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COEN 241

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Homework 3 – Mininet Report

Task 1:

Questions:

1. What is the output of "nodes" and "net"?
    a. Nodes output: mininet> nodes available nodes are: h1 h2 h3 h4 h5 h6 h7 h8 s1 s2 s3 s4 s5 s6 s7
    This shows the available nodes from the topology in other words all the hosts and switches.
    b. Net output: mininet> net
    h1 h1-eth0:s3-eth1
    h2 h2-eth0:s3-eth2
    h3 h3-eth0:s4-eth1
    h4 h4-eth0:s4-eth2
    h5 h5-eth0:s6-eth1
    h6 h6-eth0:s6-eth2
    h7 h7-eth0:s7-eth1
    h8 h8-eth0:s7-eth2
    s1 lo: s1-eth1:s2-eth3 s1-eth2:s5-eth3
    s2 lo: s2-eth1:s3-eth3 s2-eth2:s4-eth3 s2-eth3:s1-eth1
    s3 lo: s3-eth1:h1-eth0 s3-eth2:h2-eth0 s3-eth3:s2-eth1
    s4 lo: s4-eth1:h3-eth0 s4-eth2:h4-eth0 s4-eth3:s2-eth2
    s5 lo: s5-eth1:s6-eth3 s5-eth2:s7-eth3 s5-eth3:s1-eth2
    s6 lo: s6-eth1:h5-eth0 s6-eth2:h6-eth0 s6-eth3:s5-eth1
    s7 lo: s7-eth1:h7-eth0 s7-eth2:h8-eth0 s7-eth3:s5-eth2

    This describes how the network is connected through which links for each of the nodes.
2. What is the output of "h7 ifconfig"?
    a. mininet> h7 ifconfig
    h7-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 10.0.0.7 netmask 255.0.0.0 broadcast 10.255.255.255
        inet6 fe80::bc55:29ff:fe70:8c2f prefixlen 64 scopeid 0x20<link>
        ether be:55:29:70:8c:2f txqueuelen 1000 (Ethernet)
        RX packets 371 bytes 50635 (50.6 KB)

RX errors 0 dropped 0 overruns 0 frame 0
TX packets 17 bytes 1286 (1.2 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

This command gives the output of the config information for host 7's link such as the ip address and all the packets received and sent on that port.

Task 2:

Questions:

1. Draw the function call graph of this controller.
    a. Incoming packet → handle_PacketIn() function called → (learning happens) → act_like_switch function called.
2. Have h1 ping h2, and h1 ping h8 for 100 times (e.g., h1 ping -c100 p2).
    a. Around 1.4 ms and 4.2
    b. Minimum: 0.6 ms and Maximum: 4.6 ms
    c. The difference in the ping is due to the connectivity and topology. H1 and h2 are connected through the same switch making it possible for h2 to receive the packets sooner than h8 which has to go through more switches.
3. Run "iperf h1 h2" and "iperf h1 h8".
    a. iperf is used to test the network throughput.
    b. H2 throughput: h8 throughput:
    c. The difference in throughput is very little to none as they are all connected through the same links. The very small difference could be a result of network congestion as the packets are being flooded on all the ports.
4. Which of the switches observe traffic?
    a. All of the switches do observe traffic. In other words, there is traffic going through all the switches because when we ping h1 to h2 and h1 to h8, the packets are being flooded as this controller is acting as a "dumb" switch. One way to observe this would be to add a print statement in act_like_switch function to see the information of the traffic.

Task 3:

Questions:

1. Initially when a packet is received at a port, let's say when h1 pings h8, the packet's information is checked. In the "act_like_switch" code, the controller checks if the source mac address exists in the mac_to_port to see if it exists. If it does not exist, the controller learns this mac address and stores it in mac_to_port. If it does exist, then it checks the destination mac in the packet's information and forwards it based on the port number associated with that mac address in mac_to_port if it exists in mac_to_port. If the destination mac is not in mac_to_port, then the packets are flooded out to all the ports.
2. Have h1 ping h2, and h1 ping h8 for 100 times (e.g., h1 ping -c100 p2)
    a. H1 to h2 was about 0.1 ms and h1 to h8 was around 0.3 ms
    b. Minimum: 0.05 ms maximum: 1.1 ms
    c. There is a difference from task 2 because this acts as a "smarter" switch. With the mac learning, the packets are not flooded through all the ports unless it is a new mac address being learned. Because of existing information about mac addresses and which ports to forward to, there is less network congestion as more traffic is sent and more addresses are learned.
3. Run "iperf h1 h2" and "iperf h1 h8
    a. The throughput values for this task were much better than task 2 as well. Similar to the ping, the throughput was also much better due to fewer traffic collisions and less network congestion. This was also due to the mac learning and storing the information.