

## Q.No:1 SDN-Based Blocking of Malfunctioning IoT Devices

```
mininet@mininet-vm:~$ ryu-manager ryu.app.simple_switch_13 ryu.app.ofctl_rest
loading app ryu.app.simple_switch_13
loading app ryu.app.ofctl_rest
loading app ryu.controller.ofp_handler
instantiating app None of DPSet
creating context dpset
creating context wsgi
instantiating app ryu.app.simple_switch_13 of SimpleSwitch13
instantiating app ryu.app.ofctl_rest of RestStatsApi
instantiating app ryu.controller.ofp_handler of OFPHandler
(1045) wsgi starting up on http://0.0.0.0:8080
packet in 1 7a:5f:bf:34:6d:70 ff:ff:ff:ff:ff:ff 1
packet in 1 5a:05:c5:9b:33:9c 7a:5f:bf:34:6d:70 2
packet in 1 7a:5f:bf:34:6d:70 5a:05:c5:9b:33:9c 1
packet in 1 7a:5f:bf:34:6d:70 ff:ff:ff:ff:ff:ff 1
packet in 1 0e:0b:03:aa:bc:3c 7a:5f:bf:34:6d:70 3
packet in 1 7a:5f:bf:34:6d:70 0e:0b:03:aa:bc:3c 1
packet in 1 5a:05:c5:9b:33:9c ff:ff:ff:ff:ff:ff 2
packet in 1 0e:0b:03:aa:bc:3c 5a:05:c5:9b:33:9c 3
packet in 1 5a:05:c5:9b:33:9c 0e:0b:03:aa:bc:3c 2
(1045) accepted ('127.0.0.1', 38096)
No such Datapath: 1
127.0.0.1 - - [09/Jan/2026 20:11:16] "POST /stats/flowentry/add HTTP/1.1" 404 122 0.022455
packet in 1 b2:c5:f4:98:7b:17 ff:ff:ff:ff:ff:ff 2
packet in 1 7a:58:e7:8d:6f:ed b2:c5:f4:98:7b:17 1
packet in 1 b2:c5:f4:98:7b:17 7a:58:e7:8d:6f:ed 2
(1045) accepted ('127.0.0.1', 48988)
127.0.0.1 - - [09/Jan/2026 20:13:12] "GET /stats/switches HTTP/1.1" 200 113 0.000805
(1045) accepted ('127.0.0.1', 36164)
127.0.0.1 - - [09/Jan/2026 20:13:21] "POST /stats/flowentry/add HTTP/1.1" 200 115 0.010116
(1045) accepted ('127.0.0.1', 58296)
127.0.0.1 - - [09/Jan/2026 20:15:18] "POST /stats/flowentry/delete HTTP/1.1" 200 115 0.006482
```

19°C Partly sunny

Search

9:45 AM 1/10/2026

```
mininet@mininet-vm:~$ sudo mn --topo single,3 --switch ovs,protocols=OpenFlow13 \
> --controller=remote,ip=127.0.0.1,port=6653
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3
*** Adding switches:
s1
*** Adding links:
(h1, s1) (h2, s1) (h3, s1)
*** Configuring hosts
h1 h2 h3
*** Starting controller
c0
*** Starting 1 switches
s1 ...
*** Starting CLI:
mininet> pingall
*** Ping: testing ping reachability
h1 -> h2 h3
h2 -> h1 h3
h3 -> h1 h2
*** Results: 0% dropped (6/6 received)
mininet> h2 ifconfig
h2-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.2 netmask 255.0.0.0 broadcast 10.255.255.255
        ether 5a:05:c5:9b:33:9c txqueuelen 1000 (Ethernet)
            RX packets 9 bytes 602 (602.0 B)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 8 bytes 560 (560.0 B)
            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
        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

mininet> h2 10.0.0.2
```

```
mininet> h2 10.0.0.2
bash: 10.0.0.2: command not found
mininet> h2 ping h1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data.
64 bytes from 10.0.0.1: icmp_seq=1 ttl=64 time=0.337 ms
64 bytes from 10.0.0.1: icmp_seq=2 ttl=64 time=0.081 ms
64 bytes from 10.0.0.1: icmp_seq=3 ttl=64 time=0.142 ms
^C
--- 10.0.0.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2005ms
rtt min/avg/max/mdev = 0.081/0.186/0.337/0.109 ms
```

```
mininet@mininet-vm:~$ curl http://127.0.0.1:8080/stats/switches
[2, 1]mininet@mininet-vm:~$ curl -X POST http://127.0.0.1:8080/stats/flowentry /\add
> -d '{
>   "dpid": 1,
>   "priority": 200,
>   "match": {
>     "eth_type": 2048,
>     "ipv4_src": "10.0.0.2"
>   },
>   "actions": []
> }'
mininet@mininet-vm:~$ sudo ovs-ofctl -O OpenFlow13 dump-flows s1
cookie=0x0, duration=47.423s, table=0, n_packets=2, n_bytes=196, priority=200,ip,nw_src=10.0.0.2 actions=drop
cookie=0x0, duration=140.647s, table=0, n_packets=5, n_bytes=378, priority=1,in_port="s1-eth1",dl_src=7a:58:e7:8d:6f:ed,dl_dst=b2:c5:f4:98:7b:17 actions=output:"s1-eth2"
cookie=0x0, duration=140.643s, table=0, n_packets=4, n_bytes=280, priority=1,in_port="s1-eth2",dl_src=b2:c5:f4:98:7b:17,dl_dst=7a:58:e7:8d:6f:ed actions=output:"s1-eth1"
cookie=0x0, duration=146.257s, table=0, n_packets=3, n_bytes=182, priority=0 actions=CONTROLLER:65535
mininet@mininet-vm:~$ curl -X POST http://127.0.0.1:8080/stats/flowentry/delete \
> -d '{
>   "dpid": 1,
>   "match": {
>     "ipv4_src": "10.0.0.2",
>     "eth_type": 2048
>   }
> }'
mininet@mininet-vm:~$ |
```

```
mininet> h2 ping h1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data.
^C
--- 10.0.0.1 ping statistics ---
2 packets transmitted, 0 received, 100% packet loss, time 1007ms

mininet> sudo ovs-ofctl -O OpenFlow13 dump-flows s1
*** Unknown command: sudo ovs-ofctl -O OpenFlow13 dump-flows s1
mininet> h2 ping h1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data.
sudo ovs-ofctl -O OpenFlow13 dump-flows s1^?^?^?^?^?^?^C
--- 10.0.0.1 ping statistics ---
13 packets transmitted, 0 received, 100% packet loss, time 12273ms

mininet> h2 ping h1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data.
64 bytes from 10.0.0.1: icmp_seq=1 ttl=64 time=0.476 ms
64 bytes from 10.0.0.1: icmp_seq=2 ttl=64 time=0.241 ms
64 bytes from 10.0.0.1: icmp_seq=3 ttl=64 time=0.045 ms
64 bytes from 10.0.0.1: icmp_seq=4 ttl=64 time=0.096 ms
64 bytes from 10.0.0.1: icmp_seq=5 ttl=64 time=0.204 ms
64 bytes from 10.0.0.1: icmp_seq=6 ttl=64 time=0.152 ms
^C
--- 10.0.0.1 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5084ms
rtt min/avg/max/mdev = 0.045/0.202/0.476/0.138 ms
mininet> |
```

## Q.No:2 Extract Network Information Using Ryu REST APIs

```
mininet@mininet-vm:~$ ryu-manager \
> ryu.app.simple_switch_13 \
> ryu.app.ofctl_rest \
> ryu.app.rest_topology
loading app ryu.app.simple_switch_13
loading app ryu.app.ofctl_rest
loading app ryu.app.rest_topology
loading app ryu.controller.ofp_handler
loading app ryu.topology.switches
loading app ryu.controller.ofp_handler
instantiating app None of DPSets
creating context dpset
creating context wsgi
instantiating app ryu.app.simple_switch_13 of SimpleSwitch13
instantiating app ryu.app.ofctl_rest of RestStatsApi
instantiating app ryu.app.rest_topology of TopologyAPI
instantiating app ryu.controller.ofp_handler of OFPHandler
instantiating app ryu.topology.switches of Switches
(1844) wsgi starting up on http://0.0.0.0:8080
packet in 1 6e:b0:1a:9a:06:c5 ff:ff:ff:ff:ff:ff 1
packet in 1 ca:9a:d0:bb:1b:1f 6e:b0:1a:9a:06:c5 2
packet in 1 6e:b0:1a:9a:06:c5 ca:9a:d0:bb:1b:1f 1
(1844) accepted ('127.0.0.1', 47736)
127.0.0.1 - - [09/Jan/2026 20:28:35] "GET /v1.0/topology/switches HTTP/1.1" 200 358 0.022348
(1844) accepted ('127.0.0.1', 55122)
127.0.0.1 - - [09/Jan/2026 20:28:45] "GET /v1.0/topology/links HTTP/1.1" 200 109 0.000577
(1844) accepted ('127.0.0.1', 40840)
127.0.0.1 - - [09/Jan/2026 20:28:57] "GET /v1.0/topology/hosts HTTP/1.1" 200 461 0.000843
(1844) accepted ('127.0.0.1', 40846)
127.0.0.1 - - [09/Jan/2026 20:29:03] "GET /stats/flow/1 HTTP/1.1" 200 974 0.003768
|
```



The screenshot shows a Windows desktop environment with a dark theme. At the top, there's a window titled 'mininet@mininet-vm: ~' which contains the terminal output. Below the taskbar, the system tray shows a weather icon (partly sunny at 19°C), a battery icon, and a network icon. The system clock in the bottom right corner shows '10:00 AM' and the date '1/10/2026'. The taskbar itself has several pinned icons, including File Explorer, Microsoft Edge, Google Chrome, and others.

```
mininet@mininet-vm:~$ sudo mn \
> --topo single,2 \
> --controller remote,ip=127.0.0.1,port=6653 \
> --switch ovsk,protocols=OpenFlow13
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2
*** Adding switches:
s1
*** Adding links:
(h1, s1) (h2, s1)
*** Configuring hosts
h1 h2
*** Starting controller
c0
*** Starting 1 switches
s1 ...
*** Starting CLI:
mininet> h1 ping 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=17.0 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.293 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.100 ms
^C
--- 10.0.0.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2007ms
rtt min/avg/max/mdev = 0.100/5.811/17.041/7.940 ms
mininet> |
```

```
mininet@mininet-vm:~$ curl http://127.0.0.1:8080/v1.0/topology/switches
[{"dpid": "0000000000000001", "ports": [{"dpid": "0000000000000001", "port_no": "00000001", "hw_addr": "36:62:cf:e7:5c:61", "name": "s1-eth1"}, {"dpid": "0000000000000001", "port_no": "00000002", "hw_addr": "92:0e:8f:6d:9e:bd", "name": "s1-eth2"}]}mininet@mininet-vm:~$ curl http://127.0.0.1:8080/v1.0/topology/hosts
[{"mac": "6e:b0:1a:9a:06:c5", "ipv4": ["10.0.0.1"], "ipv6": [], "port": {"dpid": "0000000000000001", "port_no": "00000001", "hw_addr": "36:62:cf:e7:5c:61", "name": "s1-eth1"}}, {"mac": "ca:9a:d0:bb:1b:1f", "ipv4": ["10.0.0.2"], "ipv6": [], "port": {"dpid": "0000000000000001", "port_no": "00000002", "hw_addr": "92:0e:8f:6d:9e:bd", "name": "s1-eth2"}]}mininet@mininet-vm:~$ curl http://127.0.0.1:8080/v1.0/topology/links
[]mininet@mininet-vm:~$ curl http://127.0.0.1:8080/v1.0/topology/hosts
[{"mac": "6e:b0:1a:9a:06:c5", "ipv4": ["10.0.0.1"], "port": {"dpid": "0000000000000001", "port_no": "00000001", "hw_addr": "36:62:cf:e7:5c:61", "name": "s1-eth1"}}, {"mac": "ca:9a:d0:bb:1b:1f", "ipv4": ["10.0.0.2"], "ipv6": [], "port": {"dpid": "0000000000000001", "port_no": "00000002", "hw_addr": "92:0e:8f:6d:9e:bd", "name": "s1-eth2"}]}mininet@mininet-vm:~$ curl http://127.0.0.1:8080/stats/flow/1
[{"1": [{"priority": 1, "cookie": 0, "idle_timeout": 0, "hard_timeout": 0, "byte_count": 336, "duration_sec": 291, "duration_nsec": 199000000, "packet_count": 4, "length": 104, "flags": 0, "actions": ["OUTPUT:1"], "match": {"in_port": 2, "dl_src": "ca:9a:d0:bb:1b:1f", "dl_dst": "6e:b0:1a:9a:06:c5"}, "table_id": 0}, {"priority": 1, "cookie": 0, "idle_timeout": 0, "hard_timeout": 0, "byte_count": 238, "duration_sec": 291, "duration_nsec": 194000000, "packet_count": 3, "length": 104, "flags": 0, "actions": ["OUTPUT:2"], "match": {"in_port": 1, "dl_src": "6e:b0:1a:9a:06:c5", "dl_dst": "ca:9a:d0:bb:1b:1f"}, "table_id": 0}, {"priority": 0, "cookie": 0, "idle_timeout": 0, "hard_timeout": 0, "byte_count": 182, "duration_sec": 304, "duration_nsec": 949000000, "packet_count": 3, "length": 104, "flags": 0, "actions": ["OUTPUT:2"], "match": {"in_port": 1, "dl_src": "6e:b0:1a:9a:06:c5", "dl_dst": "ca:9a:d0:bb:1b:1f"}, "table_id": 0}]}mininet@mininet-vm:~$ |
```



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10:03 AM  
1/10/2026