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 a custom topology in Mininet and use Ryu SDN controller to monitor the network system

Project assigned: 2021.03.30
Project deadline: 2021.04.20

Project Content

1. Create a specific topology network system in Mininet

2. Modify the SDN controller code (simple_switch_13.py)
   - To make your controller able to monitor the traffic of the switch
   - And to also show the Layer 2 MAC address table of the switch
   - **e.g:**

Step-by-Step Instructions (1/5)

Step 1: Create the custom topology in Mininet

There is an example for custom topology script in mininet at "~/mininet/custom/topo-2sw-2host.py"

We can find three useful commend 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 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 custom topology in Mininet

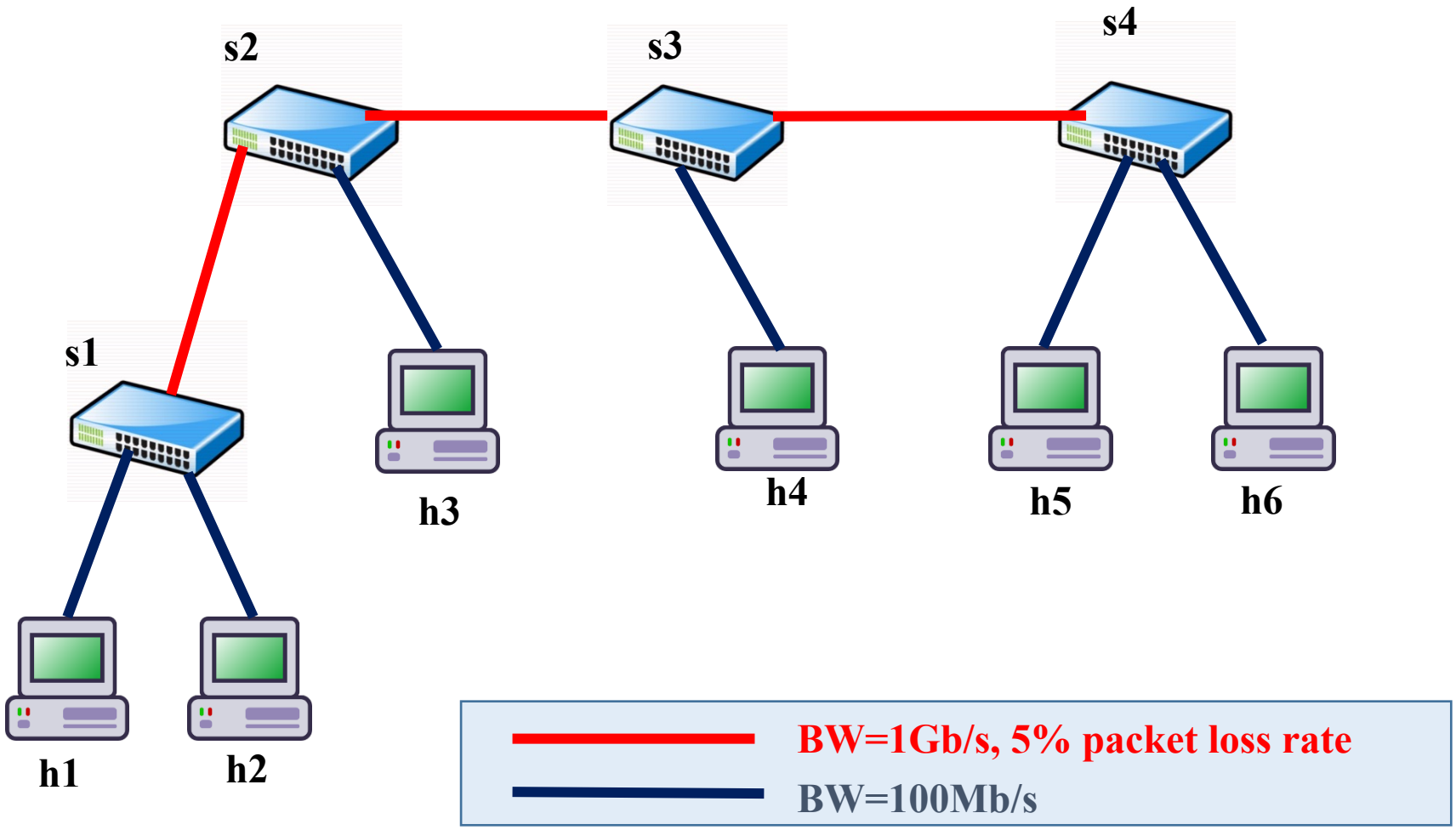
Understand this sample script and write the custom topology script

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

E.g.:
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 custom 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:

1. The use of OFPPortStatsRequest ( ), OFPPortStatsReply( ) to get the switch port information
2. Information to be monitored:
   a. Switch ID; **b.** TX and RX packets information of each port in a switch;
   c. Switch MAC Address Table
3. Print the monitoring information every 5s
4. Correct topology (pp. 7)

To test your code, do the following:

- Run your code by the command "ryu-manager yourcode.py"
- Test your code with "ping"
  E.g.: use "h1 ping h2" on mininet terminal, this makes host1 keep sending packets to host2

```
**************************
Switch ID: 4
Port No  Tx-Bytes  Rx-Bytes
-------  --------  --------
      1       192       104
      2        43       220
      3        43       220
fffffffe         0         0

MAC Address Table   Port No
--------------------------
ca:4a:86:0b:76:90         3
5e:97:7e:3c:06:2e         1
aa:bc:1b:2c:f6:47         1
72:03:25:be:57:8f         1
72:f9:7a:d8:24:ab         2
ea:5a:4e:61:b1:5b         1
82:d0:29:f4:25:75         1
ce:8e:e5:a0:be:8e         1
6a:1a:fd:03:6d:19         1
8e:aa:89:3e:bd:d1         3
b6:40:51:ca:50:1d         1
**************************

**************************
Switch ID: 2
Port No  Tx-Bytes  Rx-Bytes
-------  --------  --------
      1       104       193
      2        43       221
      3       154       154
fffffffe         0         0

MAC Address Table   Port No
--------------------------
5e:97:7e:3c:06:2e         3
72:f9:7a:d8:24:ab         3
8e:aa:89:3e:bd:d1         3
b6:40:51:ca:50:1d         1
ca:4a:86:0b:76:90         3
4a:1d:fa:79:e5:ff         3
aa:bc:1b:2c:f6:47         3
a2:a8:86:0c:16:5c         3
ea:5a:4e:61:b1:5b         1
5a:c6:ce:5e:78:de         3
72:03:25:be:57:8f         1
ce:8e:e5:a0:be:8e         2
**************************
```

DEMO

- We will have DEMO on **04/22 Thursday**
  - Please register for your preferred demo time in the link below
  - GoogleSheet link
- TA will ask questions about your modified controller code
- Email TAs, if you have any questions