LINUX NETWORKING MODULE 3 AND 4 ASSESSMENT SOLUTIONS

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10.Use Linux to view the MAC address table of a switch (if using a Linux-based network switch). Use the bridge or ip link commands to inspect the MAC table and demonstrate a basic switch's operation.

Viewing the MAC Address Table on a Linux-Based Network Switch

1. Using the bridge Command

The bridge command is used to configure and manage the Linux bridge, which functions as a software-based network switch.

1) Creating a Bridge:

```
sudo ip link add name br0 type bridge
sudo ip link set br0 up
```

```
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$ sudo ip link add name br0 type bridge
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$ sudo ip link set br0 up
```

2)Adding Network Interfaces to the Bridge:

```
sudo ip link set enp0s3 master br0
```

```
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$ sudo ip link set enp0s3 master br0
```

3)View the MAC Address Table:

To view the MAC address table (also known as the forwarding database) for the bridge, use the following command:

```
bridge fdb show
```

```
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$ bridge fdb show
52:55:0a:00:02:03 dev enp0s3 master br0
52:55:0a:00:02:02 dev enp0s3 master br0
52:56:00:00:00:02 dev enp0s3 master br0
08:00:27:ab:97:bd dev enp0s3 vlan 1 master br0 permanent
08:00:27:ab:97:bd dev enp0s3 master br0 permanent
01:00:5e:00:00:01 dev enp0s3 self permanent
33:33:00:00:00:01 dev enp0s3 self permanent
33:33:ff:ab:97:bd dev enp0s3 self permanent
01:00:5e:00:00:fb dev enp0s3 self permanent
33:33:ff:93:79:d9 dev enp0s3 self permanent
33:33:00:00:00:fb dev enp0s3 self permanent
01:00:5e:7f:ff:fa dev enp0s3 self permanent
33:33:00:00:00:0c dev enp0s3 self permanent
33:33:00:00:00:01 dev virbr0 self permanent
01:00:5e:00:00:6a dev virbr0 self permanent
33:33:00:00:00:6a dev virbr0 self permanent
01:00:5e:00:00:01 dev virbr0 self permanent
01:00:5e:00:00:fb dev virbr0 self permanent
01:00:5e:7f:ff:fa dev virbr0 self permanent
52:54:00:a3:be:1a dev virbr0 vlan 1 master virbr0 permanent
52:54:00:a3:be:1a dev virbr0 master virbr0 permanent
33:33:00:00:00:01 dev br0 self permanent
```

2. Using the ip link Command

The ip link command provides detailed information about network interfaces. While it does not directly show the MAC address table, it can be used to inspect the MAC addresses of individual network interfaces.

1)List Network Interfaces:

To view the network interfaces and their MAC addresses:

- ip link show

```
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$ ip link show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel master br0 state UP mode DEFAULT group default qlen
 1000
    link/ether 08:00:27:ab:97:bd brd ff:ff:ff:ff:ff:ff
3: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN mode DEFAULT group default qlen 1000
    link/ether 52:54:00:a3:be:1a brd ff:ff:ff:ff:ff:ff
4: br0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether 6e:fb:dd:62:4f:9a brd ff:ff:ff:ff:ff:ff
```

2)Deleting the bridge Created:

```
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$ ip link show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel master br0 state UP mode DEFAULT group default qlen
 1000
    link/ether 08:00:27:ab:97:bd brd ff:ff:ff:ff:ff:ff
3: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN mode DEFAULT group default qlen 1000
    link/ether 52:54:00:a3:be:1a brd ff:ff:ff:ff:ff:ff
4: br0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether 6e:fb:dd:62:4f:9a brd ff:ff:ff:ff:ff:ff
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$ sudo ip link set br0 down
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$ sudo ip link delete br0
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$ ip link show
```

```
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$ ip link show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:ab:97:bd brd ff:ff:ff:ff:ff:ff
3: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN mode DEFAULT group default qlen 1000
    link/ether 52:54:00:a3:be:1a brd ff:ff:ff:ff:ff:ff
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$ bridge fdb show
01:00:5e:00:00:01 dev enp0s3 self permanent
33:33:00:00:00:01 dev enp0s3 self permanent
33:33:ff:ab:97:bd dev enp0s3 self permanent
01:00:5e:00:00:fb dev enp0s3 self permanent
33:33:ff:93:79:d9 dev enp0s3 self permanent
33:33:00:00:00:fb dev enp0s3 self permanent
33:33:00:00:00:01 dev virbr0 self permanent
01:00:5e:00:00:6a dev virbr0 self permanent
33:33:00:00:00:6a dev virbr0 self permanent
01:00:5e:00:00:01 dev virbr0 self permanent
01:00:5e:00:00:fb dev virbr0 self permanent
01:00:5e:7f:ff:fa dev virbr0 self permanent
52:54:00:a3:be:1a dev virbr0 vlan 1 master virbr0 permanent
52:54:00:a3:be:1a dev virbr0 master virbr0 permanent
(base) sakthi-kumar-s@sakthi-kumar-s-VirtualBox:~$
```

Basic Switch Operation

1. When a frame arrives on a port, the switch adds the source MAC address and the corresponding port to its MAC address table.
2. When a frame needs to be forwarded, the switch looks up the destination MAC address in the table and sends the frame to the appropriate port.
3. If the destination MAC address is not found in the table, the switch floods the frame to all ports (except the one it was received on), performing a broadcast.
4. As it continues to learn, the switch optimizes the forwarding process by maintaining a dynamic MAC address table or CAM table.
5. The Switch stores the MAC address table in its memory. It is a temporary memory so it will be flushed out if the switch is rebooted and also aging time is set for dynamic MAC address entries and so the MAC addresses will be removed over time.