

## ELEC5517: Software Defined Networks

### Project II with ONOS controller and P4 language

#### Background

In Information Technology (IT) environment, topologies such as single, linear and tree can be utilised to connect all IT services. Depending on the nature of business and interdependencies amongst IT services, the arrangement of nodes must support efficient operation across the business. Imagine an Internet Service Provider (ISP) providing related IT services to various customers in the telecommunications, banks, and media industries. In this project, your task is to create a simple tree topology based on the IT services provided to these industries. Below is an example of a tree network topology having two levels of switches and a fanout of three (3).

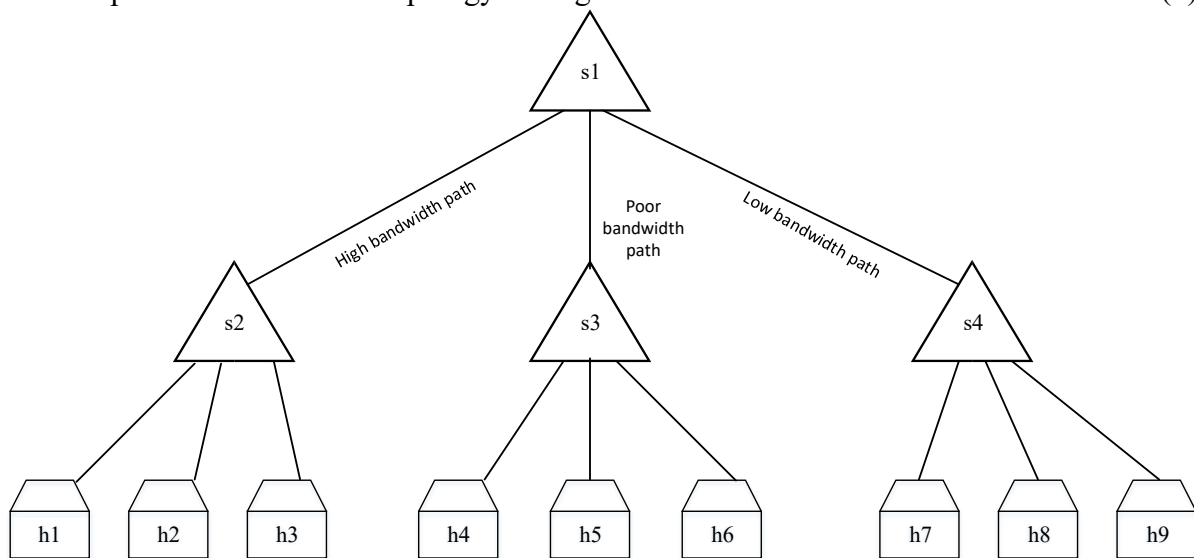


Figure 1: Tree Network Topology

Please perform the following tasks based on the required topology as specified in the background section:

#### Task 1:

- I. Create a topology showing these industries in a network controlled by the ISP. Please avoid exchange of information amongst these industries.
- II. Send HTTP amongst nodes and capture the OpenFlow packets. Analyse the captured packets for each industry and show possible similarities and differences of the results.
- III. Show and assign the bandwidth paths to these industries based on the properties below:
  - a. Voice network
  - b. Data network
  - c. Integrated voice and data network

#### Task 2:

We are required to speed up the network paths as a result of unforeseen delays affecting the network. These delays can have impacts on the read and write access in the network. Based on

the new speed on the network paths, specify the bandwidth paths and corresponding industries to be assigned the following properties in the Mininet environment:

- I. Read access
- II. Write access
- III. Read and write access
- IV. Show the similarities between the results I, II and III above.

### **Task 3:**

Based on the created topology as specified in the background, the ISP has decided to divide the network into two to support inter-communication amongst two industries. In this customised topology, two industries are allowed to communicate with each other while the third industry should not be able communication with the others. Bandwidth paths are equal across all the switches. Below is an example of a sliced topology based on the Figure 1.

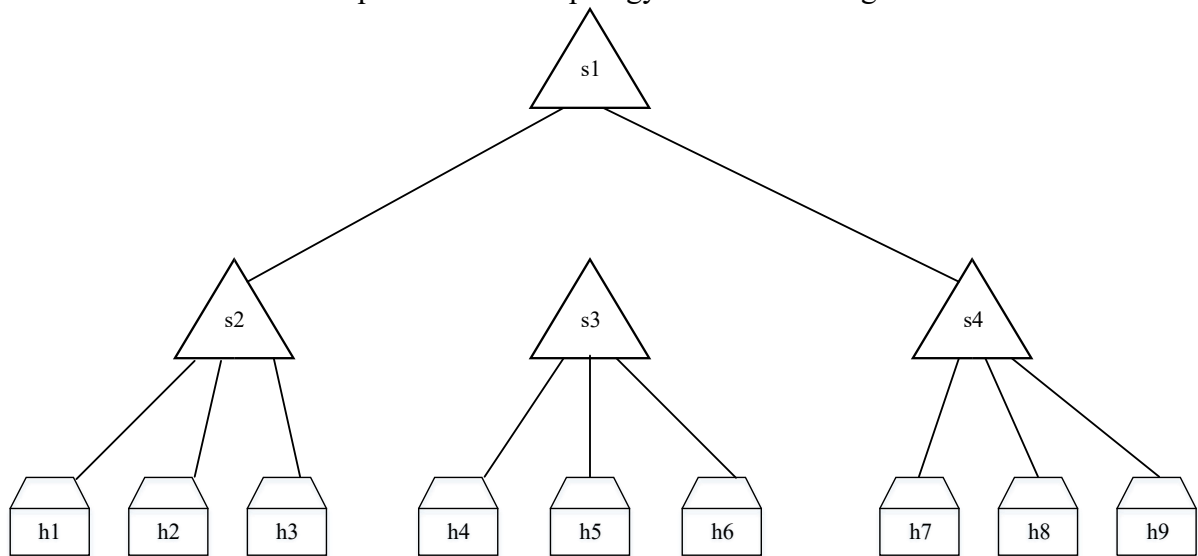


Figure 2: Sliced Tree Network Topology

Perform the following tasks based on the new sliced topology:

- I. Implement the customised topology using ONOS as the controller.
- II. Use ONOS flow endpoint API to achieve isolation of the third industry from the rest of the network.
- III. Display and analyse flow statistics at each of the edge switches using ONOS flow statistics end point API.
- IV. Using host endpoint API please add a new host to edge switch s4.

### **Task 4:**

Based on the requirements, we are required to achieve the following requirements through P4 language.

- I. Drop the NetFlow once the IP equals to h1.
- II. Enable the IPV4 forwarding function.
- III. Increase the survivability in IP headers (TTL)

Based on the requirements, please complete the coding block.

```
control MyIngress( )  
  
    {  
  
    }
```

**Please submit all your codes along with the results of this project. Good luck!**

**ELEC5517 Teaching Team**