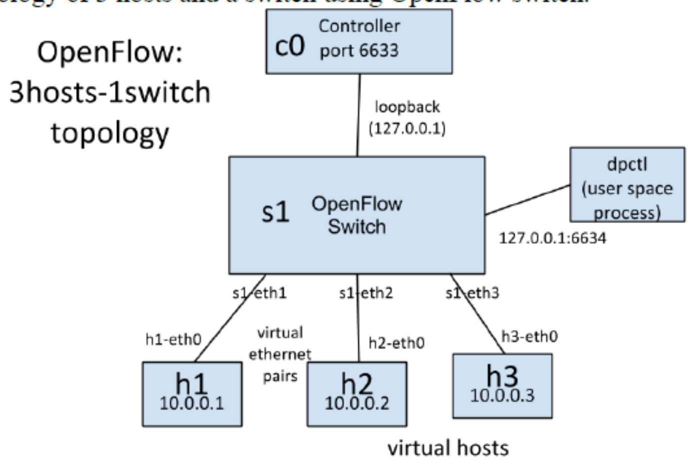
PRACTICAL-3

AIM:

Create a Network Topology of 3 hosts and a switch using OpenFlow switch.



1. Find out maximum throughput (in mbps) for the OpenFlow network created using the following command:
   sudo mn --topo single,3 --mac --controller remote --switch ovsk –link tc,bw=30,delay=25ms
2. What is the average RTT (in ms) for host (h1) when sending ping requests to host (h2)?
3. Find out command ensures an average RTT of 60 ms between the host (h1) and host (h2) for the given network topology.

THEORY:

OPENFLOW:

- OpenFlow is a communications protocol that gives access to the forwarding plane of a network switch or router over the network.

OVS CONTROLLER:

- A simple OpenFlow controller that manages any number of switches over the OpenFlow protocol

RTT:

- Round-trip delay or round-trip time is the amount of time it takes for a signal to be sent plus the amount of time it takes for acknowledgement of that signal having been received

OPENFLOW SWITCH:

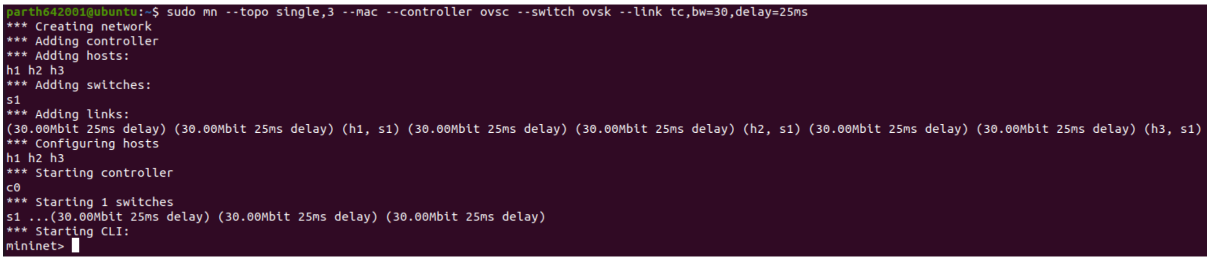
- An OpenFlow switch is a network switch based on the OpenFlow protocol that employs software-defined network (SDN) techniques to forward packets in a network

DPTCL:

- The dpctl program is a command line tool for monitoring and administering OpenFlow datapaths

TOPOLOGY IMPLEMENTATION:

- Open terminal, and write the command mentioned in the question.
- If no mistake occurs, then following will be displayed

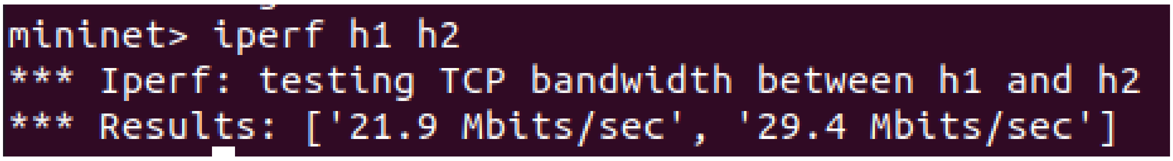


```
parth642001@ubuntu:~$ sudo mn --topo single,3 --mac --controller ovsc --switch ovsk --link tc,bw=30,delay=25ms
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3
*** Adding switches:
s1
*** Adding links:
(30.00Mbit 25ms delay) (30.00Mbit 25ms delay) (h1, s1) (30.00Mbit 25ms delay) (30.00Mbit 25ms delay) (h2, s1) (30.00Mbit 25ms delay) (30.00Mbit 25ms delay) (h3, s1)
*** Configuring hosts
h1 h2 h3
*** Starting controller
c0
*** Starting 1 switches
s1 ...(30.00Mbit 25ms delay) (30.00Mbit 25ms delay) (30.00Mbit 25ms delay)
*** Starting CLI:
mininet>
```

- The only change is instead of remote controller, we are taking ovs controller.
- To check the throughput, we will use the following command

Command: iperf <host1> <host2>

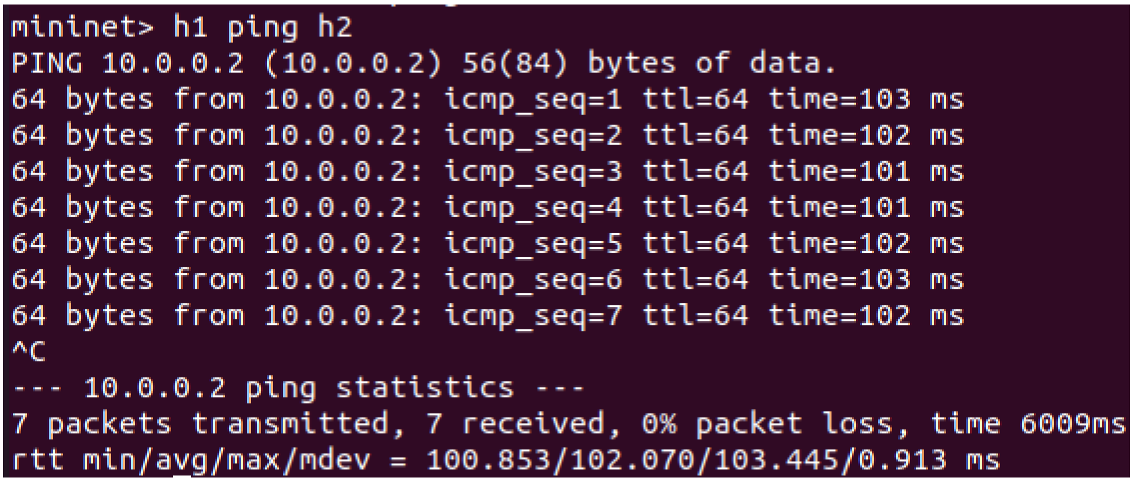
Result:



```
mininet> iperf h1 h2
*** Iperf: testing TCP bandwidth between h1 and h2
*** Results: ['21.9 Mbits/sec', '29.4 Mbits/sec']
```

- To find RTT, we will use ping command**.**

Command: <host1> ping <host2>



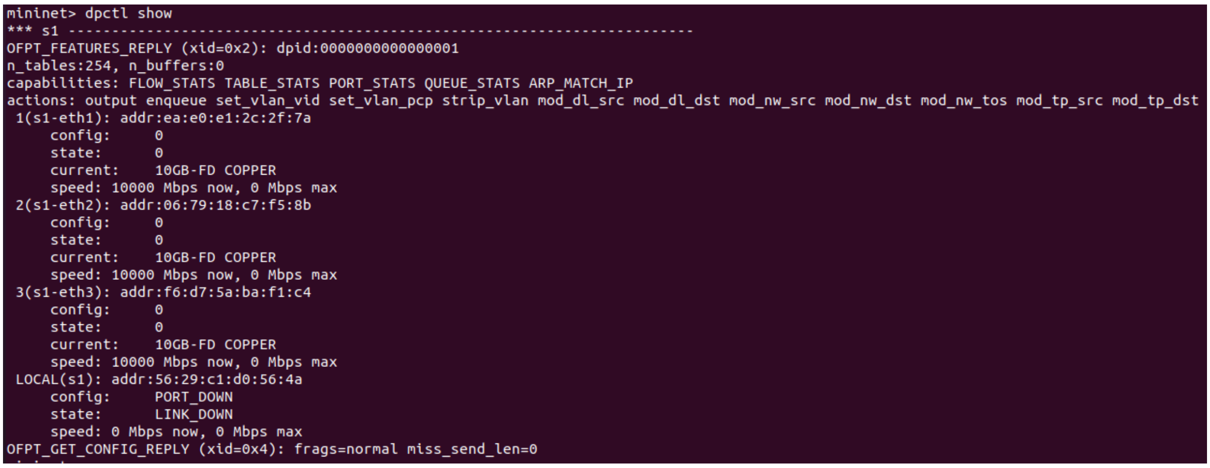
```
mininet> h1 ping h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=103 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=102 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=101 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=101 ms
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=102 ms
64 bytes from 10.0.0.2: icmp_seq=6 ttl=64 time=103 ms
64 bytes from 10.0.0.2: icmp_seq=7 ttl=64 time=102 ms
^C
--- 10.0.0.2 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6009ms
rtt min/avg/max/mdev = 100.853/102.070/103.445/0.913 ms
```

- AVERAGE RTT : 102.070 ms

- Now, we will see the usage of dpctl commands.

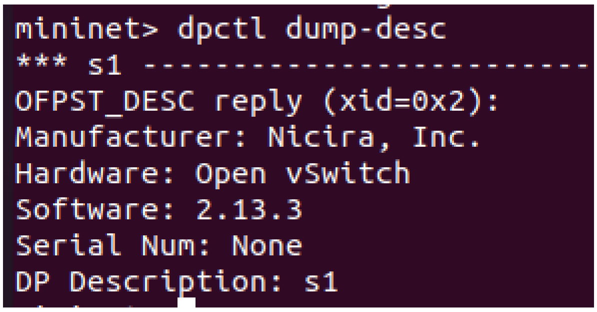
Command: dpctl show

- Prints to the console information on datapath switch including information on its flow tables and ports.



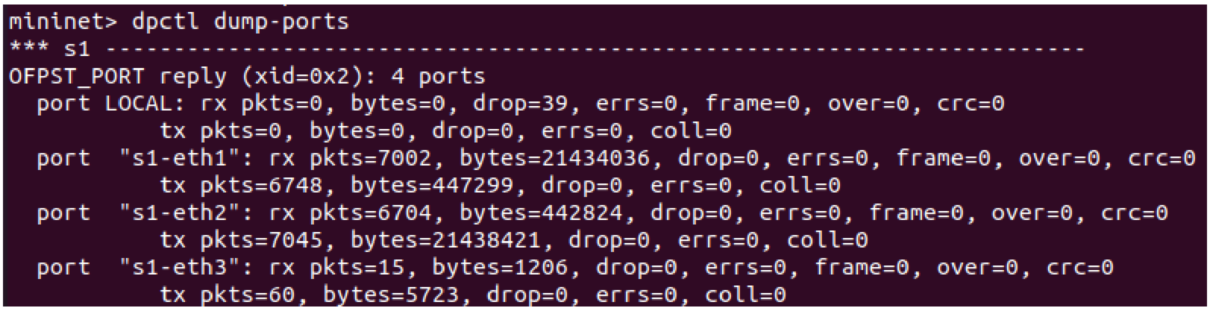
```
mininet> dpctl show
*** s1 ------------------------------------------------------------------------
OFPT_FEATURES_REPLY (xid=0x2): dpid:0000000000000001
n_tables:254, n_buffers:0
capabilities: FLOW_STATS TABLE_STATS PORT_STATS QUEUE_STATS ARP_MATCH_IP
actions: output enqueue set_vlan_vid set_vlan_pcp strip_vlan mod_dl_src mod_dl_dst mod_nw_src mod_nw_dst mod_nw_tos mod_tp_src mod_tp_dst
 1(s1-eth1): addr:ea:e0:e1:2c:2f:7a
     config:     0
     state:      0
     current:    10GB-FD COPPER
     speed: 10000 Mbps now, 0 Mbps max
 2(s1-eth2): addr:06:79:18:c7:f5:8b
     config:     0
     state:      0
     current:    10GB-FD COPPER
     speed: 10000 Mbps now, 0 Mbps max
 3(s1-eth3): addr:f6:d7:5a:ba:f1:c4
     config:     0
     state:      0
     current:    10GB-FD COPPER
     speed: 10000 Mbps now, 0 Mbps max
 LOCAL(s1): addr:56:29:c1:d0:56:4a
     config:     PORT_DOWN
     state:      LINK_DOWN
     speed: 0 Mbps now, 0 Mbps max
OFPT_GET_CONFIG_REPLY (xid=0x4): frags=normal miss_send_len=0
```

Command: dpctl dump-desc



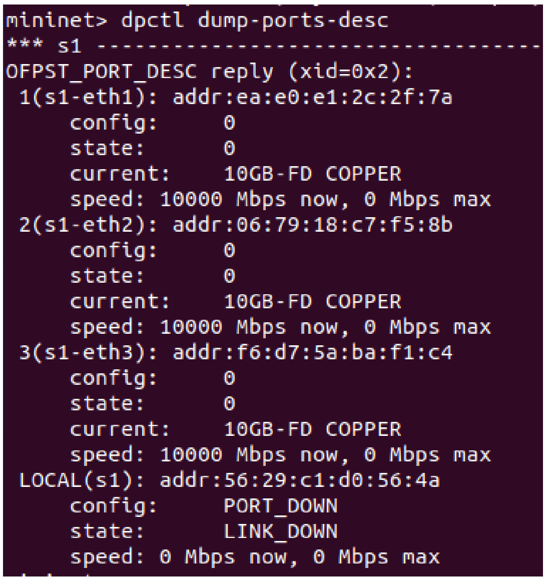
```
mininet> dpctl dump-desc
*** s1 -------------------------
OFPST_DESC reply (xid=0x2):
Manufacturer: Nicira, Inc.
Hardware: Open vSwitch
Software: 2.13.3
Serial Num: None
DP Description: s1
```

Command: dpctl dump-ports



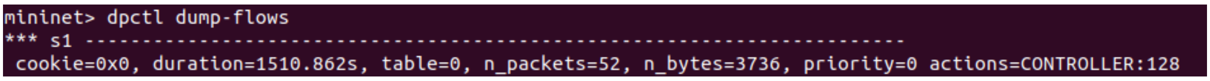
```
mininet> dpctl dump-ports
*** s1 ------------------------------------------------------------------------
OFPST_PORT reply (xid=0x2): 4 ports
  port LOCAL: rx pkts=0, bytes=0, drop=39, errs=0, frame=0, over=0, crc=0
           tx pkts=0, bytes=0, drop=0, errs=0, coll=0
  port  "s1-eth1": rx pkts=7002, bytes=21434036, drop=0, errs=0, frame=0, over=0, crc=0
           tx pkts=6748, bytes=447299, drop=0, errs=0, coll=0
  port  "s1-eth2": rx pkts=6704, bytes=442824, drop=0, errs=0, frame=0, over=0, crc=0
           tx pkts=7045, bytes=21438421, drop=0, errs=0, coll=0
  port  "s1-eth3": rx pkts=15, bytes=1206, drop=0, errs=0, frame=0, over=0, crc=0
           tx pkts=60, bytes=5723, drop=0, errs=0, coll=0
```

Command: dpctl dump-ports-desc



```
mininet> dpctl dump-ports-desc
*** s1 ----------------------------------
OFPST_PORT_DESC reply (xid=0x2):
 1(s1-eth1): addr:ea:e0:e1:2c:2f:7a
     config:     0
     state:      0
     current:    10GB-FD COPPER
     speed: 10000 Mbps now, 0 Mbps max
 2(s1-eth2): addr:06:79:18:c7:f5:8b
     config:     0
     state:      0
     current:    10GB-FD COPPER
     speed: 10000 Mbps now, 0 Mbps max
 3(s1-eth3): addr:f6:d7:5a:ba:f1:c4
     config:     0
     state:      0
     current:    10GB-FD COPPER
     speed: 10000 Mbps now, 0 Mbps max
 LOCAL(s1): addr:56:29:c1:d0:56:4a
     config:     PORT_DOWN
     state:      LINK_DOWN
     speed: 0 Mbps now, 0 Mbps max
```

Command: dpctl dump-flows



```
mininet> dpctl dump-flows
*** s1 ------------------------------------------------------------------
 cookie=0x0, duration=1510.862s, table=0, n_packets=52, n_bytes=3736, priority=0 actions=CONTROLLER:128
```

CONCLUSION:

By performing the above practical, I learnt the basics about openflow, how to create topology in terminal in mininet and basics of dpctl and it’s commands.