Universitat de Lleida

MÀSTER en ENGINYERIA INFORMÀTICA

ESCOLA POLITÈCNICA SUPERIOR

CURS 2020/2021

Communication Services and Security
Exercise 3 - Problem 2

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18/04/21

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1 Introduction

This problem aim is to analyze trraffic flow using Class-Based Weighted Fair Queueing (CBWFQ) of the presented topology scenario. By creating a shell script that computes the percentage of bandwidth occupation at serial link R1-R2 for each of the streams coming from C1-tap0 and C2-tap1. Using tshark application.

2 Implemented Topology

Figure 3 shows the structure of the implemented topology.

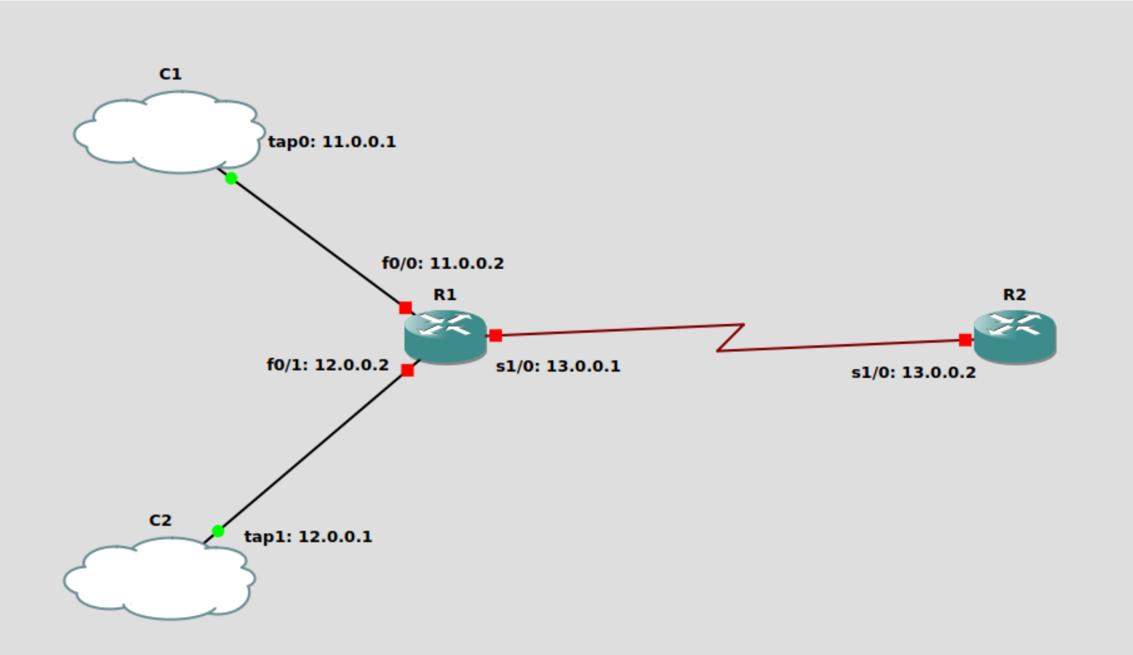


Figure 1: Implemented Topology

3 Configurations

To implement the presented topology where added the following commands on the different elements.

3.1 Computer

1. Tap configuration

```
sudo tunctl -t tap[0|1] -u radu
sudo ip link set tap[0|1] up
sudo ip add add [11.0.0.1/24 dev tap0 | 12.0.0.1/24 dev tap1]
```

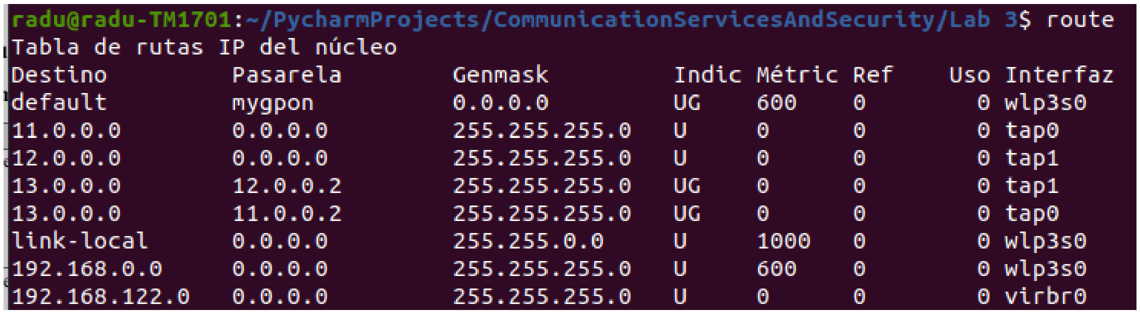
2. Add extra routes

```
sudo route add -net 13.0.0.0/24 gw 11.0.0.2
sudo route add -net 13.0.0.0/24 gw 12.0.0.2
```

3. Flow generation

```
./packETHcli -i tap0 -d 1000 -m 2 -f ping-tap0-100.pcap -n 0
./packETHcli -i tap1 -d 1000 -m 2 -f ping-tap1-300.pcap -n 0
```

The “route” command was used to check that the previous tab interfaces were created correctly.



```
radu@radu-TM1701:~/PycharmProjects/CommunicationServicesAndSecurity/Lab 3$ route
Tabla de rutas IP del núcleo
Destino         Pasarela        Genmask         Indic Métric Ref    Uso Interfaz
default         mygpon          0.0.0.0         UG    600    0        0 wlp3s0
11.0.0.0        0.0.0.0         255.255.255.0   U     0      0        0 tap0
12.0.0.0        0.0.0.0         255.255.255.0   U     0      0        0 tap1
13.0.0.0        12.0.0.2        255.255.255.0   UG    0      0        0 tap1
13.0.0.0        11.0.0.2        255.255.255.0   UG    0      0        0 tap0
link-local      0.0.0.0         255.255.0.0     U     1000   0        0 wlp3s0
192.168.0.0     0.0.0.0         255.255.255.0   U     600    0        0 wlp3s0
192.168.122.0   0.0.0.0         255.255.255.0   U     0      0        0 virbr0
```

Figure 2: Route checking

3.2 Router (R1)

1. Access List 10 Configuration

```
access-list 101 permit ip 11.0.0.0 0.0.0.255 any
access-list 102 permit ip 12.0.0.0 0.0.0.255 any
```

2. Acces Group Per Class Configuration

```
class-map match-all class2
    match access-group 102
class-map match-all class1
    match access-group 101
```

3. Bandwith Per Class Definition

```
policy-map policy1
    class class1
        bandwidth percent 79
    class class2
        bandwidth percent 20
```

4. Interface Fast Ethernet 0/0 Configuration

```
ip address 11.0.0.2 255.255.255.0
duplex auto
no shutdown
```

5. Interface Fast Ethernet 0/1 Configuration

```
ip address 12.0.0.2 255.255.255.0
duplex auto
no shutdown
```

6. Interface Serial 1/0 Configuration

```
ip address 13.0.0.1 255.255.255.0
max-reserved-bandwidth 100
service-policy output policy1
serial restart-delay 0
no shutdown
```

3.3 Router (R2)

1. Default Route Configuration

```
ip route 0.0.0.0 0.0.0.0 13.0.0.1
```

2. Interface Serial 1/0 Configuration

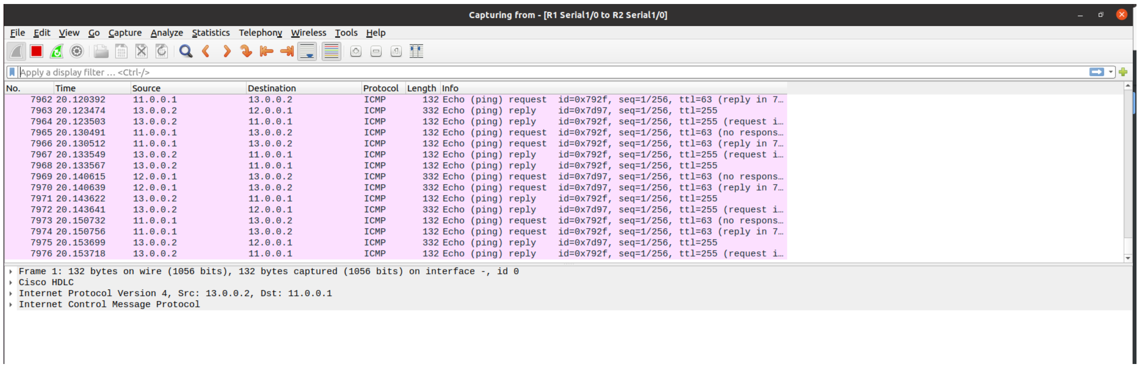
```
ip address 13.0.0.2 255.255.255.0
serial restart-delay 0
no shutdown
```

4 Trace

4.1 Generation

In order to generate traffic the packETH was downloaded and execute with the captures "ping-tap0-100.pcap" and "ping-tap1-300.pcap" provided at CV and executed on the host computer with the previous generated commands:

```
./packETHcli -i tap0 -d 1000 -m 2 -f ping-tap0-100.pcap -n 0
./packETHcli -i tap1 -d 1000 -m 2 -f ping-tap1-300.pcap -n 0
```


Capturing from - [R1 Serial1/0 to R2 Serial1/0]
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter … <Ctrl-/>

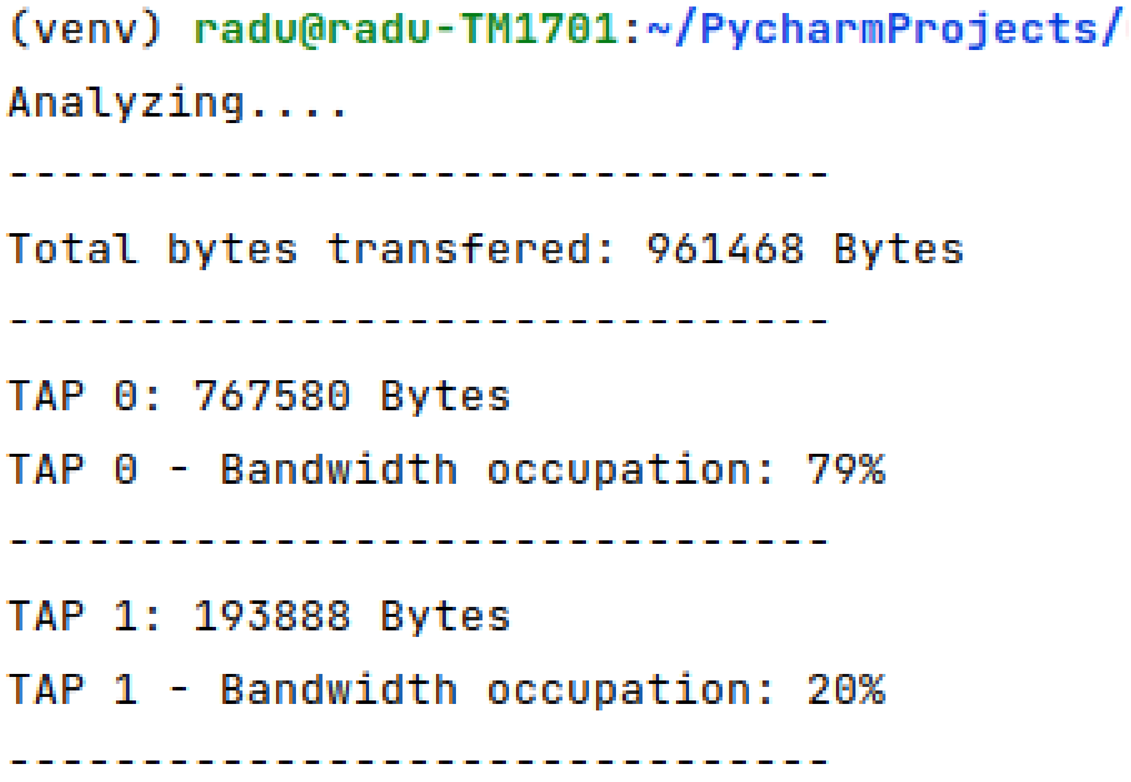
No.	Time	Source	Destination	Protocol	Length	Info
7962	20.120392	11.0.0.1	13.0.0.2	ICMP	132	Echo (ping) request id=0x792f, seq=1/256, ttl=63 (reply in 7…
7963	20.123474	13.0.0.2	12.0.0.1	ICMP	332	Echo (ping) reply id=0x7d97, seq=1/256, ttl=255
7964	20.123503	13.0.0.2	11.0.0.1	ICMP	132	Echo (ping) reply id=0x792f, seq=1/256, ttl=255 (request i…
7965	20.130491	11.0.0.1	13.0.0.2	ICMP	132	Echo (ping) request id=0x792f, seq=1/256, ttl=63 (no respons…
7966	20.130512	11.0.0.1	13.0.0.2	ICMP	132	Echo (ping) request id=0x792f, seq=1/256, ttl=63 (reply in 7…
7967	20.133549	13.0.0.2	11.0.0.1	ICMP	132	Echo (ping) reply id=0x792f, seq=1/256, ttl=255 (request i…
7968	20.133567	13.0.0.2	11.0.0.1	ICMP	132	Echo (ping) reply id=0x792f, seq=1/256, ttl=255
7969	20.140615	12.0.0.1	13.0.0.2	ICMP	332	Echo (ping) request id=0x7d97, seq=1/256, ttl=63 (no respons…
7970	20.140639	12.0.0.1	13.0.0.2	ICMP	332	Echo (ping) request id=0x7d97, seq=1/256, ttl=63 (reply in 7…
7971	20.143622	13.0.0.2	11.0.0.1	ICMP	132	Echo (ping) reply id=0x792f, seq=1/256, ttl=255
7972	20.143641	13.0.0.2	12.0.0.1	ICMP	332	Echo (ping) reply id=0x7d97, seq=1/256, ttl=255 (request i…
7973	20.150732	11.0.0.1	13.0.0.2	ICMP	132	Echo (ping) request id=0x792f, seq=1/256, ttl=63 (no respons…
7974	20.150756	11.0.0.1	13.0.0.2	ICMP	132	Echo (ping) request id=0x792f, seq=1/256, ttl=63 (reply in 7…
7975	20.153699	13.0.0.2	12.0.0.1	ICMP	332	Echo (ping) reply id=0x7d97, seq=1/256, ttl=255
7976	20.153718	13.0.0.2	11.0.0.1	ICMP	132	Echo (ping) reply id=0x792f, seq=1/256, ttl=255 (request i…

```
› Frame 1: 132 bytes on wire (1056 bits), 132 bytes captured (1056 bits) on interface -, id 0
› Cisco HDLC
› Internet Protocol Version 4, Src: 13.0.0.2, Dst: 11.0.0.1
› Internet Control Message Protocol
```

Figure 3: Trace Generation

4.2 Analysis

The implemented script is executed with the command “sudo bash ./script.sh”. As it is shown in the Figure 4 the control algorithm based on traffic ratios worked as expected, 80% of the bandwith was assigned to **class1** and 20% to **class2**. As a final clarification the sum of the bandwith percentages assigned on a plociy can’t overpass 99%, that’s why class1 was reduced to 79%.



```
(venv) radu@radu-TM1701:~/PycharmProjects/
Analyzing....
-------------------------------
Total bytes transfered: 961468 Bytes
-------------------------------
TAP 0: 767580 Bytes
TAP 0 - Bandwidth occupation: 79%
-------------------------------
TAP 1: 193888 Bytes
TAP 1 - Bandwidth occupation: 20%
-------------------------------
```

Figure 4: Trace Analysis Output