

1)

```
mininet@mininet-vm:~$ loading app ryu.app.simple_switch_13
loading app ryu.controller.ofp_handler
instantiating app ryu.app.simple_switch_13 of SimpleSwitch13
instantiating app ryu.controller.ofp_handler of OFPHandler
sudo mn --topo=single,3 --controller remote
*** Creating network
*** Adding controller
Connecting to remote controller at 127.0.0.1:6653
*** 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> sh ovs-ofctl show s1
OFPPT_FEATURES_REPLY (xid=0x2): dpid:0000000000000001
n_tables:254, n_buffers:0
capabilities: FLOW_STATS TABLE_STATS PORT_STATS QUEUE_STATS ARP_MATCH_IP
actions: output enqueue set_vlan_vid set_vlan_pcp strip_vlan mod_dl_src mod_dl_dst mod_nw_src mod_nw_dst mod_nw_tos mod_tp_src mod_tp_dst
1(s1-eth1): addr:b6:c7:da:7d:62:b2
    config:      0
    state:       0
    current:     10GB-FD COPPER
    speed: 10000 Mbps now, 0 Mbps max
2(s1-eth2): addr:ba:66:5d:d0:95:1e
    config:      0
    state:       0
    current:     10GB-FD COPPER
    speed: 10000 Mbps now, 0 Mbps max
3(s1-eth3): addr:96:73:f4:f3:4f:1b
    config:      0
    state:       0
    current:     10GB-FD COPPER
    speed: 10000 Mbps now, 0 Mbps max
LOCAL(s1): addr:92:92:a6:e1:a8:4d
    config:      PORT_DOWN
    state:       LINK_DOWN
    speed: 0 Mbps now, 0 Mbps max
OFPPT_GET_CONFIG_REPLY (xid=0x4): frags=normal miss_send_len=0
```

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mininet@mininet-vm: ~
mininet> sh ovs-ofctl -O OpenFlow13 add-flow s1 "priority=100,ip,nw_src=10.0.0.1,nw_dst=10.0.0.2,actions=output:2"
mininet> sh ovs-ofctl -O OpenFlow13 add-flow s1 "priority=100,ip,nw_src=10.0.0.2,nw_dst=10.0.0.1,actions=output:1"
mininet> sh ovs-ofctl -O OpenFlow13 add-flow s1 "priority=200,ip,nw_src=10.0.0.1,nw_dst=10.0.0.3,actions=drop"
mininet> sh ovs-ofctl -O OpenFlow13 add-flow s1 "priority=200,ip,nw_src=10.0.0.2,nw_dst=10.0.0.3,actions=drop"
mininet> sh ovs-ofctl -O OpenFlow13 add-flow s1 "priority=200,ip,nw_src=10.0.0.3,nw_dst=10.0.0.1,actions=drop"
mininet> sh ovs-ofctl -O OpenFlow13 add-flow s1 "priority=200,ip,nw_src=10.0.0.3,nw_dst=10.0.0.2,actions=drop"
mininet> sh ovs-ofctl -O OpenFlow13 dump-flows s1
  cookie=0x0, duration=96.080s, table=0, n_packets=0, n_bytes=0, priority=100,ip,nw_src=10.0.0.1,nw_dst=10.0.0.2 actions=output:"s1-eth2"
  cookie=0x0, duration=76.656s, table=0, n_packets=0, n_bytes=0, priority=100,ip,nw_src=10.0.0.2,nw_dst=10.0.0.1 actions=output:"s1-eth1"
  cookie=0x0, duration=58.248s, table=0, n_packets=0, n_bytes=0, priority=200,ip,nw_src=10.0.0.1,nw_dst=10.0.0.3 actions=drop
  cookie=0x0, duration=42.438s, table=0, n_packets=0, n_bytes=0, priority=200,ip,nw_src=10.0.0.2,nw_dst=10.0.0.3 actions=drop
  cookie=0x0, duration=25.669s, table=0, n_packets=0, n_bytes=0, priority=200,ip,nw_src=10.0.0.3,nw_dst=10.0.0.1 actions=drop
  cookie=0x0, duration=10.206s, table=0, n_packets=0, n_bytes=0, priority=200,ip,nw_src=10.0.0.3,nw_dst=10.0.0.2 actions=drop
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=0.275 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.134 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.072 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.077 ms
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=0.076 ms
^C
--- 10.0.0.2 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4099ms
rtt min/avg/max/mdev = 0.072/0.126/0.275/0.077 ms
mininet> h1 ping h3
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.
From 10.0.0.1 icmp_seq=9 Destination Host Unreachable
From 10.0.0.1 icmp_seq=10 Destination Host Unreachable
From 10.0.0.1 icmp_seq=11 Destination Host Unreachable
From 10.0.0.1 icmp_seq=12 Destination Host Unreachable
From 10.0.0.1 icmp_seq=13 Destination Host Unreachable
From 10.0.0.1 icmp_seq=14 Destination Host Unreachable
^C
--- 10.0.0.3 ping statistics ---
15 packets transmitted, 0 received, +6 errors, 100% packet loss, time 14327ms
pipe 4
mininet> h2 ping h3
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.
From 10.0.0.2 icmp_seq=1 Destination Host Unreachable
From 10.0.0.2 icmp_seq=2 Destination Host Unreachable
From 10.0.0.2 icmp_seq=3 Destination Host Unreachable
^C
--- 10.0.0.3 ping statistics ---
5 packets transmitted, 0 received, +3 errors, 100% packet loss, time 4084ms
pipe 4
mininet> |

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2)

```
mininet@mininet-vm: ~  
*** Killing stale mininet node processes  
pkill -9 -f mininet:  
*** Shutting down stale tunnels  
pkill -9 -f Tunnel=Ethernet  
pkill -9 -f .ssh/mn  
rm -f ~/.ssh/mn/*  
*** Cleanup complete.  
mininet@mininet-vm:~$ ryu-manager \  
> ryu.app.simple_switch_13 \  
> ryu.app.ofctl_rest \  
> ryu.app.rest_topology \  
> ryu.app.ws_topology  
loading app ryu.app.simple_switch_13  
loading app ryu.app.ofctl_rest  
loading app ryu.app.rest_topology  
loading app ryu.app.ws_topology  
loading app ryu.controller.ofp_handler  
instantiating app None of DPSet  
creating context dpset  
creating context wsgi  
instantiating app None of Switches  
creating context switches  
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.app.ws_topology of WebSocketTopology  
instantiating app ryu.controller.ofp_handler of OFPHandler  
(1096) wsgi starting up on http://0.0.0.0:8080  
(1096) accepted ('127.0.0.1', 47488)  
127.0.0.1 - - [09/Jan/2026 20:34:40] "GET /v1.0/topology/switches HTTP/1.1" 200 486 0.012327  
(1096) accepted ('127.0.0.1', 57618)  
127.0.0.1 - - [09/Jan/2026 20:34:54] "GET /v1.0/topology/links HTTP/1.1" 200 133 0.000323  
(1096) accepted ('127.0.0.1', 50282)  
127.0.0.1 - - [09/Jan/2026 20:35:03] "GET /v1.0/topology/hosts HTTP/1.1" 200 133 0.000469  
packet in 1 ca:08:07:24:07:a1 ff:ff:ff:ff:ff:ff 1  
packet in 1 22:27:87:df:52:b8 ca:08:07:24:07:a1 2  
packet in 1 ca:08:07:24:07:a1 22:27:87:df:52:b8 1  
packet in 1 ca:08:07:24:07:a1 ff:ff:ff:ff:ff:ff 1  
packet in 1 86:bb:5e:1d:9e:70 ca:08:07:24:07:a1 3  
packet in 1 ca:08:07:24:07:a1 86:bb:5e:1d:9e:70 1  
packet in 1 22:27:87:df:52:b8 ff:ff:ff:ff:ff:ff 2  
packet in 1 86:bb:5e:1d:9e:70 22:27:87:df:52:b8 3  
packet in 1 22:27:87:df:52:b8 86:bb:5e:1d:9e:70 2  
(1096) accepted ('127.0.0.1', 42460)  
127.0.0.1 - - [09/Jan/2026 20:36:45] "GET /v1.0/topology/hosts HTTP/1.1" 200 661 0.000430
```

```
mininet@mininet-vm: ~  X  mininet@mininet-vm: ~  X  mininet@mininet-vm: ~  X  +  v
Windows PowerShell
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Install the latest PowerShell for new features and improvements! https://aka.ms/PSWin

PS C:\Users\peeru> ssh -Y mininet@192.168.10.102
mininet@192.168.10.102's password:
Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.4.0-216-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro
Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Inter

Last login: Fri Jan  9 20:05:23 2026 from 192.168.10.101
mininet@mininet-vm:~$ sudo mn --topo=single,3 --controller remote
*** Creating network
*** Adding controller
Connecting to remote controller at 127.0.0.1:6653
*** 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> |
```

```
mininet@mininet-vm:~$ wget -qO- http://127.0.0.1:8080/v1.0/topology/switches
[{"dpid": "0000000000000001", "ports": [{"dpid": "0000000000000001", "port_no": "00000001", "hw_addr": "7a:24:c7:e1:80:c0", "name": "s1-eth1"}, {"dpid": "0000000000000001", "port_no": "00000002", "hw_addr": "c6:7a:e5:70:c7:80", "name": "s1-eth2"}, {"dpid": "0000000000000001", "port_no": "00000003", "hw_addr": "12:46:c5:4d:71:fe", "name": "s1-eth3"}]}]mininet@mininet-vm:~$
mininet@mininet-vm:~$ wget -qO- http://127.0.0.1:8080/v1.0/topology/links
[]mininet@mininet-vm:~$
mininet@mininet-vm:~$ wget -qO- http://127.0.0.1:8080/v1.0/topology/hosts
[{"mac": "ca:08:07:24:07:a1", "ipv4": ["10.0.0.1"], "ipv6": [], "port": {"dpid": "0000000000000001", "port_no": "00000001", "hw_addr": "7a:24:c7:e1:80:c0", "name": "s1-eth1"}}, {"mac": "22:27:87:df:52:b8", "ipv4": ["10.0.0.2"], "ipv6": [], "port": {"dpid": "0000000000000001", "port_no": "00000002", "hw_addr": "c6:7a:e5:70:c7:80", "name": "s1-eth2"}}, {"mac": "86:bb:5e:1d:9e:70", "ipv4": ["10.0.0.3"], "ipv6": [], "port": {"dpid": "0000000000000001", "port_no": "00000003", "hw_addr": "12:46:c5:4d:71:fe", "name": "s1-eth3"}}]mininet@mininet-vm:~$ |
```