rw-------    1 1003      1003            8 Jan 22 16:38 file3.txt
226 Directory send OK.
```

```
ftp> delete file3.txt
250 Delete operation successful.
ftp> ls
229 Entering Extended Passive Mode (|||62132|)
150 Here comes the directory listing.
-rw-r--r--    1 0         0              13 Jan 22  2025 file1.txt
-rw-r--r--    1 0         0              12 Jan 22 15:29 file2.txt
226 Directory send OK.
```