

Data Center Networking Technology

Project 3

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Outline

- Project Info
- Project Content
- Step-by-Step Instructions
- Demo

Project Info

Goal:

- In this project, student will learn how to create topology in Mininet and use SDN controller to monitor the network system

Project assigned: 2022.3.22

Project deadline: 2022.4.19

Project Content

1. Create a specific topology network system in mininet
2. Modify the SDN controller code based on [simple_switch_13.py](#)
 - To make your controller be able to **monitor the traffic** of the switch
 - Show the **Layer 2 address table** of the switch

| Source Address Table | | | |
|----------------------|------------------------|-------------|------------------------|
| <u>Port</u> | <u>Source MAC Add.</u> | <u>Port</u> | <u>Source MAC Add.</u> |
| | | | |

Step-by-Step Instructions (1/5)

Step 1: Create the topology in mininet

There is a simple custom topology script in mininet at
“<~/mininet/custom/topo-2sw-2host.py>”

We can find three useful
command in the code:

addHost

addSwitch

addLink

```
11 from mininet.topo import Topo
12
13 class MyTopo( Topo ):
14     "Simple topology example."
15
16     def __init__( self ):
17         "Create custom topo."
18
19         # Initialize topology
20         Topo.__init__( self )
21
22         # Add hosts and switches
23         leftHost = self.addHost( 'h1' )
24         rightHost = self.addHost( 'h2' )
25         leftSwitch = self.addSwitch( 's3' )
26         rightSwitch = self.addSwitch( 's4' )
27
28         # Add links
29         self.addLink( leftHost, leftSwitch )
30         self.addLink( leftSwitch, rightSwitch )
31         self.addLink( rightSwitch, rightHost )
32
33
34 topos = { 'mytopo': ( lambda: MyTopo() ) }
```

For “addLink” command, there are some more parameters you
can use to specify the link’s property

**Ex: “self.addLink(sw1,sw2,bw=10,loss=10)” means add a link
with a bandwidth of 10 Mbps, and 10% packet loss rate**

Step-by-Step Instructions (2/5)

Step 1: Create the topology in mininet

Understand this sample script and write the topology script

You can use “**--custom**” , “**--topo**”, “**--link**” to run the topology in mininet

“**--custom**” means use custom topology

“**--topo**” means use topology “mytopo” from the dictionary “topos” in the script.

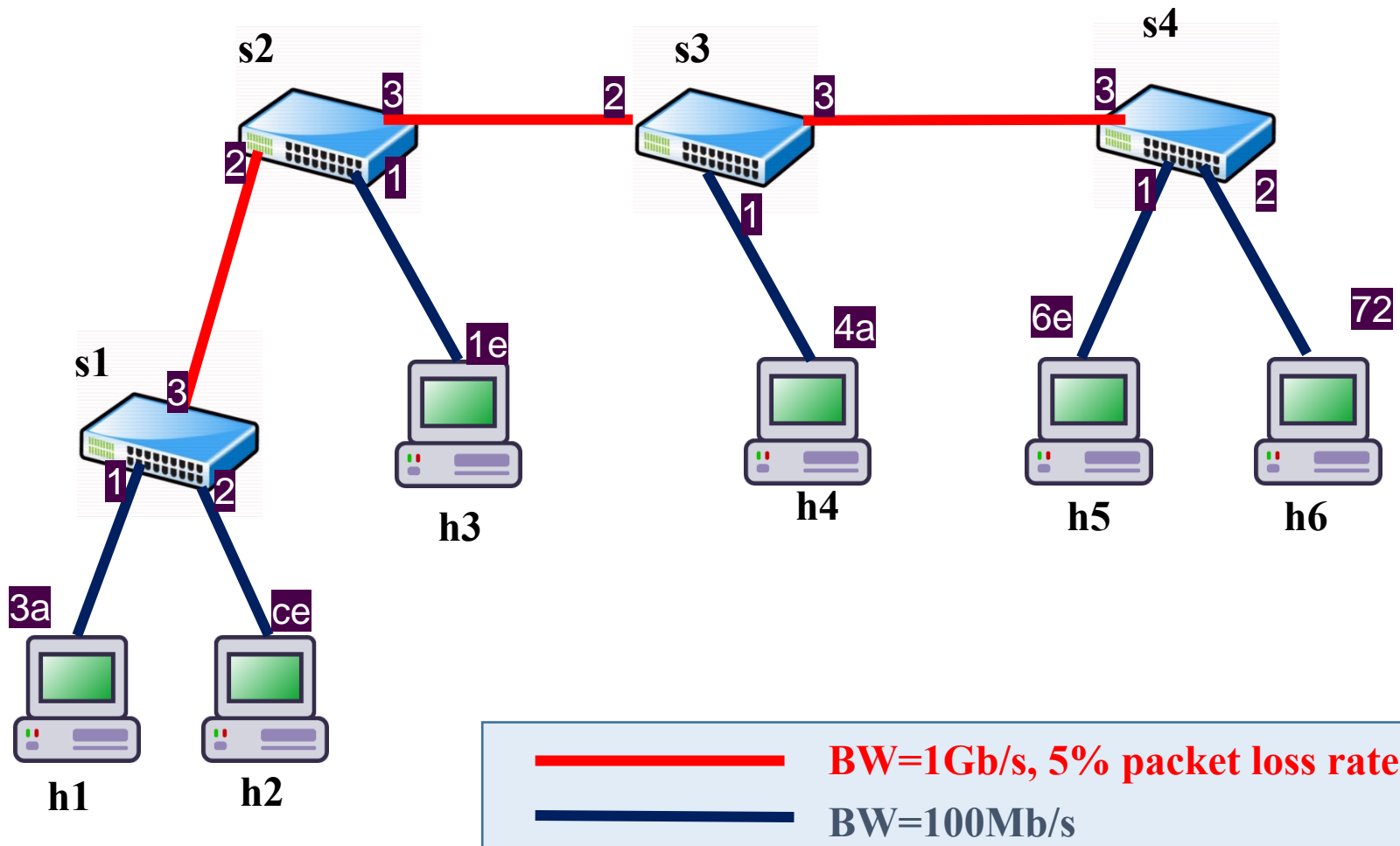
“**--link=tc**” means use traffic control link

Ex:

```
sudo mn --topo mytopo --custom ~/mininet/custom/yourscript.py  
--controller remote --switch default,protocols=OpenFlow13 --  
link=tc
```

Step-by-Step Instructions (3/5)

Step 1: Create the topology in mininet



Step-by-Step Instructions (4/5)

Step 2: Modify the SDN controller code

You need to create a thread to monitor the traffic of all the switches every 5 seconds

Reference : Chap.3 of Ryubook

<http://osrg.github.io/ryu-book/en/Ryubook.pdf>

Use **OFPPortStatsRequest ()**, **OFPPortStatsReply()** to get the switch port information

Reference : Chap.3 of Ryubook or the link below

http://ryu.readthedocs.org/en/latest/ofproto_v1_3_ref.html#multipart-messages

Step-by-Step Instructions (5/5)

Step 2: Modify the SDN controller code

Project 3 requirements:

- The use of **OFPPortStatsRequest ()**, **OFPPortStatsReply()** to get the switch port information
- Information to be monitored:
 - ✓ Switch ID
 - ✓ TX and RX packets information of each port in a switch
 - ✓ Switch MAC Address Table
- Print the address table of all switches every 5 seconds
- Correct topology (pp. 7)

How to test your code:

- Run your code by the command:
“**ryu-manager** **yourcode.py**”
- Test your code with “ping”
Ex: use “h1 ping h2” on mininet terminal makes host1 keep sending packets to host2

```
*****
Switch ID: 1
Port No  Tx-Bytes  Rx-Bytes
-----
          1      4226      4226
          2      4226      4226
          3      5386      5386
fffffffe          0          0

MAC Address Table      Port No.
-----
72:88:4b:32:d9:d4      3
76:31:82:6b:36:34      3
da:d2:c3:91:f8:9f      2
c6:86:f7:78:c5:48      3
46:e4:e8:6a:51:bc      1
26:f6:0e:bc:c9:2f      3
ee:38:e3:41:fc:4d      3
a6:20:09:6c:bd:18      3
16:d3:53:ea:a9:78      3
*****

Switch ID: 4
Port No  Tx-Bytes  Rx-Bytes
-----
          1      4777      4777
          2       866       866
          3       866       866
fffffffe          0          0

MAC Address Table      Port No.
-----
66:f5:ea:e1:97:7f      1
c6:86:f7:78:c5:48      1
46:e4:e8:6a:51:bc      1
ee:38:e3:41:fc:4d      3
a6:20:09:6c:bd:18      1
```

DEMO

- We will have DEMO in 4/19 at MIRC510 (電資大樓)
- Please go to [Google sheet](#) and fill demo time you prefer
- You have to create the topology according to the picture on page 7 and monitor this network system
- Email TAs, if you have any questions
(EX: You have class in demo time)