Ex No: 9   **Network Virtualization - OpenVswitch and Linux bridge**

15/09/25

AIM:

       To configure a Linux Bridge using both persistent and manual methods to enable network virtualization by connecting a physical interface to a virtual switch.

PROCEDURE:

METHOD-1

1. Check your network interface name using the command : *ip a*

```
tce@tce-VirtualBox:~$ 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:fc:81:ae brd ff:ff:ff:ff:ff:ff
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen
1000
    link/ether 08:00:27:7e:46:ea brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.125/24 brd 192.168.56.255 scope global dynamic noprefixroute enp0s8
       valid_lft 393sec preferred_lft 393sec
    inet6 fe80::740c:9971:f174:75be/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
5: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default ql
en 1000
    link/ether 52:54:00:fe:2c:21 brd ff:ff:ff:ff:ff:ff
    inet 192.168.122.1/24 brd 192.168.122.255 scope global virbr0
       valid_lft forever preferred_lft forever
6: virbr0-nic: <BROADCAST,MULTICAST> mtu 1500 qdisc fq_codel master virbr0 state DOWN group defau
lt qlen 1000
    link/ether 52:54:00:fe:2c:21 brd ff:ff:ff:ff:ff:ff
7: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default
    link/ether 02:42:eb:5c:d6:19 brd ff:ff:ff:ff:ff:ff
    inet 172.17.0.1/16 brd 172.17.255.255 scope global docker0
       valid_lft forever preferred_lft forever
```

2. Open and Edit the Network Interfaces File.

```
tce@tce-VirtualBox:~$ sudo nano /etc/network/interfaces

  GNU nano 2.9.3              /etc/network/interfaces            Modified

# Loopback Interface
auto lo
iface lo inet loopback

# Physical Interface to be used in Bridge
allow-hotplug enp0s3
iface enp0s3 inet manual

# Bridge Interface
auto br-cloud
iface br-cloud inet static
    address 10.0.2.20
    netmask 255.255.255.0
    gateway 10.0.2.2
    bridge_ports enp0s3
```

3. Restart the networking.

```
tce@tce-VirtualBox:~$ systemctl restart networking
```

4. Now, Verify the bridge addition 'br-cloud' using *ip a* command and its ip.

```
tce@tce-VirtualBox:~$ 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 master br-cloud state UP gro
up default qlen 1000
    link/ether 08:00:27:fc:81:ae brd ff:ff:ff:ff:ff:ff
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen
1000
    link/ether 08:00:27:7e:46:ea brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.125/24 brd 192.168.56.255 scope global dynamic noprefixroute enp0s8
       valid_lft 594sec preferred_lft 594sec
    inet6 fe80::740c:9971:f174:75be/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
5: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default ql
en 1000
    link/ether 52:54:00:fe:2c:21 brd ff:ff:ff:ff:ff:ff
    inet 192.168.122.1/24 brd 192.168.122.255 scope global virbr0
       valid_lft forever preferred_lft forever
6: virbr0-nic: <BROADCAST,MULTICAST> mtu 1500 qdisc fq_codel master virbr0 state DOWN group defau
lt qlen 1000
    link/ether 52:54:00:fe:2c:21 brd ff:ff:ff:ff:ff:ff
7: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default
    link/ether 02:42:eb:5c:d6:19 brd ff:ff:ff:ff:ff:ff
    inet 172.17.0.1/16 brd 172.17.255.255 scope global docker0
       valid_lft forever preferred_lft forever
9: br-cloud: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen
 1000
    link/ether 08:00:27:fc:81:ae brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.20/24 brd 10.0.2.255 scope global br-cloud
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fefc:81ae/64 scope link
       valid_lft forever preferred_lft forever
```

5. Check if default gateway is assigned via 'br-cloud'

```
tce@tce-VirtualBox:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         10.0.2.2        0.0.0.0         UG    0      0        0 br-cloud
10.0.2.0        0.0.0.0         255.255.255.0   U     0      0        0 br-cloud
169.254.0.0     0.0.0.0         255.255.0.0     U     1000   0        0 enp0s8
172.17.0.0      0.0.0.0         255.255.0.0     U     0      0        0 docker0
192.168.56.0    0.0.0.0         255.255.255.0   U     100    0        0 enp0s8
192.168.122.0   0.0.0.0         255.255.255.0   U     0      0        0 virbr0
tce@tce-VirtualBox:~$
```

6. Check if physical interface is attached to 'br-cloud'.

```
tce@tce-VirtualBox:~$ brctl show
bridge name     bridge id               STP enabled     interfaces
br-cloud                8000.080027fc81ae       no              enp0s3
docker0         8000.0242eb5cd619       no
virbr0          8000.525400fe2c21       yes             virbr0-nic
tce@tce-VirtualBox:~$
```

METHOD-2

1. Switch to Root User.

```
tce@tce-VirtualBox:~$ sudo -s
```

2. Delete Existing Bridge (If Already Exists).

```
root@tce-VirtualBox:~# ip link set br-cloud down
root@tce-VirtualBox:~# brctl delbr br-cloud
```
```
root@tce-VirtualBox:~# brctl delif br-cloud enp0s3
```

3. Create a New Bridge and Add Interface

```
root@tce-VirtualBox:~# brctl addbr br-cloud
root@tce-VirtualBox:~# brctl addif br-cloud enp0s3
```

4. Remove IP from Physical Interface (So Only Bridge Handles Networking).

```
root@tce-VirtualBox:~# ifconfig enp0s3 0
```

5. Assign IP to the Bridge.
   - Option A — Static IP

```
root@tce-VirtualBox:~# ifconfig br-cloud 10.0.2.20 netmask 255.255.255.0
root@tce-VirtualBox:~# route add default gw 10.0.2.2 dev br-cloud
```

   - Option B — DHCP (Get IP Automatically)
     dhclient br-cloud

6. Activate Bridge Interface.

```
root@tce-VirtualBox:~# ip link set br-cloud up
```

7. Now, Verify the bridge addition 'br-cloud' using *ip a* command and its ip.

```
root@tce-VirtualBox:~# 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 master br-cloud state UP gro
up default qlen 1000
    link/ether 08:00:27:fc:81:ae brd ff:ff:ff:ff:ff:ff
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen
1000
    link/ether 08:00:27:7e:46:ea brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.125/24 brd 192.168.56.255 scope global dynamic noprefixroute enp0s8
       valid_lft 479sec preferred_lft 479sec
    inet6 fe80::740c:9971:f174:75be/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
5: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default ql
en 1000
    link/ether 52:54:00:fe:2c:21 brd ff:ff:ff:ff:ff:ff
    inet 192.168.122.1/24 brd 192.168.122.255 scope global virbr0
       valid_lft forever preferred_lft forever
```

```
6: virbr0-nic: <BROADCAST,MULTICAST> mtu 1500 qdisc fq_codel master virbr0 state DOWN group defau
lt qlen 1000
    link/ether 52:54:00:fe:2c:21 brd ff:ff:ff:ff:ff:ff
7: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default
    link/ether 02:42:eb:5c:d6:19 brd ff:ff:ff:ff:ff:ff
    inet 172.17.0.1/16 brd 172.17.255.255 scope global docker0
       valid_lft forever preferred_lft forever
10: br-cloud: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qle
n 1000
    link/ether 08:00:27:fc:81:ae brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.20/24 brd 10.0.2.255 scope global br-cloud
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fefc:81ae/64 scope link
       valid_lft forever preferred_lft forever
```

8. Check if default gateway is assigned via 'br-cloud'

```
root@tce-VirtualBox:~# route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         10.0.2.2        0.0.0.0         UG    0      0        0 br-cloud
0.0.0.0         10.0.2.2        0.0.0.0         UG    0      0        0 br-cloud
10.0.2.0        0.0.0.0         255.255.255.0   U     0      0        0 br-cloud
169.254.0.0     0.0.0.0         255.255.0.0     U     1000   0        0 enp0s8
172.17.0.0      0.0.0.0         255.255.0.0     U     0      0        0 docker0
192.168.56.0    0.0.0.0         255.255.255.0   U     100    0        0 enp0s8
192.168.122.0   0.0.0.0         255.255.255.0   U     0      0        0 virbr0
```

9. Check if physical interface is attached to 'br-cloud'.

```
root@tce-VirtualBox:~# brctl show
bridge name     bridge id               STP enabled     interfaces
br-cloud              8000.080027fc81ae          no                    enp0s3
docker0         8000.0242eb5cd619       no
virbr0          8000.525400fe2c21       yes             virbr0-nic
```

RESULT:

Thus, A functional bridged network interface (br-cloud) was successfully created and assigned an IP, allowing the system to route traffic through the bridge instead of the physical interface, enabling virtualized networking.