

## Lab 1 Solutions

2.

```
mininet> dump
<Host h1: h1-eth0:10.0.0.1 pid=7823>
<Host h2: h2-eth0:10.0.0.2 pid=7827>
<Host h3: h3-eth0:10.0.0.3 pid=7829>
<Host h4: h4-eth0:10.0.0.4 pid=7831>
<OVSSwitch s1: lo:127.0.0.1,s1-eth1:None,s1-eth2:None,s1-eth3:None pid=7836>
<OVSSwitch s2: lo:127.0.0.1,s2-eth1:None,s2-eth2:None,s2-eth3:None pid=7841>
<Controller c0: 127.0.0.1:6633 pid=7816>
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3 h4
h2 -> h1 h3 h4
h3 -> h1 h2 h4
h4 -> h1 h2 h3
*** Results: 0% dropped (12/12 received)
```

In the screenshot, the command *dump*, dumps information about all nodes, while *pingall* displays the connectivity between all hosts and tells us which hosts are connected to each other.

3. 

```
mininet> iperf
*** Iperf: testing TCP bandwidth between h1 and h4
*** Results: ['11.2 Gbits/sec', '11.2 Gbits/sec']
```

The result of running command *iperf*, shows that the bandwidth between h1 and h4 is 11.2 Gbits/sec.

4a.

19	7.358200000	10.0.0.1	10.0.0.3	OF 1.0	184 of_packet_in
20	7.358902000	127.0.0.1	127.0.0.1	OF 1.0	92 of_packet_out
26	7.359393000	10.0.0.1	10.0.0.3	OF 1.0	184 of_packet_in
27	7.359788000	127.0.0.1	127.0.0.1	OF 1.0	92 of_packet_out
33	7.360182000	10.0.0.3	10.0.0.1	OF 1.0	184 of_packet_in
34	7.360664000	127.0.0.1	127.0.0.1	OF 1.0	148 of_flow_add
37	7.361099000	10.0.0.3	10.0.0.1	OF 1.0	184 of_packet_in
38	7.361392000	127.0.0.1	127.0.0.1	OF 1.0	148 of_flow_add
43	8.359613000	10.0.0.1	10.0.0.3	OF 1.0	184 of_packet_in
44	8.360450000	127.0.0.1	127.0.0.1	OF 1.0	148 of_flow_add
48	8.361482000	10.0.0.1	10.0.0.3	OF 1.0	184 of_packet_in
49	8.362125000	127.0.0.1	127.0.0.1	OF 1.0	148 of_flow_add
83	12.367526000	3e:16:81:fb:fe:57	d6:3c:89:3a:e7:1c	OF 1.0	128 of_packet_in
84	12.367858000	127.0.0.1	127.0.0.1	OF 1.0	148 of_flow_add
88	12.368705000	3e:16:81:fb:fe:57	d6:3c:89:3a:e7:1c	OF 1.0	128 of_packet_in
89	12.369008000	127.0.0.1	127.0.0.1	OF 1.0	148 of_flow_add
93	12.369460000	d6:3c:89:3a:e7:1c	3e:16:81:fb:fe:57	OF 1.0	128 of_packet_in
94	12.369719000	127.0.0.1	127.0.0.1	OF 1.0	148 of_flow_add
97	12.370258000	d6:3c:89:3a:e7:1c	3e:16:81:fb:fe:57	OF 1.0	128 of_packet_in

From running the command *hX ping c 5 hY* where x = 1 and y = 3, results in 10 “*of\_packet\_in*” showing up.

4b.

> Frame 27: 92 bytes on wire (736 bits), 92 bytes captured (736 bits) on interface 0  
 > Linux cooked capture  
 > Internet Protocol Version 4, Src: 127.0.0.1 (127.0.0.1), Dst: 127.0.0.1 (127.0.0.1)  
 > Transmission Control Protocol, Src Port: 6633 (6633), Dst Port: 33459 (33459), Seq: 17, Ack: 133, Len: 24

▼ OpenFlow

```

version: 1
type: OFPT_PACKET_OUT (13)
length: 24
xid: 0
buffer_id: 349
in_port: 3
actions len: 8
  ▼ of_action list
    ▼ of_action_output
      type: OFPAT_OUTPUT (0)
      len: 8
      port: 65531
      max_len: 0
  
```

Filter:  Expression... Clear Apply Save

No.	Time	Source	Destination	Protocol	Length	Info
73	49.206437000	127.0.0.1	127.0.0.1	OF 1.0	92	of_packet_out
79	49.206624000	82:e8:e8:03:38:df	Broadcast	OF 1.0	128	of_packet_in
80	49.206859000	127.0.0.1	127.0.0.1	OF 1.0	92	of_packet_out
86	49.207005000	de:23:df:44:78:76	82:e8:e8:03:38:df	OF 1.0	128	of_packet_in
87	49.207237000	127.0.0.1	127.0.0.1	OF 1.0	148	of_flow_add
90	49.207553000	de:23:df:44:78:76	82:e8:e8:03:38:df	OF 1.0	128	of_packet_in
91	49.207797000	127.0.0.1	127.0.0.1	OF 1.0	148	of_flow_add
94	49.208084000	10.0.0.1	10.0.0.3	OF 1.0	184	of_packet_in
95	49.208441000	127.0.0.1	127.0.0.1	OF 1.0	148	of_flow_add
98	49.208673000	10.0.0.1	10.0.0.3	OF 1.0	184	of_packet_in
99	49.208885000	127.0.0.1	127.0.0.1	OF 1.0	148	of_flow_add
102	49.209087000	10.0.0.3	10.0.0.1	OF 1.0	184	of_packet_in
103	49.209265000	127.0.0.1	127.0.0.1	OF 1.0	148	of_flow_add
106	49.209463000	10.0.0.3	10.0.0.1	OF 1.0	184	of packet in

The source and destination of the IP addresses is 127.0.0.1. While the of\_packet\_in was 10.0.0.1 and 10.0.0.3

4c.

Filter: icmp && not of		Expression... Clear Apply Save				
No.	Time	Source	Destination	Protocol	Length	Info
137	3.435107000	10.0.0.3	10.0.0.4	ICMP	100	Echo (ping) request id=0x0b8c, seq=1/256, ttl=64
140	3.435951000	10.0.0.3	10.0.0.4	ICMP	100	Echo (ping) request id=0x0b8c, seq=1/256, ttl=64 (reply in 141)
141	3.436000000	10.0.0.4	10.0.0.3	ICMP	100	Echo (ping) reply id=0x0b8c, seq=1/256, ttl=64 (request in 140)
144	3.437084000	10.0.0.4	10.0.0.3	ICMP	100	Echo (ping) reply id=0x0b8c, seq=1/256, ttl=64
145	3.441633000	10.0.0.4	10.0.0.1	ICMP	100	Echo (ping) request id=0x0b8d, seq=1/256, ttl=64
148	3.443063000	10.0.0.4	10.0.0.1	ICMP	100	Echo (ping) request id=0x0b8d, seq=1/256, ttl=64
149	3.443067000	10.0.0.4	10.0.0.1	ICMP	100	Echo (ping) request id=0x0b8d, seq=1/256, ttl=64
152	3.444492000	10.0.0.4	10.0.0.1	ICMP	100	Echo (ping) request id=0x0b8d, seq=1/256, ttl=64 (reply in 153)
153	3.444508000	10.0.0.1	10.0.0.4	ICMP	100	Echo (ping) reply id=0x0b8d, seq=1/256, ttl=64 (request in 152)
156	3.445067000	10.0.0.1	10.0.0.4	ICMP	100	Echo (ping) reply id=0x0b8d, seq=1/256, ttl=64
157	3.445070000	10.0.0.1	10.0.0.4	ICMP	100	Echo (ping) reply id=0x0b8d, seq=1/256, ttl=64
160	3.445552000	10.0.0.1	10.0.0.4	ICMP	100	Echo (ping) reply id=0x0b8d, seq=1/256, ttl=64
161	3.455670000	10.0.0.4	10.0.0.2	ICMP	100	Echo (ping) request id=0x0b8e, seq=1/256, ttl=64
164	3.456283000	10.0.0.4	10.0.0.2	ICMP	100	Echo (ping) request id=0x0b8e, seq=1/256, ttl=64
165	3.456285000	10.0.0.4	10.0.0.2	ICMP	100	Echo (ping) request id=0x0b8e, seq=1/256, ttl=64
168	3.456759000	10.0.0.4	10.0.0.2	ICMP	100	Echo (ping) request id=0x0b8e, seq=1/256, ttl=64 (reply in 169)
169	3.456772000	10.0.0.2	10.0.0.4	ICMP	100	Echo (ping) reply id=0x0b8e, seq=1/256, ttl=64 (request in 168)
172	3.457308000	10.0.0.2	10.0.0.4	ICMP	100	Echo (ping) reply id=0x0b8e, seq=1/256, ttl=64
173	3.457309000	10.0.0.2	10.0.0.4	ICMP	100	Echo (ping) reply id=0x0b8e, seq=1/256, ttl=64
176	3.457721000	10.0.0.2	10.0.0.4	ICMP	100	Echo (ping) reply id=0x0b8e, seq=1/256, ttl=64
177	3.464208000	10.0.0.4	10.0.0.3	ICMP	100	Echo (ping) request id=0x0b8f, seq=1/256, ttl=64
180	3.465452000	10.0.0.4	10.0.0.3	ICMP	100	Echo (ping) request id=0x0b8f, seq=1/256, ttl=64 (reply in 181)
181	3.465472000	10.0.0.3	10.0.0.4	ICMP	100	Echo (ping) reply id=0x0b8f, seq=1/256, ttl=64 (request in 180)
184	3.467407000	10.0.0.3	10.0.0.4	ICMP	100	Echo (ping) reply id=0x0b8f, seq=1/256, ttl=64

File: "/tmp/wireshark\_pcapng\_... Packets: 186 · Displayed: 94 (50.5%) · Dropped: 0 (0.0%) Profile: Default

There are 94 entries generated in wireshark, the type of icmp entries are request and replies.