



Academic Year: 2023-24
Class /Branch: TE-DS

Semester: V
Subject: WCN

Experiment No. 10

1. **Aim:** To simulate Software Defined Network using Mininet.

```
-ASUS-EXPERTBOOK-B1502CBA-B1502CBA: ~  
-ASUS-EXPERTBOOK-B1502CBA-B1502CBA:~$ lsb_release -a  
No LSB modules are available.  
Distributor ID: Ubuntu  
Description:    Ubuntu 22.04.3 LTS  
Release:        22.04  
Codename:       jammy  
-ASUS-EXPERTBOOK-B1502CBA-B1502CBA:~$ sudo apt-get install mininet  
[sudo] password  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following additional packages will be installed:  
  cgroup-tools iperf libcgroupl libunbound8 net-tools openvswitch-common openvswitch-swit  
ch python3-openvswitch python3-sortedcontainers socat  
Suggested packages:  
  ethtool openvswitch-doc python-sortedcontainers-doc  
The following NEW packages will be installed:  
  cgroup-tools iperf libcgroupl libunbound8 mininet net-tools openvswitch-common openvswi  
tch-switch python3-openvswitch python3-sortedcontainers socat  
0 upgraded, 11 newly installed, 0 to remove and 2 not upgraded.  
Need to get 3,920 kB of archives.  
After this operation, 13.4 MB of additional disk space will be used.  
Do you want to continue? [Y/n] y  
Get:1 http://in.archive.ubuntu.com/ubuntu jammy/universe amd64 libcgroupl amd64 2.0-2 [49
```



- To know the version of Mininet

```
-ASUS-EXPERTBOOK-B1502...  
-ASUS-EXPERTBOOK-B1502CBA-B1502CBA:~$ mn --version  
2.3.0  
-ASUS-EXPERTBOOK-B1502CBA-B1502CBA:~$
```

- Next, verify the installation by issuing the following command:

```
-ASUS-EXPERTBOOK-...  
-ASUS-EXPERTBOOK-B1502CBA-B1502CBA:~$ sudo mn  
*** No default OpenFlow controller found for default switch!  
*** Falling back to OVS Bridge  
*** Creating network  
*** Adding controller  
*** Adding hosts:  
h1 h2  
*** Adding switches:  
s1  
*** Adding links:  
(h1, s1) (h2, s1)  
*** Configuring hosts  
h1 h2  
*** Starting controller  
  
*** Starting 1 switches  
s1 ...  
*** Starting CLI:  
mininet>
```

- The command to display the nodes present in the network is:

```
mininet> nodes  
available nodes are:  
h1 h2 s1  
mininet>
```



- The command to display and list the links present in the network is:

```
mininet> net
h1 h1-eth0:s1-eth1
h2 h2-eth0:s1-eth2
s1 lo: s1-eth1:h1-eth0 s1-eth2:h2-eth0
mininet>
```

- The command to display the IP addresses and the process IDs of the nodes is:

```
mininet> dump
<Host h1: h1-eth0:10.0.0.1 pid=5707>
<Host h2: h2-eth0:10.0.0.2 pid=5709>
<OVSBridge s1: lo:127.0.0.1,s1-eth1:None,s1-eth2:None pid=5714>
mininet>
```

- The command to display the links of the network is:

```
mininet> links
h1-eth0<->s1-eth1 (OK OK)
h2-eth0<->s1-eth2 (OK OK)
mininet>
```

- The command to display the ports used in the network is:

```
mininet> ports
s1 lo:0 s1-eth1:1 s1-eth2:2
mininet>
```

- The command to display the interfaces in the network is:



```
mininet> intfs
h1: h1-eth0
h2: h2-eth0
s1: lo,s1-eth1,s1-eth2
mininet>
```

- The command to test the connectivity among hosts is:

```
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2
h2 -> h1
*** Results: 0% dropped (2/2 received)
mininet>
```

This command will make each host in the network ping every other host in the network. In the network that we have, *h1* will ping *h2*, and *h2* will ping *h1*.

- The command to test the connectivity among hosts by giving all details including RTT (round trip time) etc., is:

```
-ASUS-EXPERTBOOK-B15...
mininet> pingallfull
*** Ping: testing ping reachability
h1 -> h2
h2 -> h1
*** Results:
  h1->h2: 1/1, rtt min/avg/max/mdev 0.507/0.507/0.507/0.000 ms
  h2->h1: 1/1, rtt min/avg/max/mdev 0.043/0.043/0.043/0.000 ms
mininet>
```

- The command to ping a specific host to a targeted host is: (undergoes to execute infinite pings, to stop click CTRL + C.



```
mininet> h1 ping h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=0.468 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.109 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.112 ms
^C
--- 10.0.0.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2056ms
rtt min/avg/max/mdev = 0.109/0.229/0.468/0.168 ms
mininet>
```

- The command to ping a specific host to a targeted host with specific number of pings is:

```
mininet> h1 ping h2 -c 5
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=0.529 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.121 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.050 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.126 ms
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=0.106 ms

--- 10.0.0.2 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4103ms
rtt min/avg/max/mdev = 0.050/0.186/0.529/0.173 ms
mininet>
```

- The command to display the address information of the nodes is:



```
-ASUS-EXPERTBOOK-B1502CBA-B1502CBA: ~
mininet> h1 ifconfig
h1-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 10.0.0.1 netmask 255.0.0.0 broadcast 10.255.255.255
inet6 fe80::a4dc:95ff:feaa:33b4 prefixlen 64 scopeid 0x20<link>
ether a6:dc:95:aa:33:b4 txqueuelen 1000 (Ethernet)
RX packets 102 bytes 10662 (10.6 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 57 bytes 4702 (4.7 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
inet 127.0.0.1 netmask 255.0.0.0
inet6 ::1 prefixlen 128 scopeid 0x10<host>
loop txqueuelen 1000 (Local Loopback)
RX packets 0 bytes 0 (0.0 B)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 0 bytes 0 (0.0 B)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

mininet> h2 ifconfig
h2-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 10.0.0.2 netmask 255.0.0.0 broadcast 10.255.255.255
inet6 fe80::7892:36ff:fe90:66ff prefixlen 64 scopeid 0x20<link>
ether 7a:92:36:90:66:ff txqueuelen 1000 (Ethernet)
RX packets 102 bytes 10662 (10.6 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 57 bytes 4702 (4.7 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
inet 127.0.0.1 netmask 255.0.0.0
inet6 ::1 prefixlen 128 scopeid 0x10<host>
loop txqueuelen 1000 (Local Loopback)
RX packets 0 bytes 0 (0.0 B)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 0 bytes 0 (0.0 B)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

mininet> 
```

- The command to down a link is:

```
mininet> link s1 h1 down
mininet> 
```

Ping now fails to connect:

```
mininet> link s1 h1 down
mininet> pingall
*** Ping: testing ping reachability
h1 -> X
h2 -> X
*** Results: 100% dropped (0/2 received)
mininet> 
```

- The command to activate a link is:



```
mininet> link s1 h1 up
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2
h2 -> h1
*** Results: 0% dropped (2/2 received)
mininet>
```

- The command Help:

```
i-ASUS-EXPERTBOOK-B1502CBA-B1502CBA: ~
mininet> help

Documented commands (type help <topic>):
=====
EOF      gterm  iperfudp  nodes      pingpair    py      switch  xterm
dpctl    help   link      noecho     pingpairfull  quit    time
dump     intfs  links     pingall    ports       sh      wait
exit     iperf  net       pingallfull px          source  x

You may also send a command to a node using:
  <node> command [args]
For example:
  mininet> h1 ifconfig

The interpreter automatically substitutes IP addresses
for node names when a node is the first arg, so commands
like
  mininet> h2 ping h3
should work.

Some character-oriented interactive commands require
noecho:
  mininet> noecho h2 vi foo.py
However, starting up an xterm/qterm is generally better:
```

- The command Exit:



```
mininet> exit
*** Stopping 0 controllers

*** Stopping 2 links
..
*** Stopping 1 switches
s1
*** Stopping 2 hosts
h1 h2
*** Done
completed in 3805.376 seconds
-ASUS-EXPERTBOOK-B1502CBA-B1502CBA:~$
```