SDN-NFV

lab2-report

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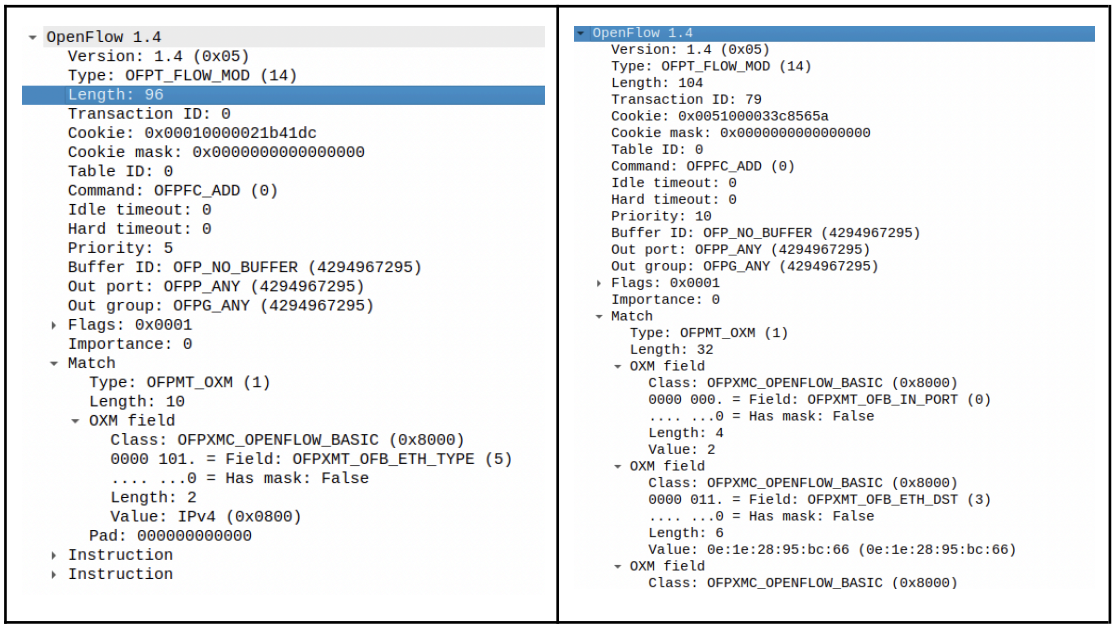
Part1: Answer the Questions

1. How many OpenFlow headers with type “OFPT_FLOW_MOD” and command “OFPFC_ADD” are there among all the packets?

   As shown below, there are 2 distinct OpenFlow headers with type “OFPT_FLOW_MOD” (type==14) and command “OFPFC_ADD”.



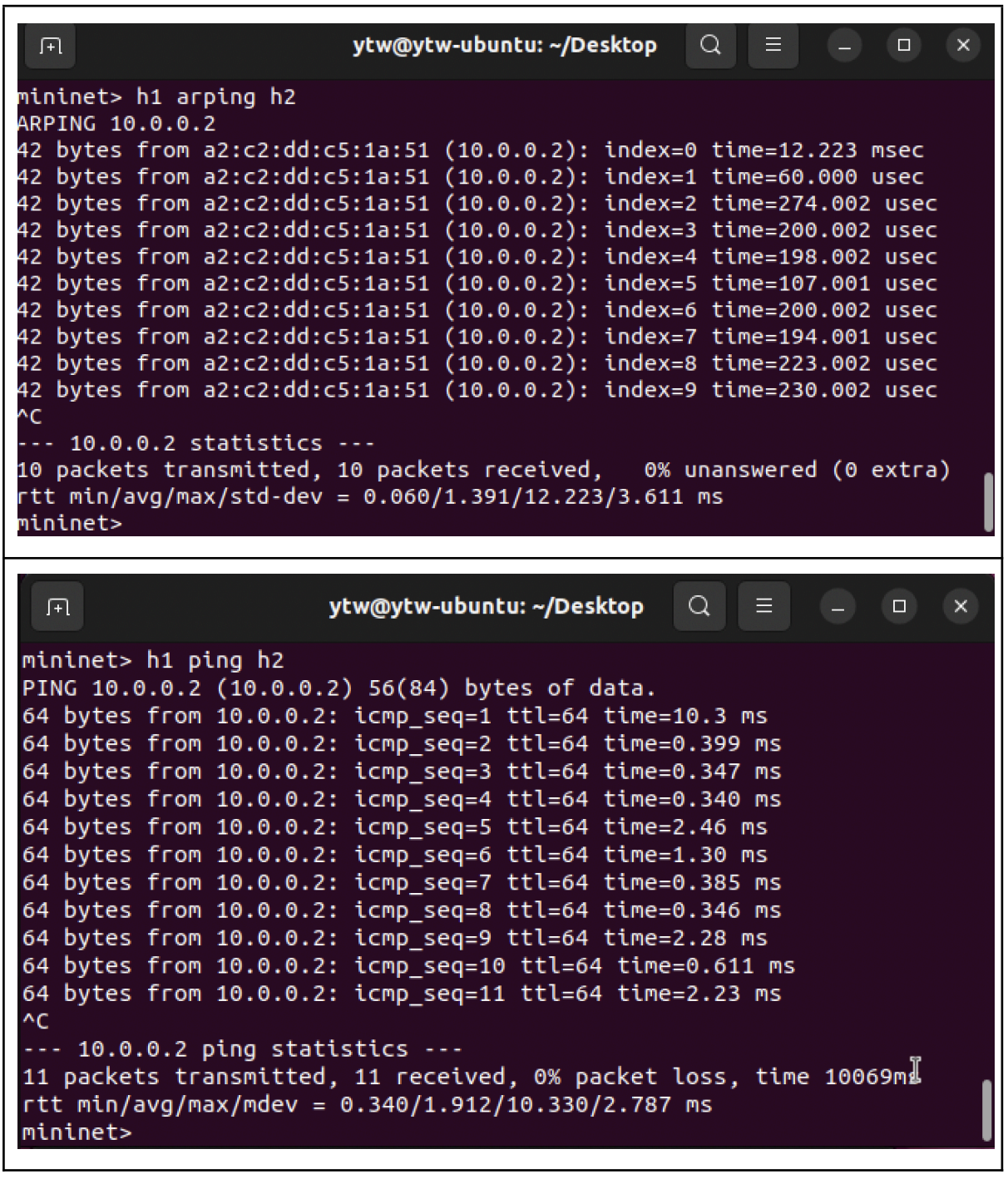
2. What are the match fields and the corresponding actions in each “OFPT_FLOW_MOD” message?

3. What are the Idle Timeout values for all flow rules on s1 in GUI?

Match fields	Actions	Timeout values
ETH_TYPE (5) = IPv4 OFPXMT_OFB_ETH_TYPE (5) = IPv4	OUTPUT (0) port = OFPP_CONTROLLER (4294967293) OFPAT_OUTPUT (0) = OFPP_CONTROLLER (4294967293)	0

IN_PORT (0) = 1 ETH_DST (3) = f2:03:65:f3:1f ETH_SRC (4) = 0e:1e:28:95:bc:66 OFPXMT_OFB_IN_PORT (0) = 1 OFPXMT_OFB_ETH_DST (3) = f2:03:65:f3:1f OFPXMT_OFB_ETH_SRC (4) = 0e:1e:28:95:bc:66	OUTPUT (0) port = 1 OFPFT_OUTPUT (0) = 1	0

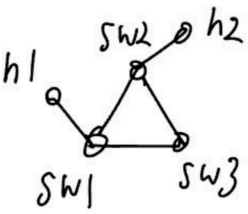
Part2: Install Flow Rules



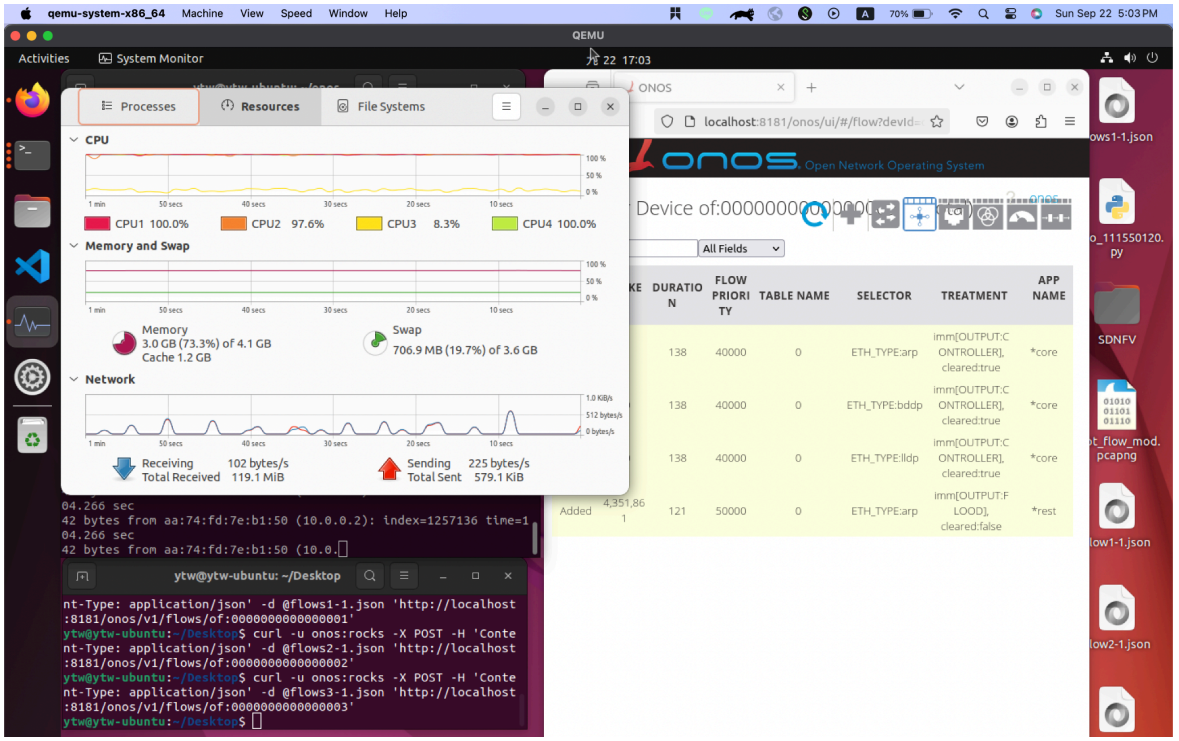
Part3: Create Topology with Broadcast Storm

I created the topology on the right and added flow rules below to the three switches:

When a switch receives a packet, it will FLOOD, and because the three switches create a loop, the switches continuingly “FLOOD” the packet, making the amount of packets grow exponentially and using up the bandwidth, causing a broadcast storm



As shown below, when “h1 arping h2”, a broadcast storm happens and the CPU usage hits 100%.



Part4: Trace ReactiveForwarding

control plane:

1. The ICMP packet (ping request) will reach the switch, received by the reactive forwarding application
2. The application finds that there are no existing flow rule to handle the request, so it sends a PACKET_IN message to the ONOS controller
3. The ONOS controller will decide the forwarding path and install the flow rule in the switch to handle further ICMP packets. This flow rule is sent from the controller to the switch via FLOW_MOD messages

data plane:

1. After the switch has the new flow rules, it can forward the subsequent ICMP packets directly between h1 and h2 without involving the controller.

step-by-step observation:

1. **ICMP Request** (h1 ping h2): The switch doesn't know how to handle, so it sends a packet-in message to the controller

2. **Flow Rule Installation**: ONOS responds by adding flow rules using FLOW_MOD

3. **ICMP Reply (from h2)**:The switch forwards the reply based on the installed flow rule.

4. **Subsequent ICMP Requests or Replies**:After the flow rules are installed, subsequent pings are handled directly by the switch without contacting the controller (data plane forwarding).

Part5: What I Learned or Solved

I learned to install and delete flow rules via 'curl', what causes a broadcast storm, and how ovs communicates with the controller. I am also now more familiar with wireshark and openflow protocol.