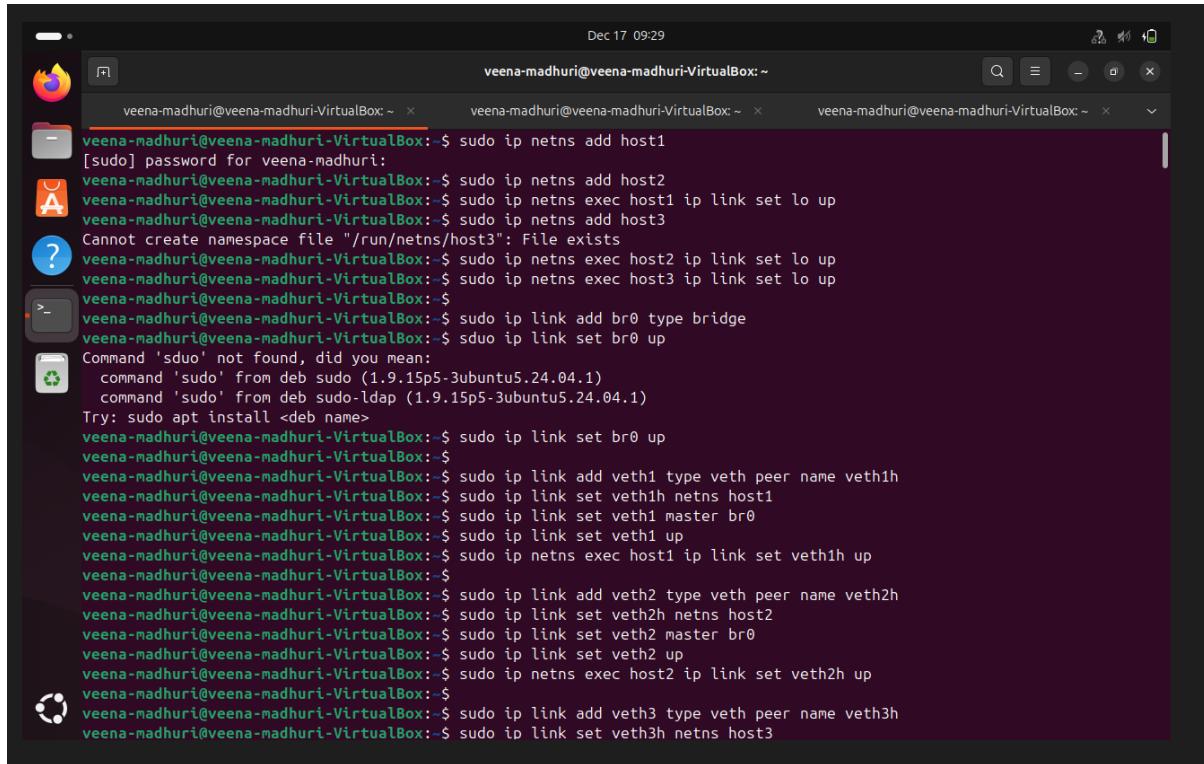


Advanced Linux Network Lab: Bridges, NAT, Policy Routing, VXLAN

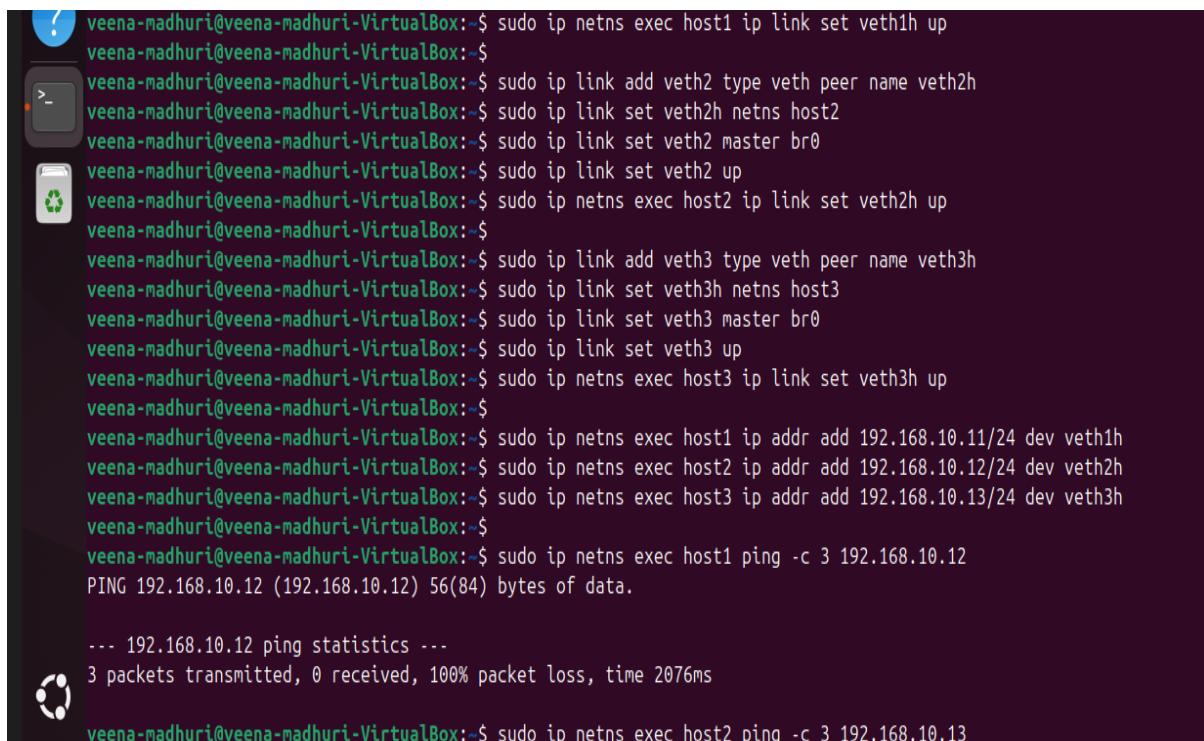
Part 1: L2 switch with bridge and multiple hosts



```
Dec 17 09:29
veena-madhuri@veena-madhuri-VirtualBox: ~
veena-madhuri@veena-madhuri-VirtualBox: ~
veena-madhuri@veena-madhuri-VirtualBox: ~

veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns add host1
[sudo] password for veena-madhuri:
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns add host2
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host1 ip link set lo up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns add host3
Cannot create namespace file "/run/netns/host3": File exists
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host2 ip link set lo up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host3 ip link set lo up
veena-madhuri@veena-madhuri-VirtualBox:~$ 
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link add br0 type bridge
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set br0 up
Command 'sduo' not found, did you mean:
  command 'sudo' from deb sudo (1.9.15p5-3ubuntu5.24.04.1)
  command 'sudo' from deb sudo-ldap (1.9.15p5-3ubuntu5.24.04.1)
Try: sudo apt install <deb name>
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set br0 up
veena-madhuri@veena-madhuri-VirtualBox:~$ 
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link add veth1 type veth peer name veth1h
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth1h netns host1
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth1 master br0
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth1 up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host1 ip link set veth1h up
veena-madhuri@veena-madhuri-VirtualBox:~$ 
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link add veth2 type veth peer name veth2h
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth2h netns host2
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth2 master br0
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth2 up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host2 ip link set veth2h up
veena-madhuri@veena-madhuri-VirtualBox:~$ 
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link add veth3 type veth peer name veth3h
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth3h netns host3
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth3 master br0
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth3 up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host3 ip link set veth3h up
veena-madhuri@veena-madhuri-VirtualBox:~$ 
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host1 ip addr add 192.168.10.11/24 dev veth1h
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host2 ip addr add 192.168.10.12/24 dev veth2h
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host3 ip addr add 192.168.10.13/24 dev veth3h
veena-madhuri@veena-madhuri-VirtualBox:~$ 
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host1 ping -c 3 192.168.10.12
PING 192.168.10.12 (192.168.10.12) 56(84) bytes of data.

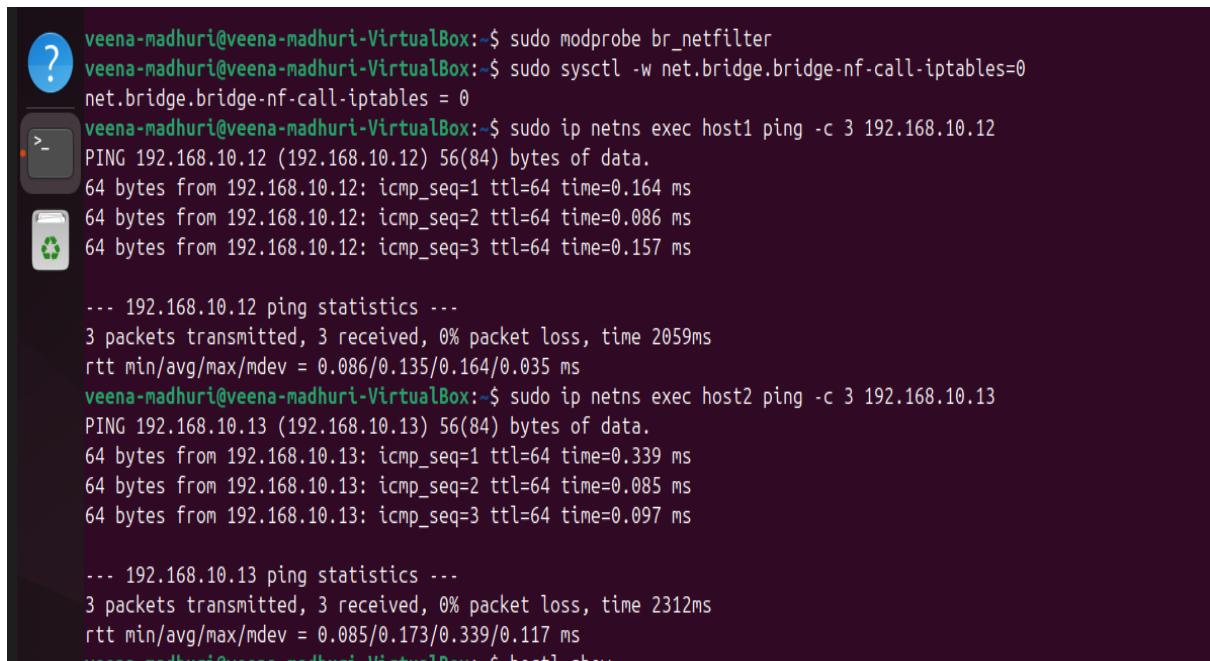
--- 192.168.10.12 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2076ms
```



```
veena-madhuri@veena-madhuri-VirtualBox: ~
veena-madhuri@veena-madhuri-VirtualBox: ~
veena-madhuri@veena-madhuri-VirtualBox: ~

veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host1 ip link set veth1h up
veena-madhuri@veena-madhuri-VirtualBox:~$ 
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link add veth2 type veth peer name veth2h
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth2h netns host2
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth2 master br0
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth2 up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host2 ip link set veth2h up
veena-madhuri@veena-madhuri-VirtualBox:~$ 
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link add veth3 type veth peer name veth3h
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth3h netns host3
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth3 master br0
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth3 up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host3 ip link set veth3h up
veena-madhuri@veena-madhuri-VirtualBox:~$ 
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host1 ip addr add 192.168.10.11/24 dev veth1h
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host2 ip addr add 192.168.10.12/24 dev veth2h
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host3 ip addr add 192.168.10.13/24 dev veth3h
veena-madhuri@veena-madhuri-VirtualBox:~$ 
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host1 ping -c 3 192.168.10.12
PING 192.168.10.12 (192.168.10.12) 56(84) bytes of data.

--- 192.168.10.12 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2076ms
```

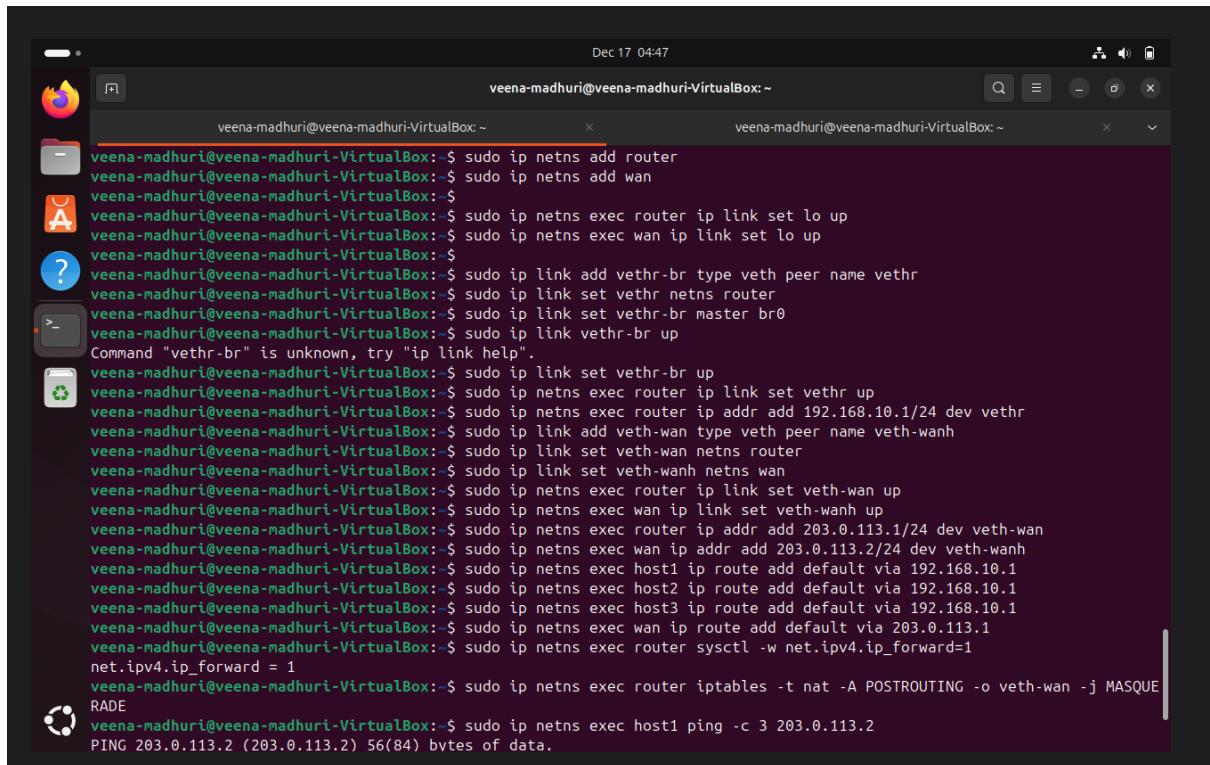


```
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo modprobe br_netfilter
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo sysctl -w net.bridge.bridge-nf-call-iptables=0
net.bridge.bridge-nf-call-iptables = 0
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host1 ping -c 3 192.168.10.12
PING 192.168.10.12 (192.168.10.12) 56(84) bytes of data.
64 bytes from 192.168.10.12: icmp_seq=1 ttl=64 time=0.164 ms
64 bytes from 192.168.10.12: icmp_seq=2 ttl=64 time=0.086 ms
64 bytes from 192.168.10.12: icmp_seq=3 ttl=64 time=0.157 ms

--- 192.168.10.12 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2059ms
rtt min/avg/max/mdev = 0.086/0.135/0.164/0.035 ms
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host2 ping -c 3 192.168.10.13
PING 192.168.10.13 (192.168.10.13) 56(84) bytes of data.
64 bytes from 192.168.10.13: icmp_seq=1 ttl=64 time=0.339 ms
64 bytes from 192.168.10.13: icmp_seq=2 ttl=64 time=0.085 ms
64 bytes from 192.168.10.13: icmp_seq=3 ttl=64 time=0.097 ms

--- 192.168.10.13 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2312ms
rtt min/avg/max/mdev = 0.085/0.173/0.339/0.117 ms
veena-madhuri@veena-madhuri-VirtualBox:~$ host1 show
```

Part 2: Router + NAT firewall namespace



```
Dec 17 04:47
veena-madhuri@veena-madhuri-VirtualBox:~$ veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns add router
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns add wan
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip link set lo up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec wan ip link set lo up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link add vethr-br type veth peer name vethr
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set vethr netns router
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set vethr-br master br0
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link vethr-br up
Command "vethr-br" is unknown, try "ip link help".
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set vethr-br up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip link set vethr up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip addr add 192.168.10.1/24 dev vethr
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link add veth-wan type veth peer name veth-wanh
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth-wan netns router
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth-wanh netns wan
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip link set veth-wan up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec wan ip link set veth-wanh up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip addr add 203.0.113.1/24 dev veth-wan
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec wan ip addr add 203.0.113.2/24 dev veth-wanh
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host1 ip route add default via 192.168.10.1
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host2 ip route add default via 192.168.10.1
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host3 ip route add default via 192.168.10.1
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec wan ip route add default via 203.0.113.1
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router sysctl -w net.ipv4.ip_forward=1
net.ipv4.ip_forward = 1
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router iptables -t nat -A POSTROUTING -o veth-wan -j MASQUE
RADE
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host1 ping -c 3 203.0.113.2
PING 203.0.113.2 (203.0.113.2) 56(84) bytes of data.
```

```
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router iptables -t nat -A POSTROUTING -o veth-wan -j MASQUERADE
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec host1 ping -c 3 203.0.113.2
PING 203.0.113.2 (203.0.113.2) 56(84) bytes of data.
64 bytes from 203.0.113.2: icmp_seq=1 ttl=63 time=0.863 ms
64 bytes from 203.0.113.2: icmp_seq=2 ttl=63 time=0.113 ms
64 bytes from 203.0.113.2: icmp_seq=3 ttl=63 time=0.119 ms

... 203.0.113.2 ping statistics ...
3 packets transmitted, 3 received, 0% packet loss, time 2275ms
rtt min/avg/max/mdev = 0.113/0.365/0.863/0.352 ms
veena-madhuri@veena-madhuri-VirtualBox:~$
```

```
Try 'iptables -h' or 'iptables --help' for more information.
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo iptables -t nat -L -v -n --line-number
Chain PREROUTING (policy ACCEPT 19 packets, 1606 bytes)
num  pkts bytes target     prot opt in     out      source        destination
 1      1   94 DOCKER     0    -- *       *        0.0.0.0/0      0.0.0.0/0          ADDRTYPE match dst-type LO
CAL

Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
num  pkts bytes target     prot opt in     out      source        destination

Chain OUTPUT (policy ACCEPT 133 packets, 10741 bytes)
num  pkts bytes target     prot opt in     out      source        destination
 1      0     0 DOCKER     0    -- *       *        0.0.0.0/0      !127.0.0.0/8          ADDRTYPE match dst-type LO
CAL

Chain POSTROUTING (policy ACCEPT 133 packets, 10741 bytes)
num  pkts bytes target     prot opt in     out      source        destination
 1      0     0 MASQUERADE  0    -- *       !docker0  172.17.0.0/16      0.0.0.0/0

Chain DOCKER (2 references)
num  pkts bytes target     prot opt in     out      source        destination
 1      0     0 RETURN     0    -- docker0 *        0.0.0.0/0      0.0.0.0/0
veena-madhuri@veena-madhuri-VirtualBox:~$
```

Part 3: Policy-based routing with multiple uplinks

The terminal window shows the configuration of policy-based routing in a Linux environment. The user runs several commands to set up routes and rules:

```
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec wan2 ip link set lo up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link add veth-wan2 type veth peer name veth-wan2h
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth-wan2 netns router
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip link set veth-wan2h netns wan2
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip link set veth-wan2 up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec wan2 ip link set veth-wan2h up
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip addr add 198.51.100.1/24 dev veth-wan2
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec wan2 ip addr add 198.51.100.2/24 dev veth-wan2h
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec wan2 ip route add default via 198.51.100.1
veena-madhuri@veena-madhuri-VirtualBox:~$ 100 wan1
100: command not found
veena-madhuri@veena-madhuri-VirtualBox:~$ 200 wan2
200: command not found
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo nano /etc/iproute2/rt_tables
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip route add default via 203.0.113.2 dev veth-wan table 100
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip route add default via 198.51.100.2 dev veth-wan2 table 200
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip rule add from 192.168.10.11/32 table 100
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip rule add from 192.168.10.12/32 table 200
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip rule list
0:      from all lookup local
32764:  from 192.168.10.12 lookup wan2
32765:  from 192.168.10.11 lookup wan1
32766:  from all lookup main
32767:  from all lookup default
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip route show table 100
default via 203.0.113.2 dev veth-wan
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip route show table 200
```

The terminal window shows the configuration of policy-based routing and a live capture session using tcpdump. The user runs several commands to set up routes and rules:

```
veena-madhuri@veena-madhuri-VirtualBox:~$ 200: command not found
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo nano /etc/iproute2/rt_tables
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip route add default via 203.0.113.2 dev veth-wan table 100
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip route add default via 198.51.100.2 dev veth-wan2 table 200
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip rule add from 192.168.10.11/32 table 100
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip rule add from 192.168.10.12/32 table 200
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip rule list
0:      from all lookup local
32764:  from 192.168.10.12 lookup wan2
32765:  from 192.168.10.11 lookup wan1
32766:  from all lookup main
32767:  from all lookup default
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip route show table 100
default via 203.0.113.2 dev veth-wan
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router ip route show table 200
default via 198.51.100.2 dev veth-wan2
veena-madhuri@veena-madhuri-VirtualBox:~$ sudo ip netns exec router tcpdump -i veth-wan -n
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on veth-wan, link-type EN10MB (Ethernet), snapshot length 262144 bytes
^C06:20:33.805096 IP 203.0.113.1 > 203.0.113.2: ICMP echo request, id 4328, seq 1, length 64
06:20:33.805423 IP 203.0.113.2 > 203.0.113.1: ICMP echo reply, id 4328, seq 1, length 64
06:20:34.827715 IP 203.0.113.1 > 203.0.113.2: ICMP echo request, id 4328, seq 2, length 64
06:20:34.827742 IP 203.0.113.2 > 203.0.113.1: ICMP echo reply, id 4328, seq 2, length 64
06:20:35.838940 IP 203.0.113.1 > 203.0.113.2: ICMP echo request, id 4328, seq 3, length 64
06:20:35.838979 IP 203.0.113.2 > 203.0.113.1: ICMP echo reply, id 4328, seq 3, length 64
06:20:39.102499 ARP, Request who-has 203.0.113.2 tell 203.0.113.1, length 28
06:20:39.102536 ARP, Request who-has 203.0.113.1 tell 203.0.113.2, length 28
06:20:39.102549 ARP, Reply 203.0.113.1 is-at b2:52:52:d5:45:35, length 28
06:20:39.102551 ARP, Request who-has 203.0.113.2 tell 203.0.113.1, length 28
06:20:39.102553 ARP, Reply 203.0.113.2 is-at b2:52:52:d5:45:35, length 28
```

```
Dec 17 09:13
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec host1 ping -c 3 203.0.113.2
[sudo] password for veena-madhuri:
PING 203.0.113.2 (203.0.113.2) 56(84) bytes of data.
64 bytes from 203.0.113.2: icmp_seq=1 ttl=63 time=0.759 ms
64 bytes from 203.0.113.2: icmp_seq=2 ttl=63 time=0.141 ms
64 bytes from 203.0.113.2: icmp_seq=3 ttl=63 time=0.247 ms
--- 203.0.113.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2034ms
rtt min/avg/max/mdev = 0.141/0.382/0.759/0.269 ms
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec host2 ping -c 3 198.51.100.2
PING 198.51.100.2 (198.51.100.2) 56(84) bytes of data.
64 bytes from 198.51.100.2: icmp_seq=1 ttl=63 time=0.380 ms
64 bytes from 198.51.100.2: icmp_seq=2 ttl=63 time=0.143 ms
64 bytes from 198.51.100.2: icmp_seq=3 ttl=63 time=0.149 ms
--- 198.51.100.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2108ms
rtt min/avg/max/mdev = 0.143/0.224/0.380/0.110 ms
veena-madhuri@veena-madhuri-VirtualBox:~ $
```

Part 4: Overlay experiment with VXLAN

```
Dec 17 09:08
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns add siteA
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns add siteB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns add hostA
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns add hostB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteA ip link set lo up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip link set lo up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec hostA ip link set lo up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec hostB ip link set lo up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteA ip link add brA type bridge
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip link add brB type bridge
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteA ip link set brA up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip link set brB up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link add veth-hostA type veth peer name veth-siteA
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link set veth-hostA netns hostA
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link set veth-siteA netns siteA
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteA ip link set veth-siteA master brA
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteA ip link set veth-siteA up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec hostA ip link set veth-hostA up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link add veth-hostB type veth peer name veth-siteB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link set veth-hostB netns hostB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link set veth-siteB netns siteB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip link set veth-siteB master brB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip link set veth-siteB up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec hostB ip link set veth-hostB up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link add veth-underA type veth peer name veth-underB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link set veth-underA netns siteA
```

```
Dec 17 09:09
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link set veth-siteB netns siteB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip link set veth-siteB master brB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip link set veth-siteB up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec hostB ip link set veth-hostB up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link add veth-underA type veth peer name veth-underB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link set veth-underA netns siteA
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip link set veth-underB netns siteB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteA ip addr add 10.100.0.1/30 dev veth-underA
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip addr add 10.100.0.2/30 dev veth-underB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteA ip link set veth-underA up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip link set veth-underB up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteA ping -c 3 10.100.0.2
PING 10.100.0.2 (10.100.0.2) 56(84) bytes of data.
64 bytes from 10.100.0.2: icmp_seq=1 ttl=64 time=1.59 ms
64 bytes from 10.100.0.2: icmp_seq=2 ttl=64 time=0.046 ms
64 bytes from 10.100.0.2: icmp_seq=3 ttl=64 time=0.056 ms

--- 10.100.0.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2058ms
rtt min/avg/max/mdev = 0.046/0.565/1.593/0.726 ms
```

```
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteA ip link add vxlanA type vxlan id 42 dev veth-underA remote 10.100.0.2 dstport 4789
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteA ip link set vxlanA up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteA ip link set vxlanA master brA
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip link add vxlanB type vxlan id 42 dev veth-underB remote 10.100.0.1 dstport 4789
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip link set vxlanB up
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec siteB ip link set vxlanB master brB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec hostA ip addr add 10.200.0.1/24 dev veth-hostA
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec hostB ip addr add 10.200.0.2/24 dev veth-hostB
veena-madhuri@veena-madhuri-VirtualBox:~ $ sudo ip netns exec hostA ping -c 4 10.200.0.2
PING 10.200.0.2 (10.200.0.2) 56(84) bytes of data.
64 bytes from 10.200.0.2: icmp_seq=1 ttl=64 time=1.58 ms
64 bytes from 10.200.0.2: icmp_seq=2 ttl=64 time=0.157 ms
64 bytes from 10.200.0.2: icmp_seq=3 ttl=64 time=0.118 ms
64 bytes from 10.200.0.2: icmp_seq=4 ttl=64 time=0.122 ms

--- 10.200.0.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3042ms
rtt min/avg/max/mdev = 0.118/0.494/1.582/0.627 ms
veena-madhuri@veena-madhuri-VirtualBox:~ $
```