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Computer Engineering Department

Software-Defined Networking

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Ryu Controller

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Starting Ryu

EBook: *RYU SDN Framework*
https://ryu-sdn.org/resources.html

```
$ ryu-manager [app_name or app_file]
```

Viewing network topology:

```
$ ryu-manager --observe-links ryu.app.gui_topology.gui_topology
```

```
$ sudo mn –topo linear,3 --controller remote --switch
ovsk,protocols=OpenFlow10
```

Open http://[*controller_host*]:8080 in a browser
127.0.0.1:8080

FlowManager Application

```
$ git clone https://github.com/martimy/flowmanager
```

```
$ ryu-manager --observe-links flowmanager/flowmanager.py
```

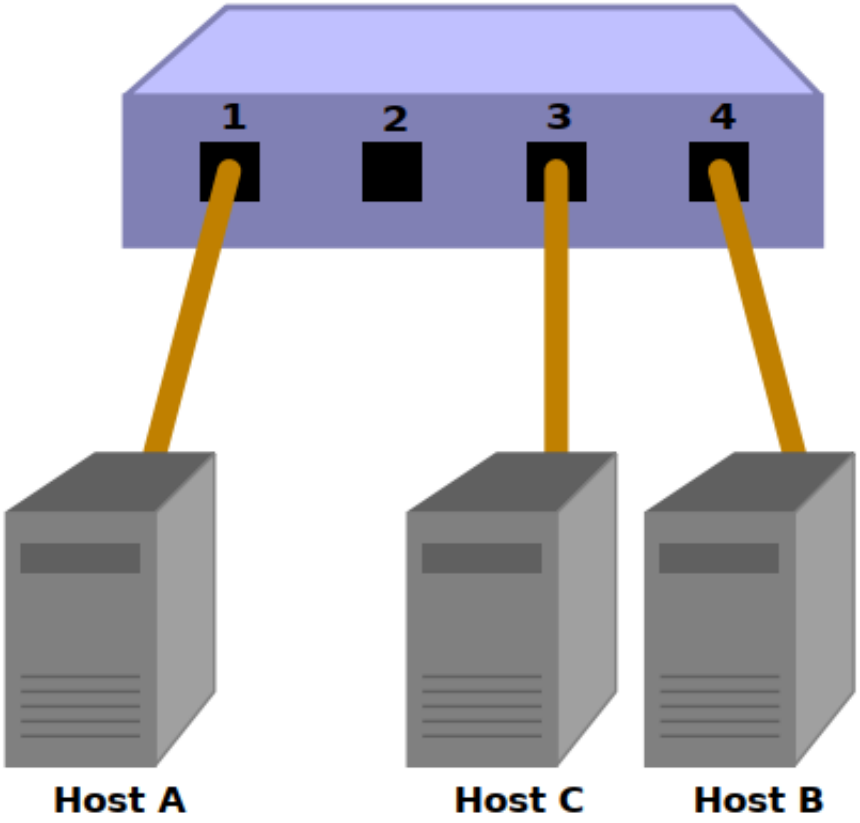
```
$ sudo mn –topo linear,3 --controller remote --switch
ovsk,protocols=OpenFlow13
```

Open http://[*controller_host*]:8080/home/index.html in a browser

Simple Layer-2 switching example

Scenario:

- Host-A is going to ping Host-B (without SDN)
- We assume Host-A already knows the MAC address of Host-B
- The switch's MAC table is empty

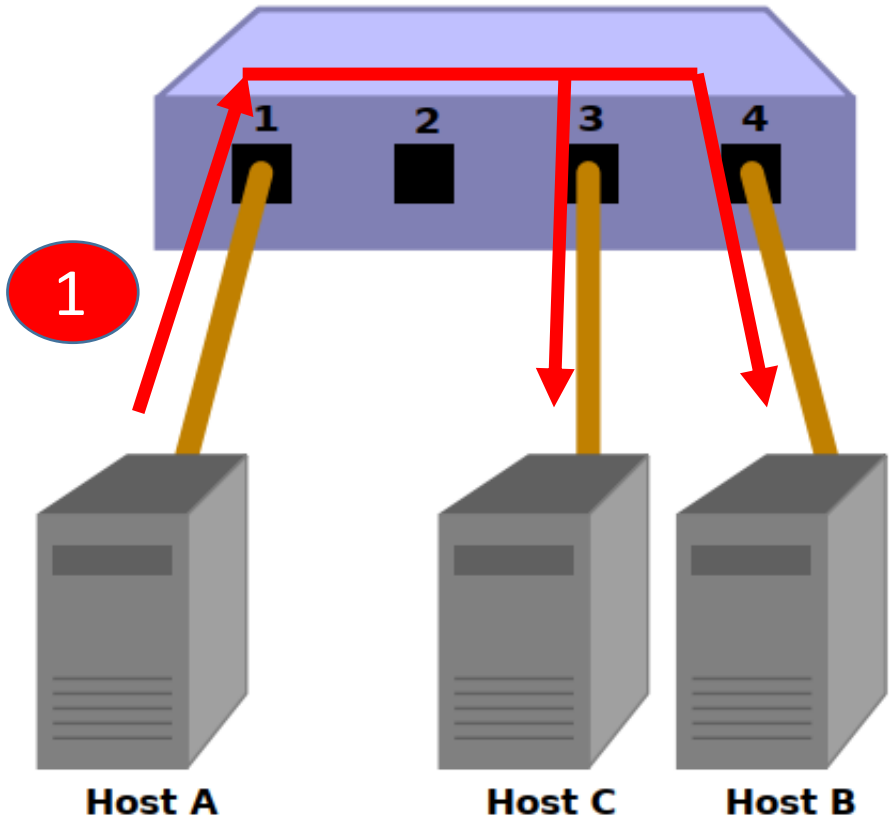


Switch MAC table

MAC	Port

Simple Layer-2 switching example

1 Ping ECHO request packet

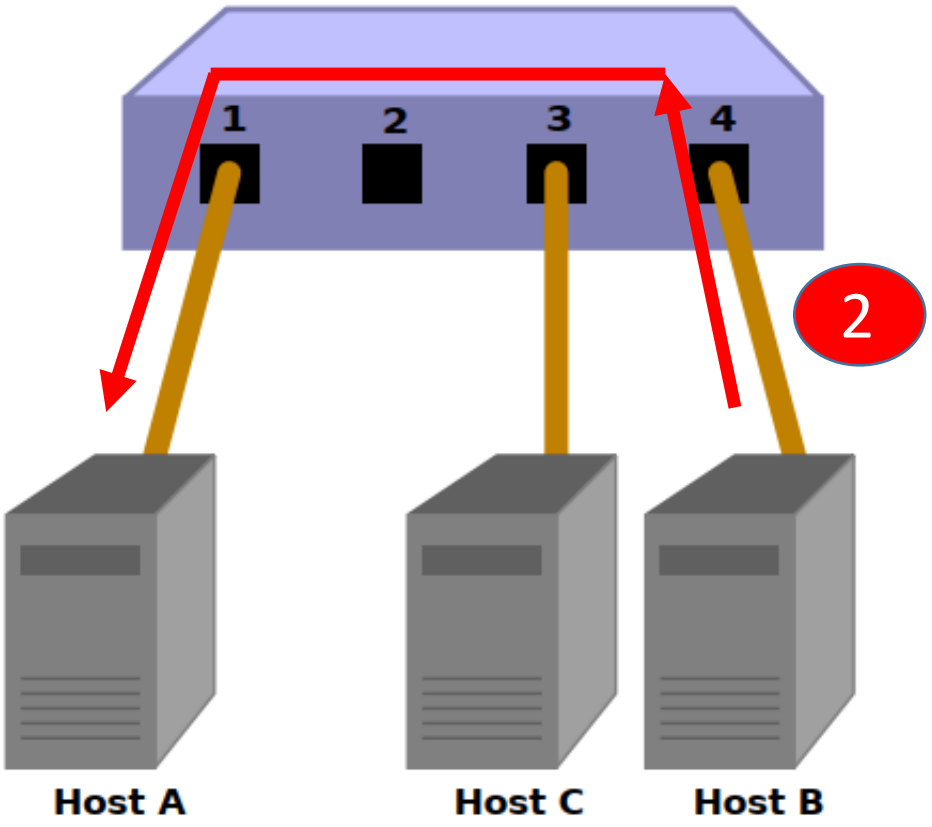


Switch MAC table

MAC	Port
A	1

Simple Layer-2 switching example

2 Ping ECHO reply packet

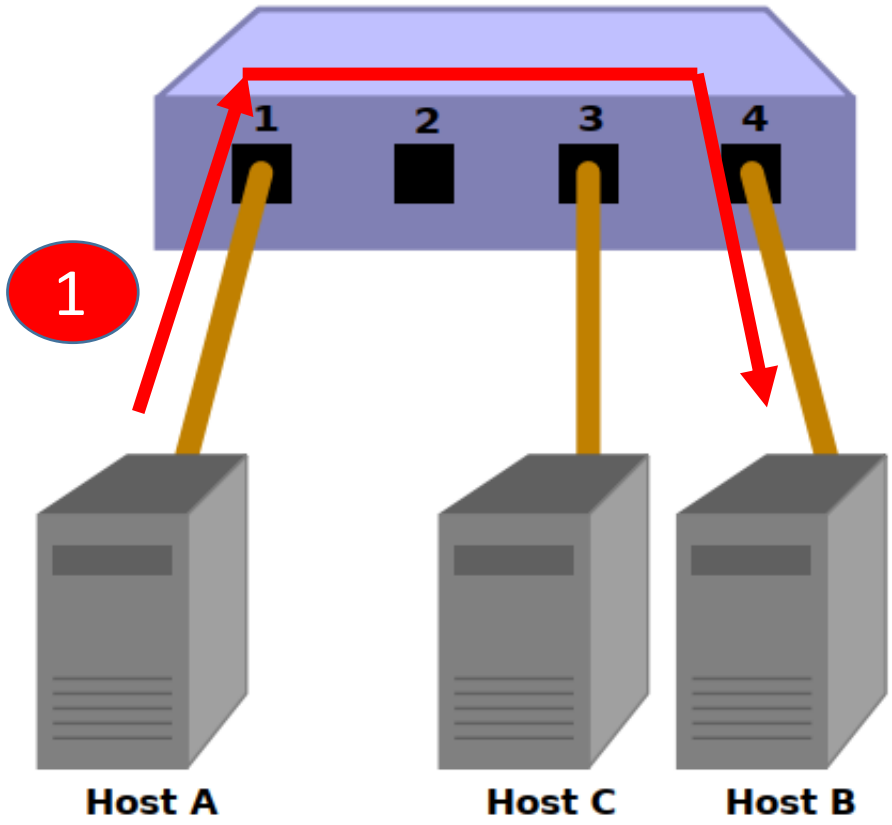


Switch MAC table

MAC	Port
A	1
B	4

Simple Layer-2 switching example

1 Ping ECHO request packet



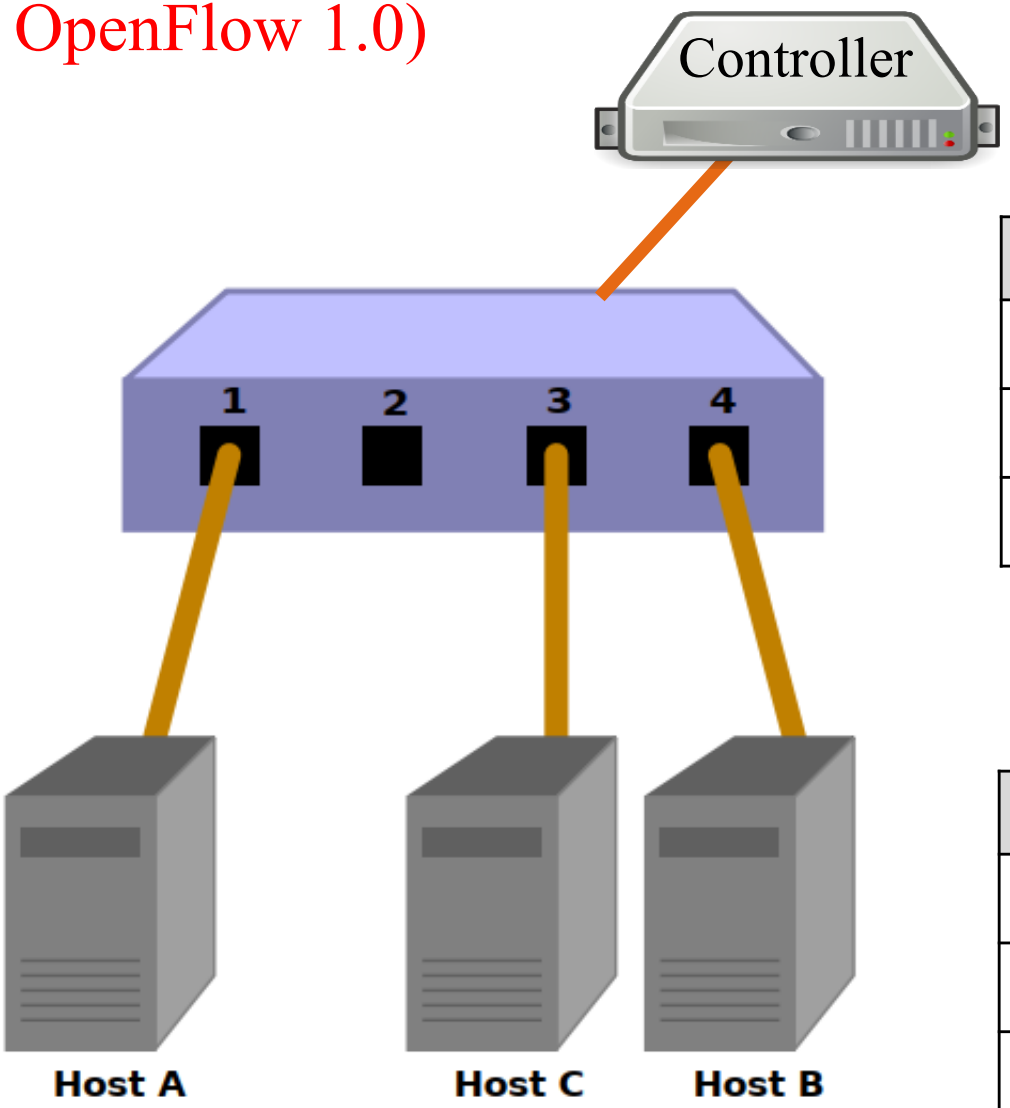
Switch MAC table

MAC	Port
A	1
B	4

Simple Layer-2 switching example

Scenario:

- Host-A is going to ping Host-B (with SDN controller based on OpenFlow 1.0)



Controller application MAC table

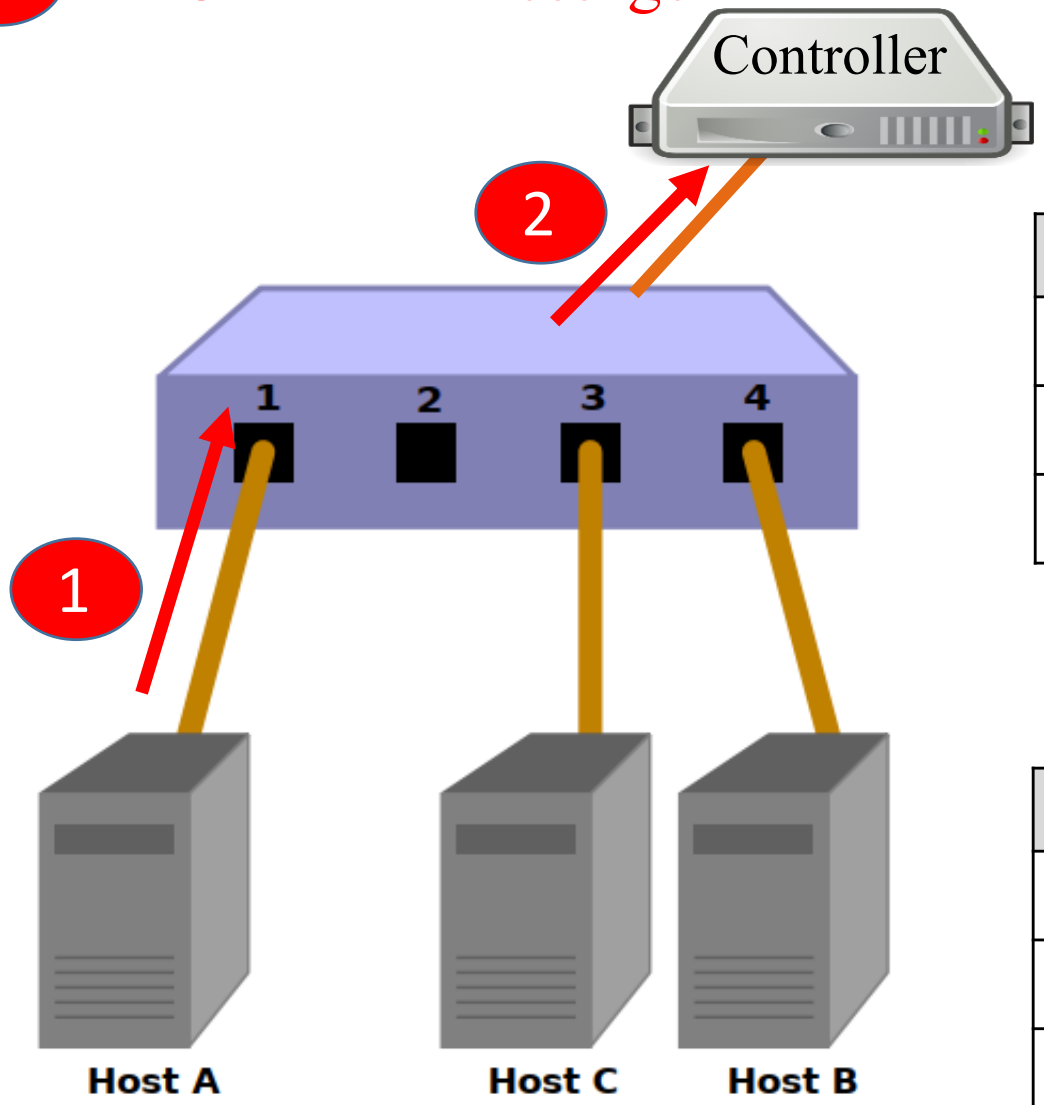
MAC	Port

Switch flow table

Match	Action

Simple Layer-2 switching example

1. Ping ECHO request packet
2. PACKET-IN message



Controller application MAC table

MAC	Port
A	1

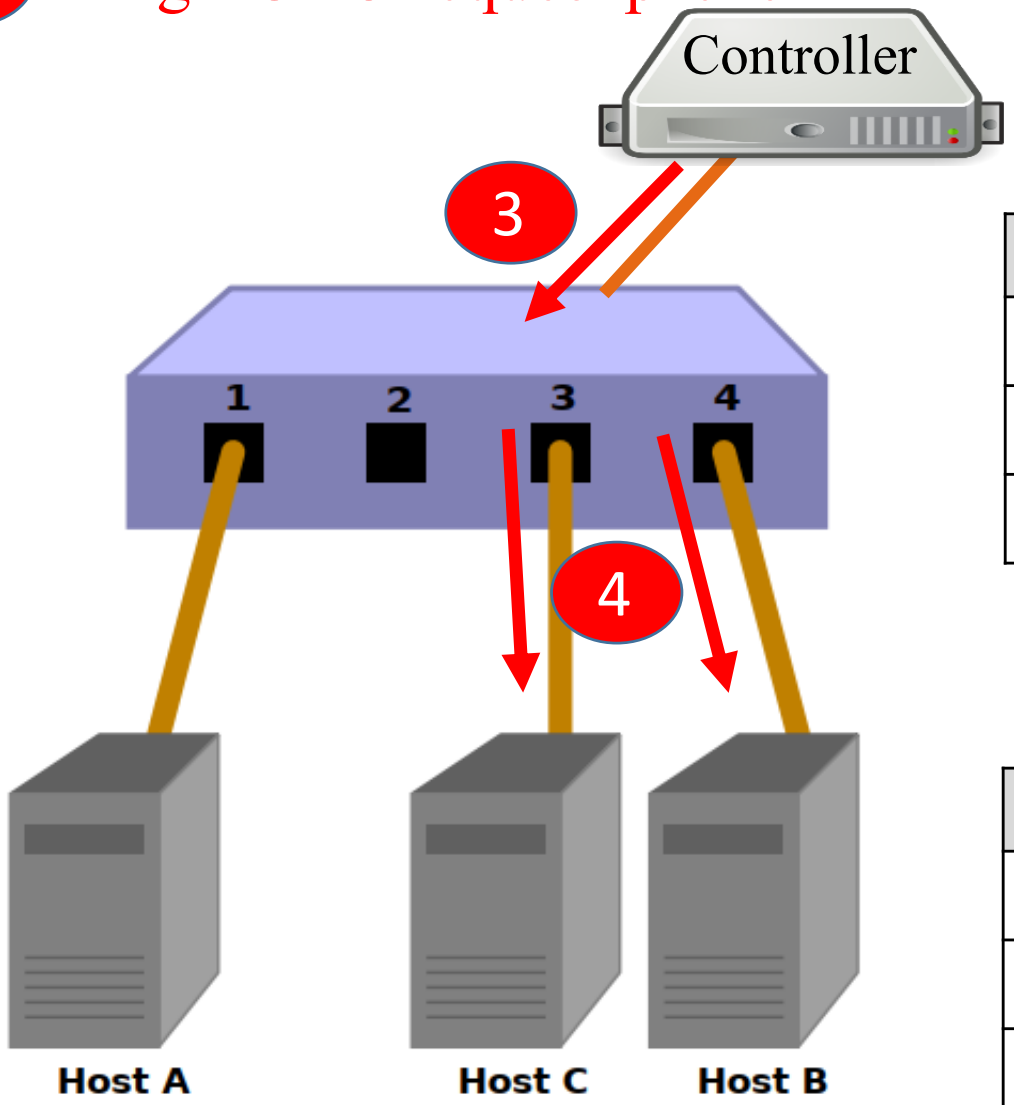
Switch flow table

Match	Action

Simple Layer-2 switching example

3 PACKET-OUT message

4 Ping ECHO request packet



Controller application MAC table

MAC	Port
A	1

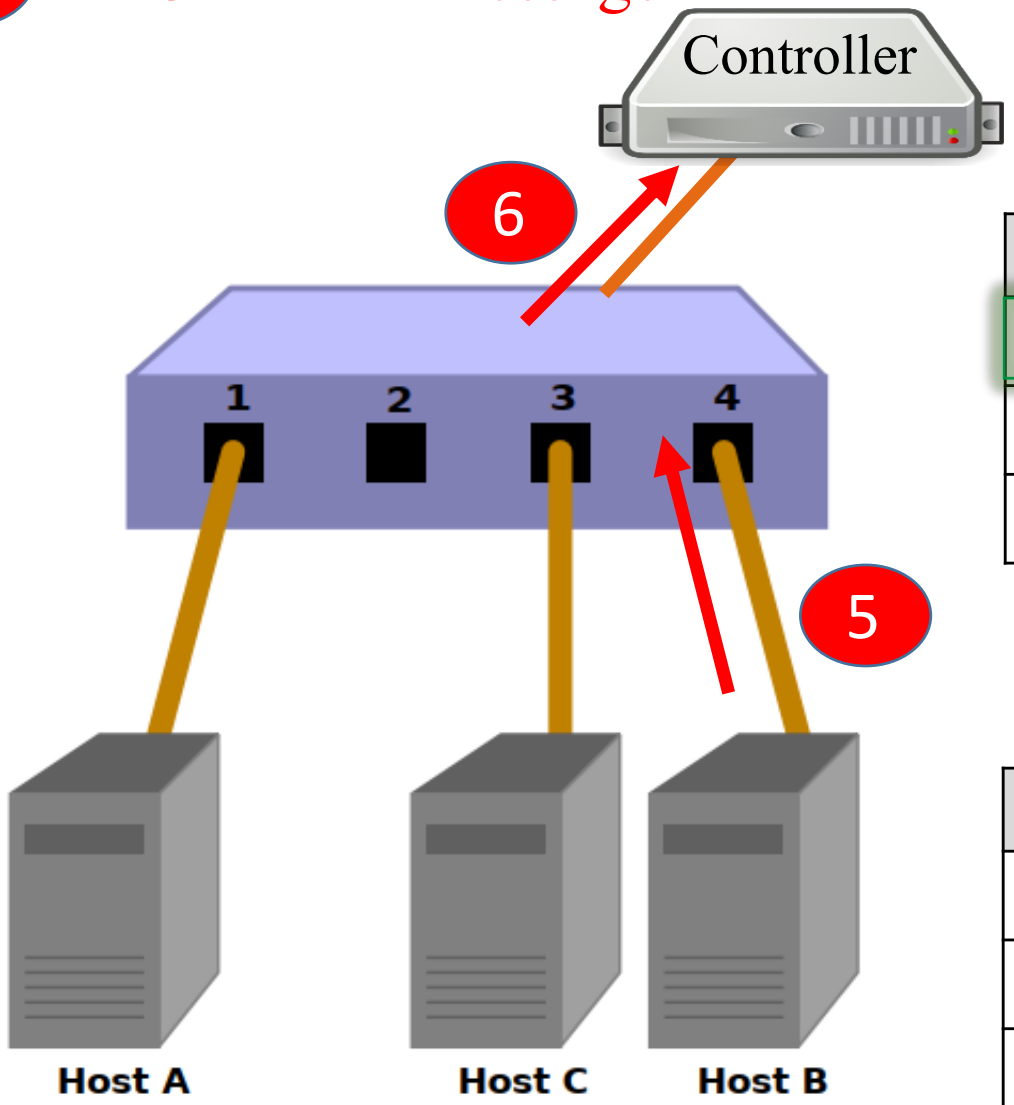
Switch flow table

Match	Action

Simple Layer-2 switching example

5 Ping ECHO reply packet

6 PACKET-IN message



Controller application MAC table

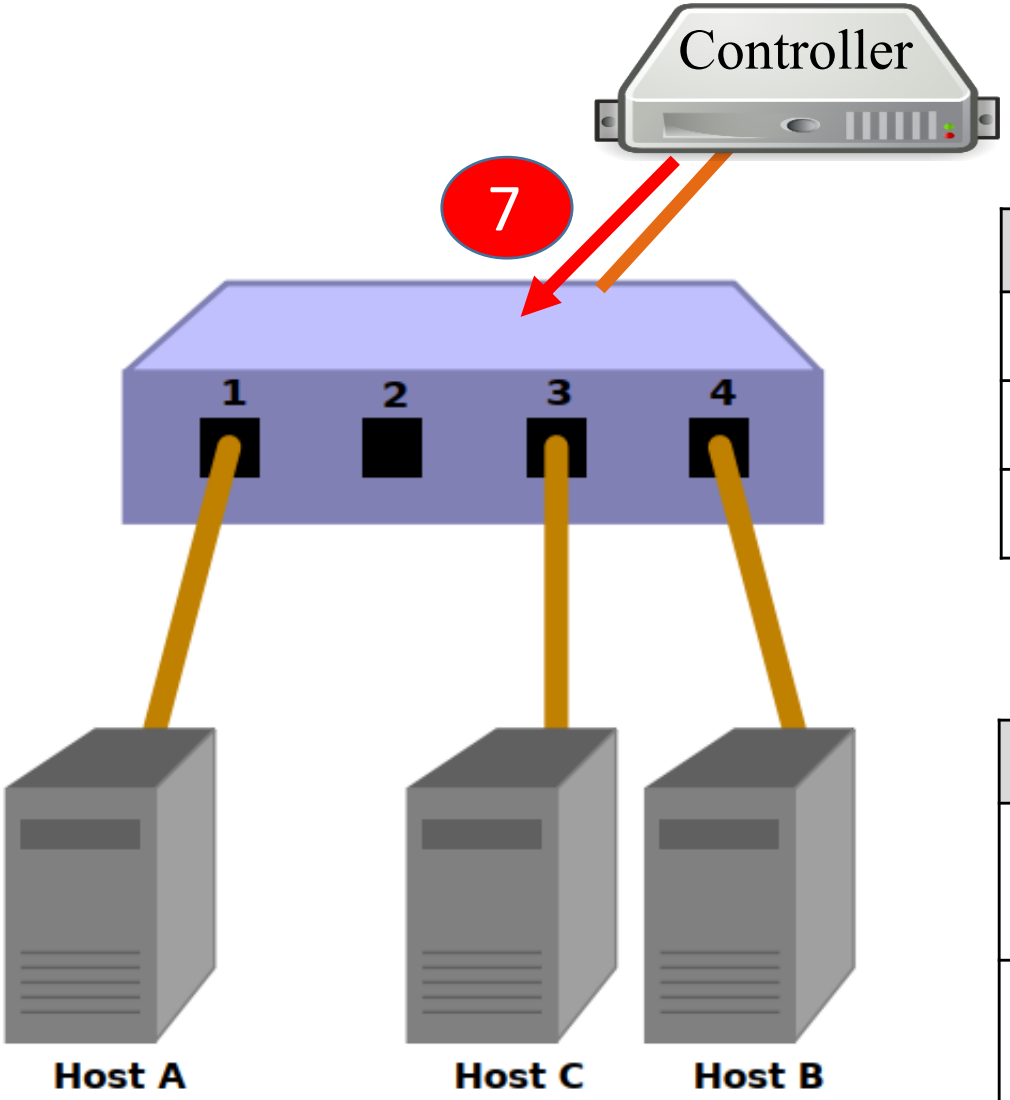
MAC	Port
A	1
B	4

Switch flow table

Match	Action

Simple Layer-2 switching example

7 FLOW-MOD message



Controller application MAC table

MAC	Port
A	1
B	4

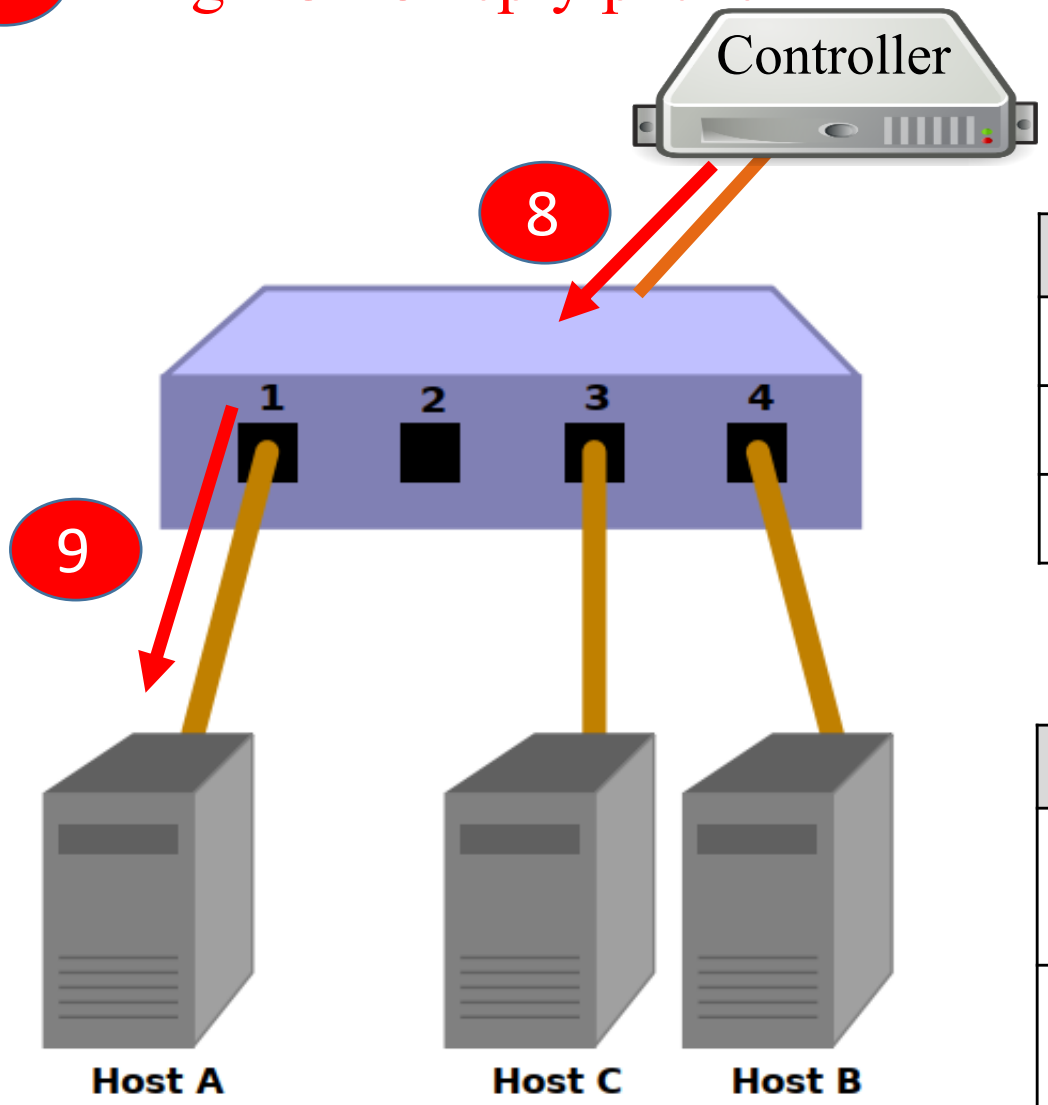
Switch flow table

Match	Action
in_port=4, dst_mac=A	output:1

Simple Layer-2 switching example

8 PACKET-OUT message

9 Ping ECHO reply packet



Controller application MAC table

MAC	Port
A	1
B	4

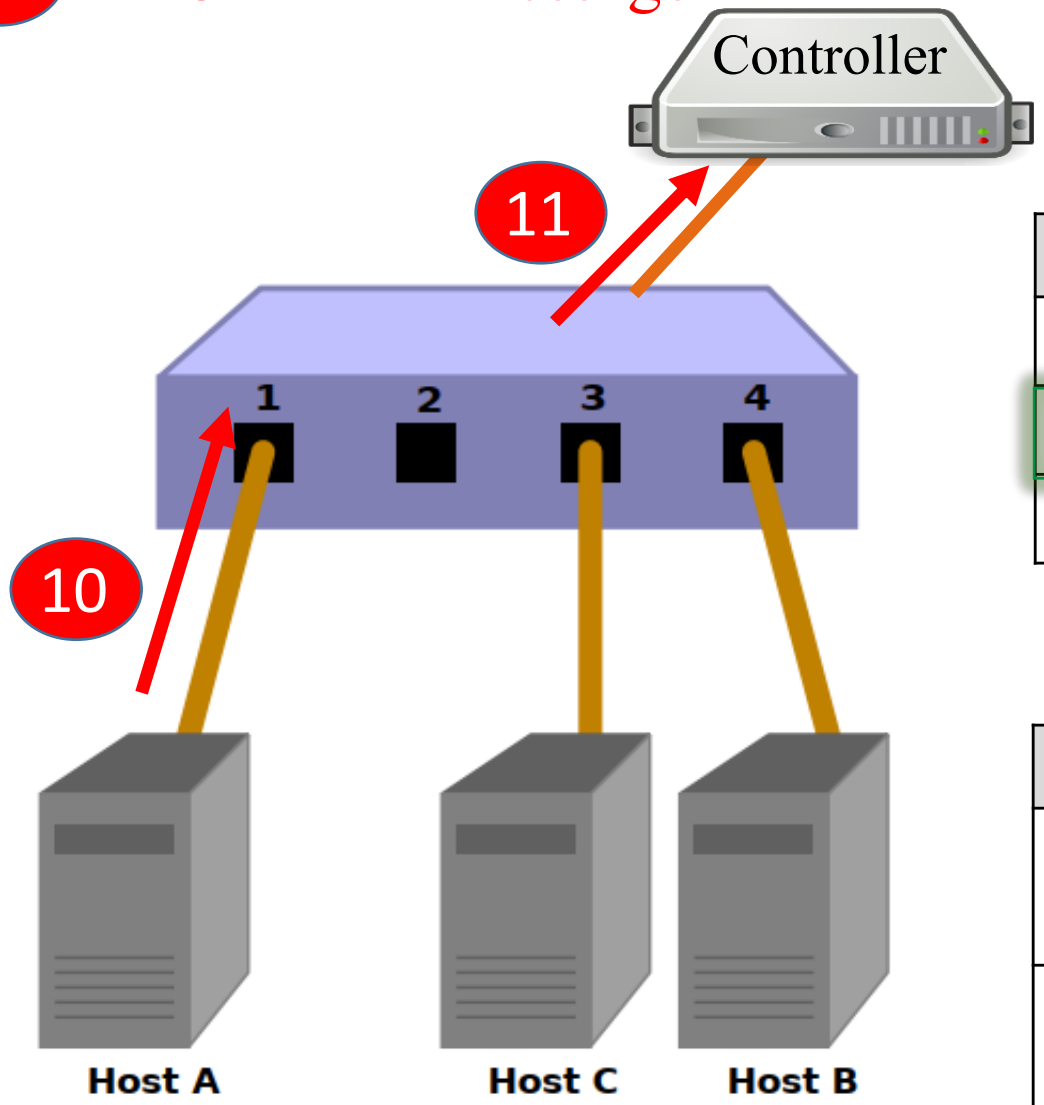
Switch flow table

Match	Action
in_port=4, dst_mac=A	output:1

Simple Layer-2 switching example

10 Ping ECHO request packet

11 PACKET-IN message



Controller application MAC table

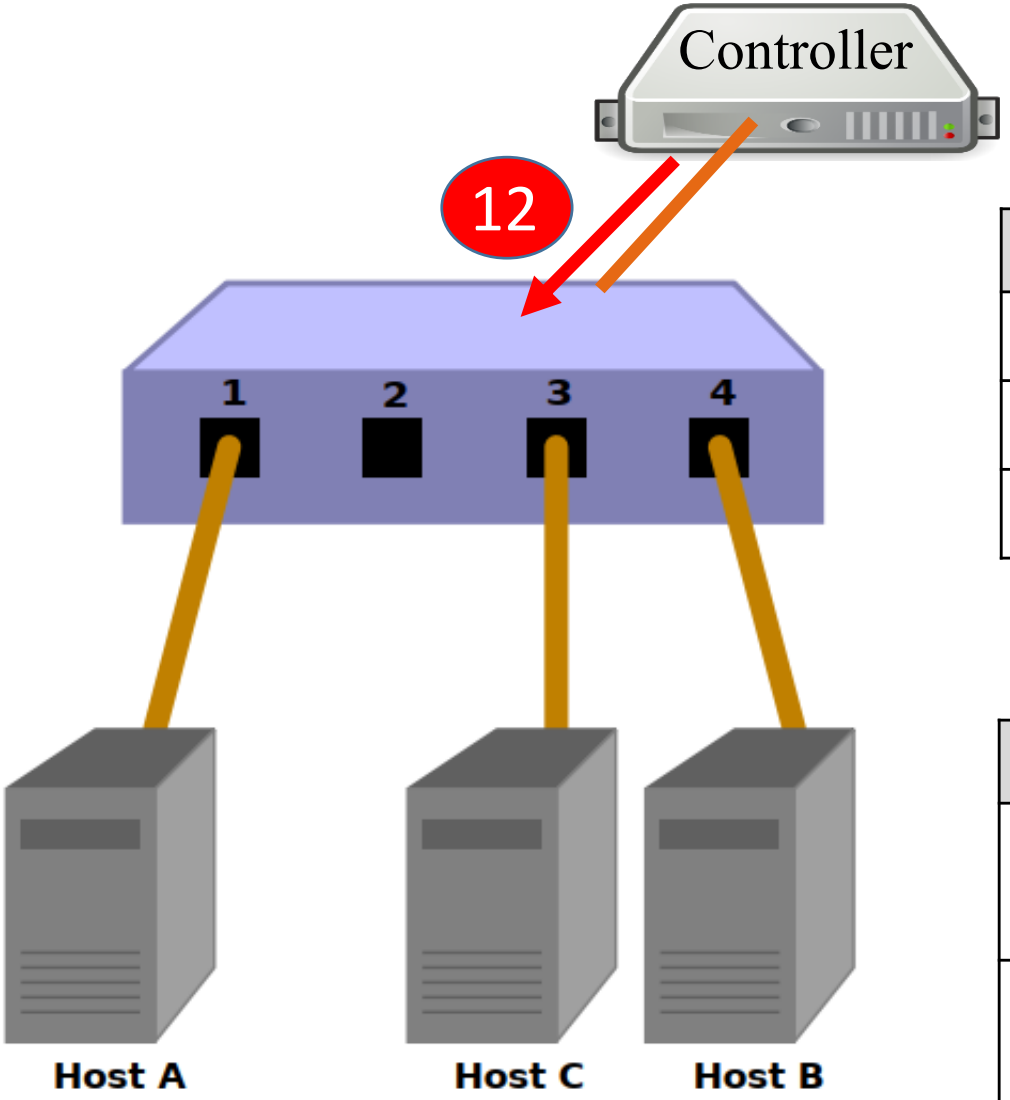
MAC	Port
A	1
B	4

Switch flow table

Match	Action
in_port=4, dst_mac=A	output:1

Simple Layer-2 switching example

12 FLOW-MOD message



Controller application MAC table

MAC	Port
A	1
B	4

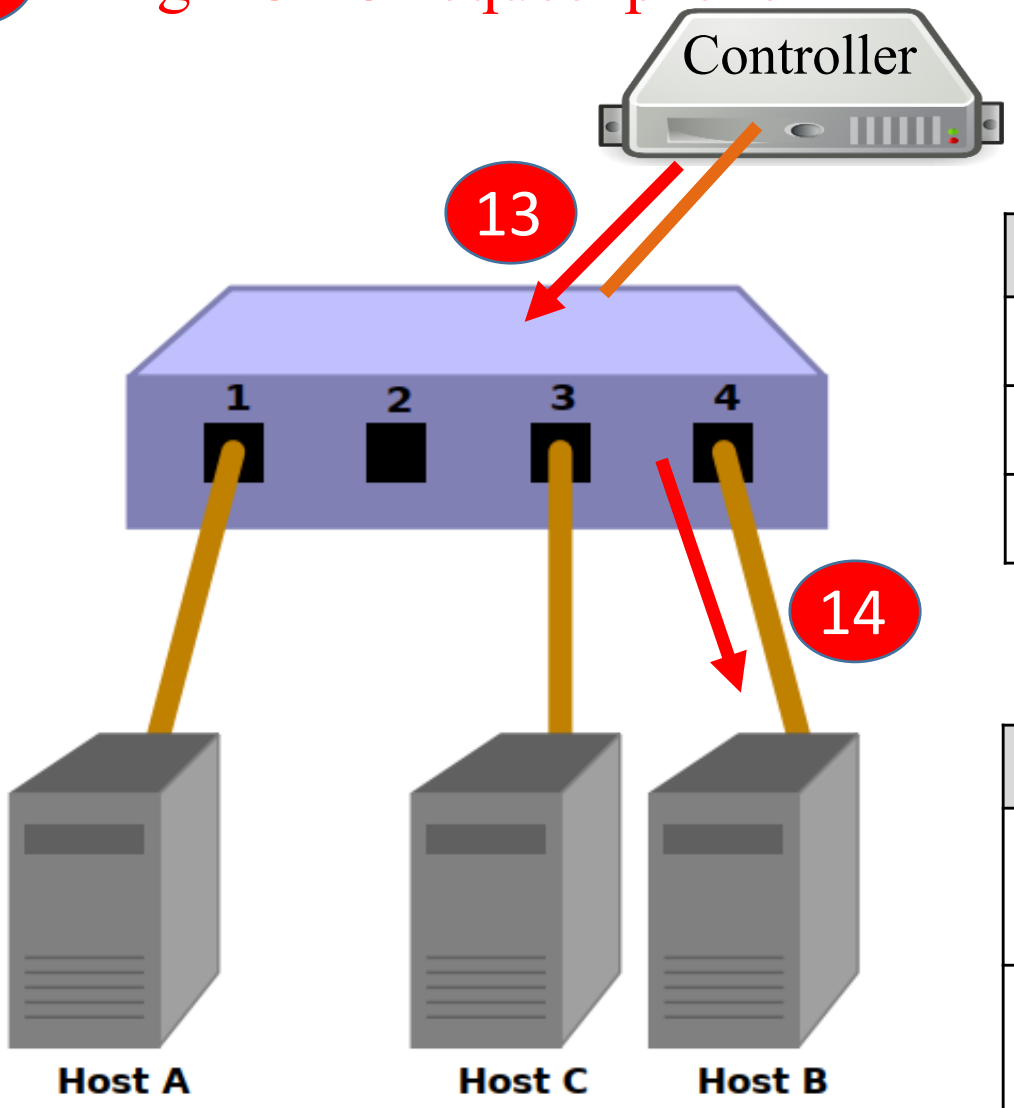
Switch flow table

Match	Action
in_port=4, dst_mac=A	output:1
in_port=1, dst_mac=B	output:4

Simple Layer-2 switching example

13 PACKET-OUT message

14 Ping ECHO request packet



Controller application MAC table

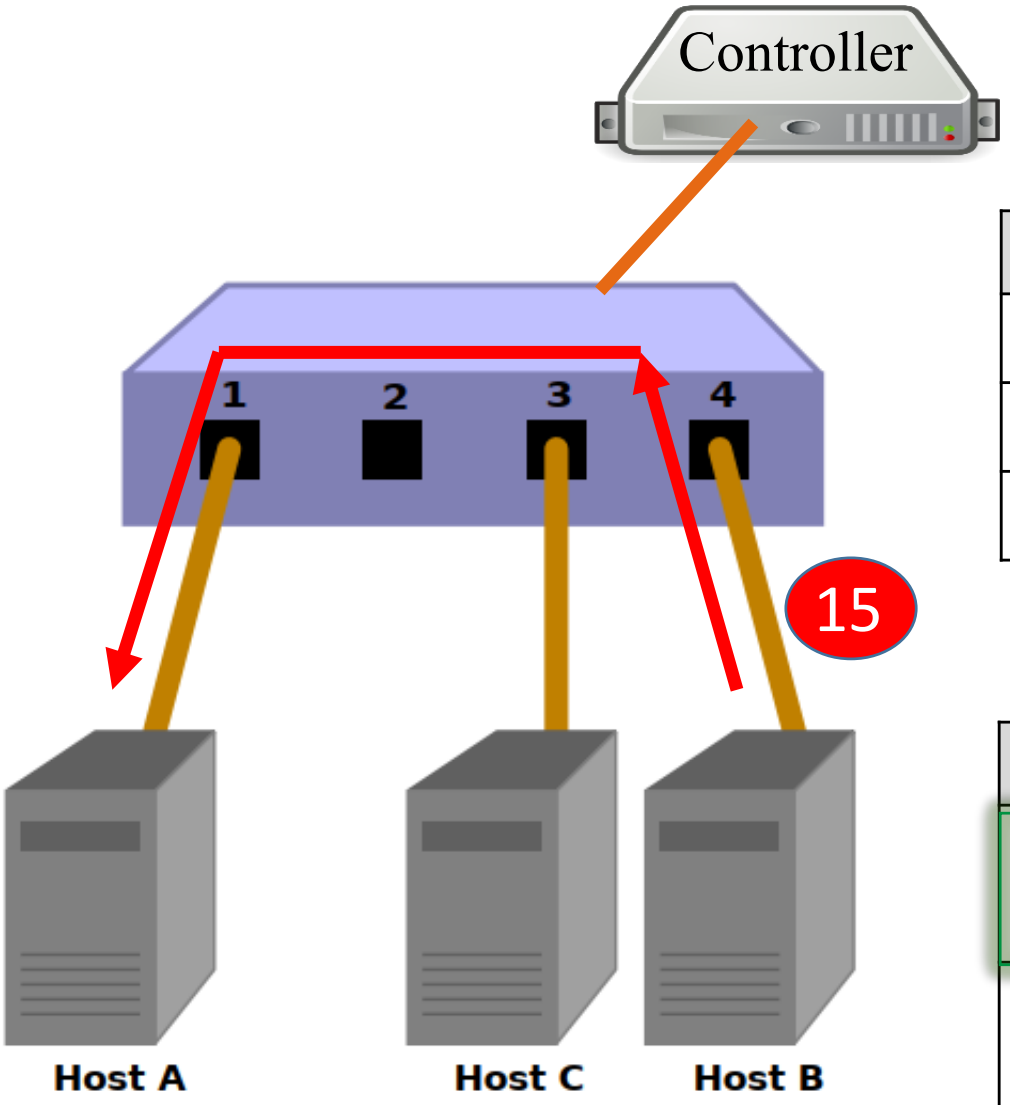
MAC	Port
A	1
B	4

Switch flow table

Match	Action
in_port=4, dst_mac=A	output:1
in_port=1, dst_mac=B	output:4

Simple Layer-2 switching example

15 Ping ECHO reply packet



Controller application MAC table

MAC	Port
A	1
B	4

Switch flow table

Match	Action
in_port=4, dst_mac=A	output:1
in_port=1, dst_mac=B	output:4

Analyzing controller-switch messages in Wireshark

```
$ ryu-manager ryu.app.simple_switch
```

```
$ sudo wireshark
```

```
$ sudo mn --controller remote --switch ovsk,protocols=OpenFlow10
--mac
```

Analyzing *simple_switch.py* code