COEN 241 HW 3 Mininet & OpenFlow

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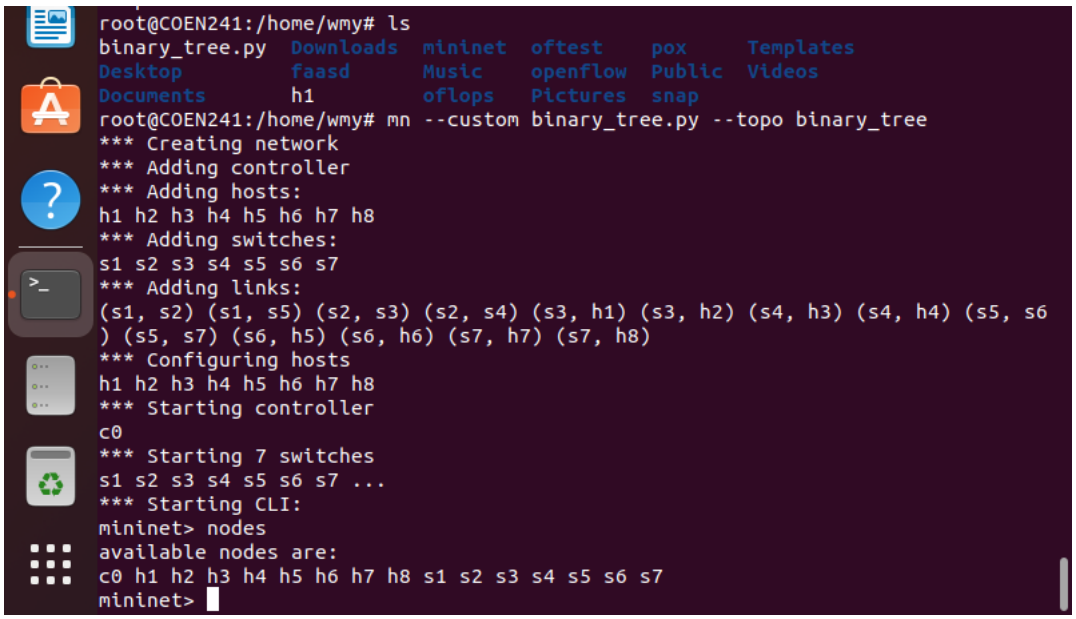
Task 1: Defining custom topologies

Questions

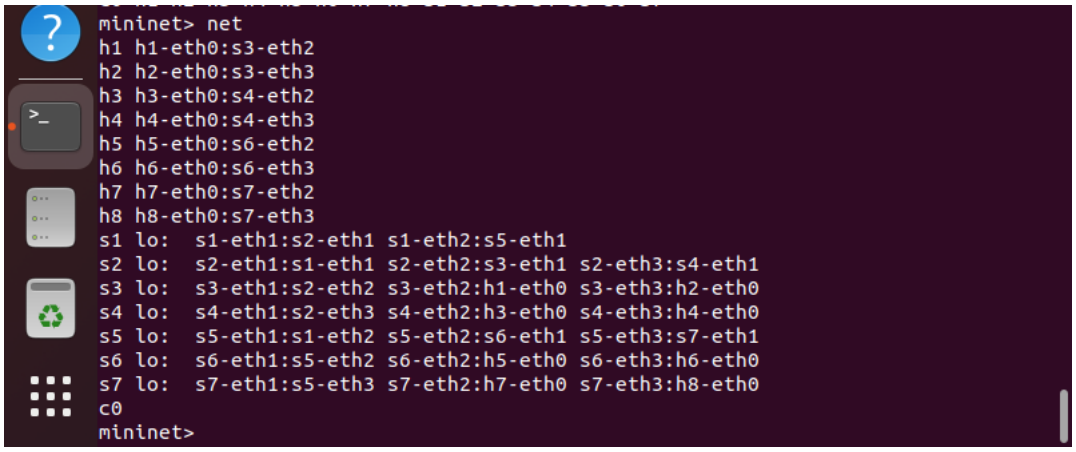
1. What is the output of “nodes” and “net”

Output of “nodes”:



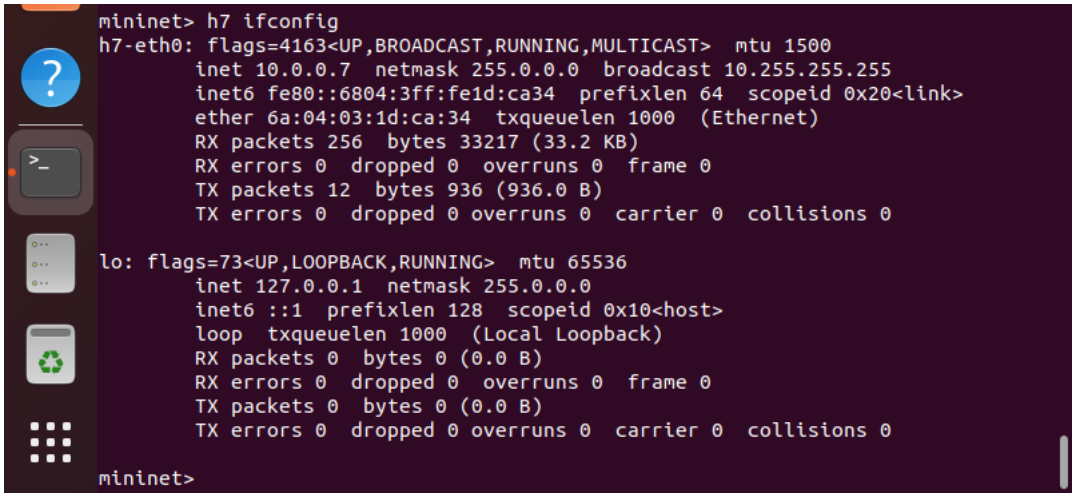
It shows all the controllers, hosts, and switches

Output of “net”:



It shows all the links between the nodes

2. What is the output of “h7 ifconfig”

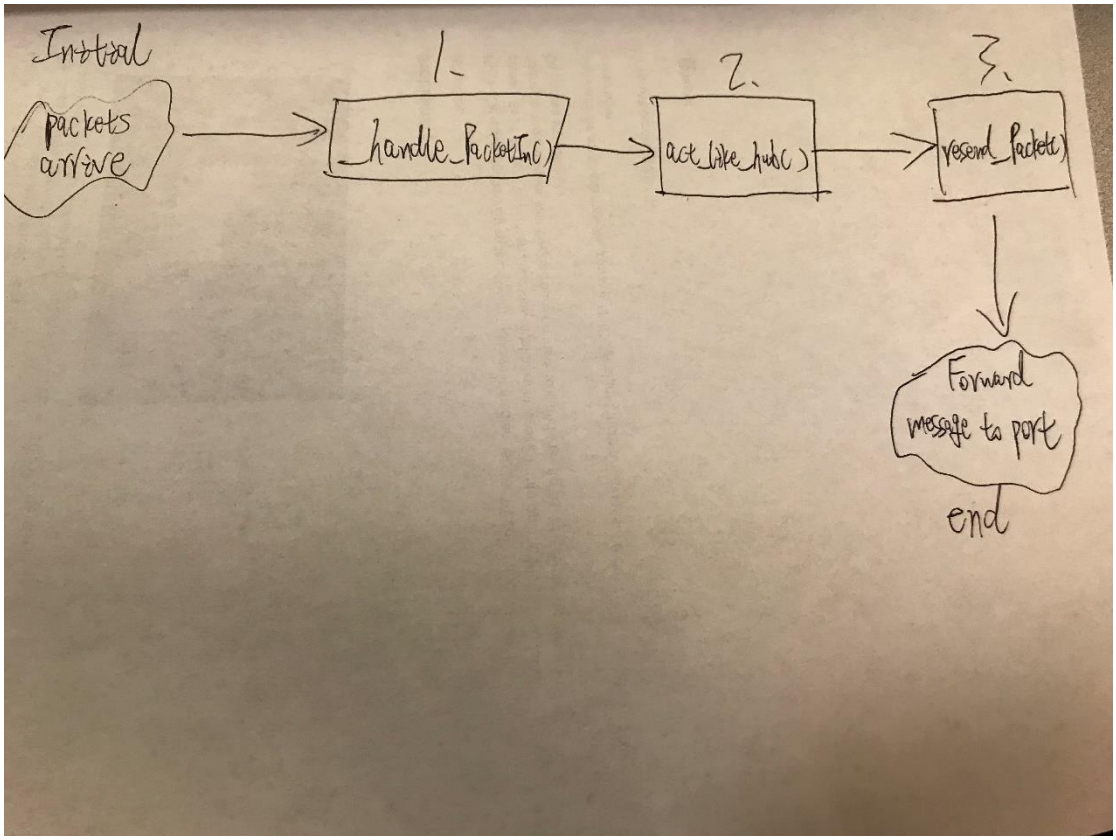


Task 2: Analyze the “of_tutorial’ controller

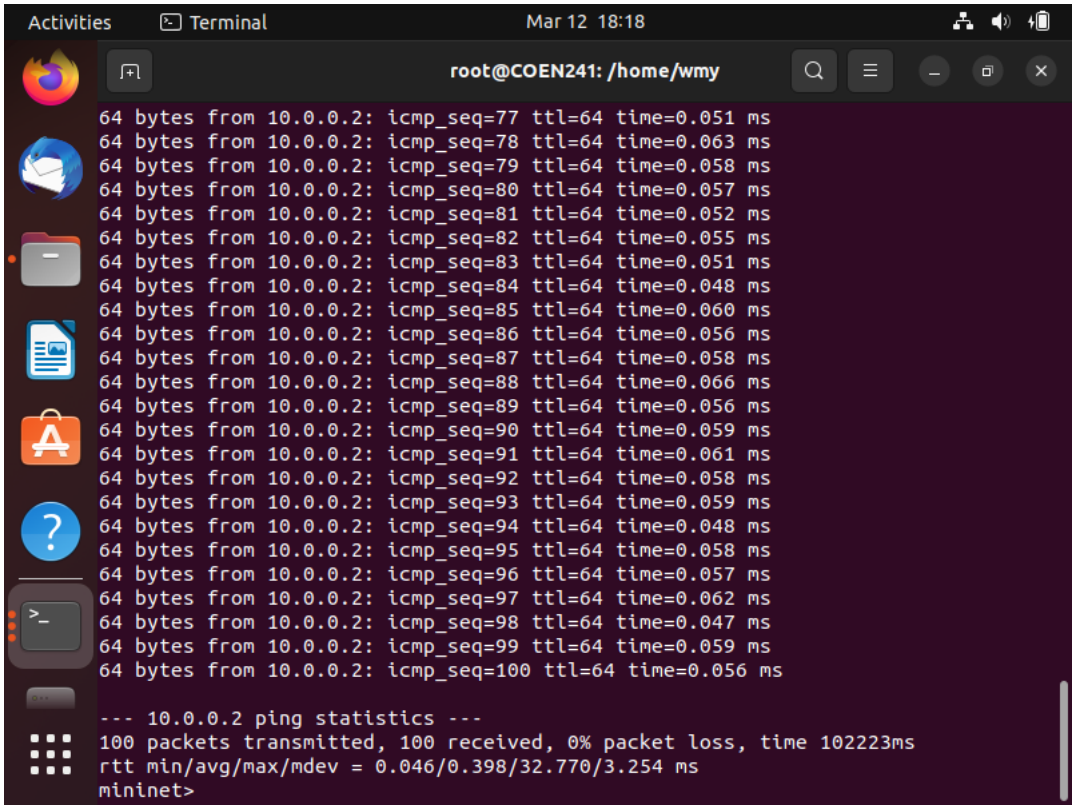
Questions

1. Draw the function call graph of this controller. For example, once a packet comes to the controller, which function is the first to be called, which one is the second, and so forth?

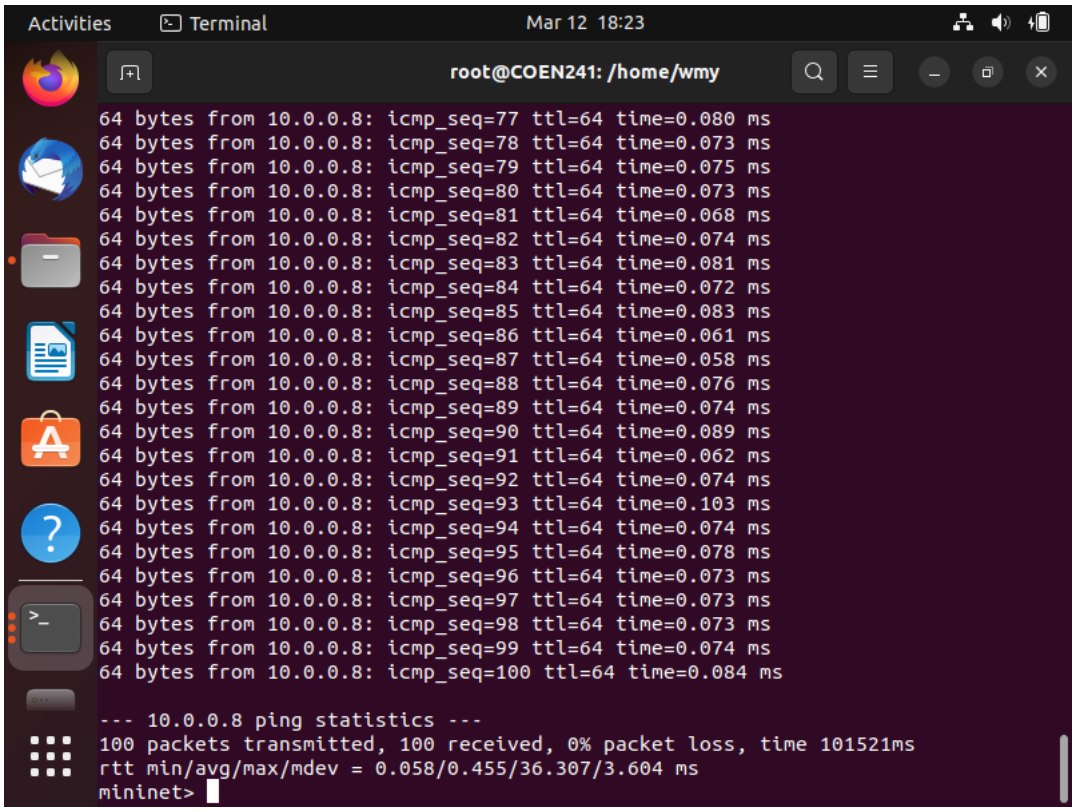
When a packet comes to the controller:



2. Have h1 ping h2, and h1 ping h8 for 100 times (e.g., h1 ping -c100 p2).
For h1 ping h2:



For h1 ping h8:



a. How long does it take (on average) to ping for each case?
For h1 ping h2:
0.398ms
For h1 ping h8:
0.455ms
b. What is the minimum and maximum ping you have observed?
For h1 ping h2:
Max: 32.770ms Min: 0.046ms
For h1 ping h8:
Max: 36.307ms Min: 0.058ms
c. What is the difference, and why?
From the data we can see that the speed of h1 ping h2 is faster than h1 ping h8 because the number of switches for h1 ping h2 is less than h1 ping h8. In this case, there exists a congestion in h1 ping h8, which leads to a delay in ping.

3. Run “iperf h1 h2” and “iperf h1 h8”
a. What is “iperf” used for?
The command “iperf” is used for testing TCP bandwidth between two hosts.
b. What is the throughput for each case?
For iperf h1 h2, the results are:
5.07 Mbits/sec and 6.02 Mbits/sec
For iperf h1 h8, the results are:
2.11 Mbits/sec and 2.36 Mbits/sec

c. What is the difference, and explain the reasons for the difference.
From the results, it showed that there is a difference between using iperf h1 h2 and iperf h1 h8, due to the distance between the hosts.
For example, it is very obvious that the switches between h1 and h8 are more than h1 and h2, in this case, the throughput for h1 & h8 is less than it for h1 & h2 because the packets were sent and received by every switch.

4. Which of the switches observe traffic? Please describe your way for observing such traffic on switches (e.g., adding some functions in the “of_tutorial” controller).
All of the switches observe traffic.
To observe this, we can use the _handle_PacketIn() function and add a function to show the info of packets before using act_like_hub() function because _handle_PacketIn() is used when a node receives packet, so we can observe the traffic of switches.

Task 3: MAC Learning Controller

Questions

1. Describe how the above code works, such as how the "MAC to Port" map is established. You could use a ‘ping’ example to describe the establishment process (e.g., h1 ping h2).

The code in of_tutorial.py aims to let the switch to learn where to send packets for giving it the source MAC address to their destination ports. In this case, the switch can know where to send the packets to and reduce the network workload. From the code, if the port associated with the destination MAC of the packet is unknow, then the switch will flood the packet to every switch.

We can use a h1 ping h2 example to illustrate this:

1. h1 sends packets to s3
2. Then, s3 maps MAC to h1 and flood to s2 and h2 if the destination is unknown
3. h2 responds to s3 and maps the destination port

2. Have h1 ping h2, and h1 ping h8 for 100 times (e.g., h1 ping -c100 p2).

a. How long did it take (on average) to ping for each case?

For h1 ping h2:

0.213ms

For h1 ping h8:

0.384ms

b. What is the minimum and maximum ping you have observed?

For h1 ping h2:

Max: 30.211ms Min: 0.025ms

For h1 ping h8:

Max: 34.134ms Min: 0.032ms

c. Any difference from Task 2 and why do you think there is a change if there is?

By observing the data we can recognize that the ping time is less than it in Task 2. I think the change may be the controller gets MAC address and send them to the specific destination ports in Task 3 rather than just flooding all packets in Task 2.

3. Q.3 Run “iperf h1 h2” and “iperf h1 h8”.

a. What is the throughput for each case?

For “iperf h1 h2”:

6.32 Mbits/sec and 7.17 Mbits/sec

For “iperf h1 h8”:

2.84 Mbits/sec and 3.24 Mbits/sec

b. What is the difference from Task 2 and why do you think there is a change if there is?

From the data we can observe that the throughput is higher than it in Task 2. The change is because in Task 3, it used MAC address, which helps the switch to route to appropriate destination port and reduce the network congestion.