Lab Exercise 3 (part A) Answers

Marking: Part 4 was marked and was worth 5 marks.

Part 1 Basic Commands in Mininet

Question 1.

The following is the minimal topology.



IP addresses are: h1: 10.0.0.1 h2: 10.0.0.2

Observe that the switch interfaces do not have IP addresses since a switch only operates at layer 2 (link layer).

Mac addresses are: h1-eth0: 1a:cb:d3:ef:c4:dd h2-eth0: c6:51:61:07:44:a3 s1-eth1: 96:4e:1b:35:d4:80 s2-eth2: 16:cf:e9:17:5d:95

Question 2.

The output for the ping test is as follows:

```
mininet> h1 ping -c5 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=2.33 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.502 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.040 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.037 ms
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=0.043 ms
--- 10.0.0.2 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4003ms
rtt min/avg/max/mdev = 0.037/0.591/2.335/0.890 ms
```

Question 3.

At start-up the switch forwarding tables are empty. When the first ping message reaches switch s1, it does not know the MAC address for h2 (i.e. 10.0.0.2). It needs to send out an ARP query to resolve the IP address – MAC address mapping for h2. This initial exchange of ARP messages is only required for the first ping packet. The subsequent packets do not incur this overhead as the mapping is now know to switch s1. We will examine ARP in detail when we study the link layer.

Part 2: Custom Topologies

Question 4.



h1: 10.0.0.1 h2: 10.0.0.2 h3: 10.0.0.3 h4: 10.0.0.4

Observe that the switch interfaces do not have IP addresses since a switch only operates at layer 2 (link layer).

Mac addresses are: h1-eth0: 96:d7:a4:cb:ba:2b h2-eth0: 32:64:0f:89:80:c3 h3-eth0: 3e:f6:93:cc:e4:8c h4-eth0: e6:dd:1f:1d:93:18 s1-eth1: 0e:31:b0:4e:c3:c0 s1-eth2: 82:74:16:77:37:63 s1-eth3: aa:56:86:de:8d:94 s2-eth1: 32:d0:76:45:c4:58 s2-eth2: 82:10:1f:a0:6f:09 s2-eth3: f2:75:e8:b9:22:78

Part 4: Simple Tree Topology

Question 5 (1.5 marks)

Code uploaded separately

Question 6 (1.5 marks)

Code uploaded separately

Question 7 (2 marks)

Initially each host can ping every other host in the network. This is reflected in the output of the pingAll test below:

*** Ping: testing ping reachability h1 -> h2 h3 h4 h5 h6 h7 h8 h2 -> h1 h3 h4 h5 h6 h7 h8 h3 -> h1 h2 h4 h5 h6 h7 h8 h4 -> h1 h2 h3 h5 h6 h7 h8 h5 -> h1 h2 h3 h4 h6 h7 h8 h6 -> h1 h2 h3 h4 h5 h7 h8 h7 -> h1 h2 h3 h4 h5 h6 h8 h8 -> h1 h2 h3 h4 h5 h6 h7 *** Results: 0% dropped (56/56 received)

Once the core switch (c1) is stopped, the network is now disconnected, i.e. the left and right sub-trees cannot communicate with each other. As such hosts in the left sub-tree can only ping those hosts in the left sub-tree while those in the right sub-tree can only ping other hosts in the right sub-tree. This is reflected in the output of the pingAll test below:

*** Ping: testing ping reachability h1 -> h2 h3 h4 X X X X h2 -> h1 h3 h4 X X X X h3 -> h1 h2 h4 X X X X h4 -> h1 h2 h3 X X X X h5 -> X X X X h6 h7 h8 h6 -> X X X X h5 h7 h8 h7 -> X X X X h5 h6 h8 h8 -> X X X X h5 h6 h7 *** Results: 57% dropped (24/56 received)