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Communication Services and Security
Exercise 3 - Problem 1

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1 Introduction

This problem aim is to analyze traffic flow using Committed Access Rate (CAR) of the presented topology scenario. By creating a shell script that computes the average rate for the following traffic flows:

- From 11.0.0.1 with precedence 7
- From 11.0.0.1 with precedence 1
- From 12.0.0.1

Captured at interface R1-s1/0. Use tshark application.

2 Implemented Topology

Figure 3 shows the structure of the implemented topology.

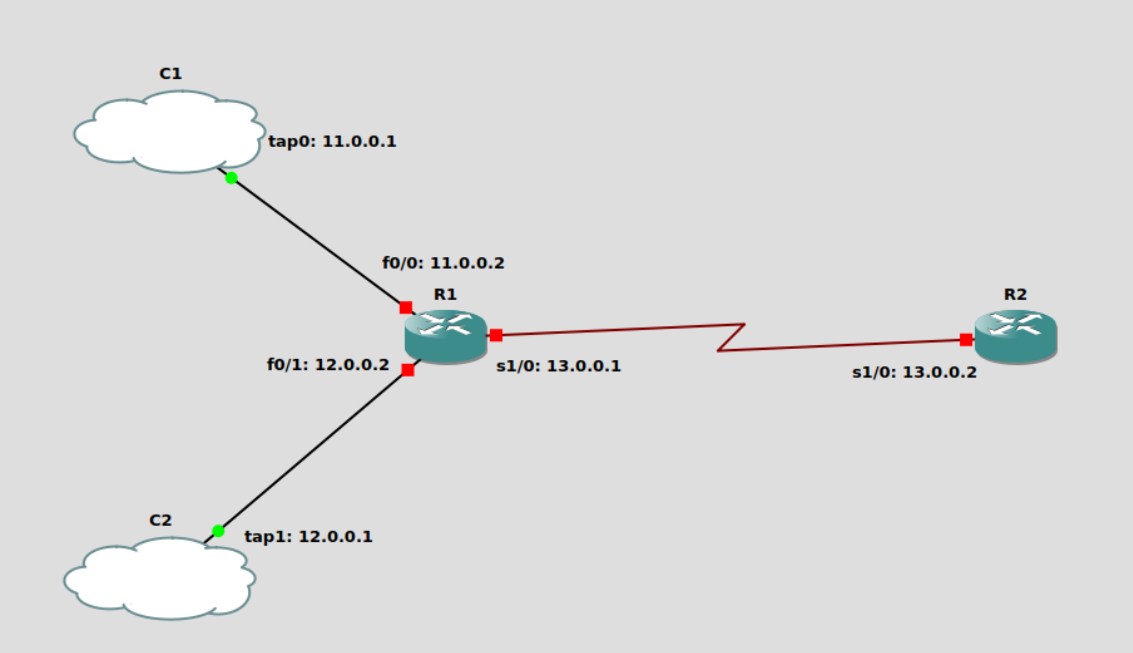

Figure 1: Implemented Topology

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. Ping

```
ping -I tap0 13.0.0.2 -s 2000 -i 1 # from C1 to R2
ping -I tap1 13.0.0.2 -s 3000 -i 1 # from C2 to R2
```

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

```
radu@radu-TM1701:~$ 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 checker

3.2 Router (R1)

1. Access List 10 Configuration

```
access-list 10 permit 11.0.0.1
```

2. Interface Fast Ethernet 0/0 Configuration

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

3. Interface Fast Ethernet 0/1 Configuration

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

4. Interface Serial 1/0 Configuration

```
ip address 13.0.0.1 255.255.255.0
rate-limit output access-group 10 8000 2000 2000 conform-action set-prec-transmit 7\
exceed-action set-prec-transmit 1
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

To generate traffic between the interface, the commands showed before were executed in the host computer in 2 different terminals simultaniousley. First to send 2000 bytes every second at a rate of 16Kbps:

```
ping -I tap0 13.0.0.2 -s 2000 -i 1 # from C1 to R2
```

And for sending 3000 bytes every second at a rate of 24Kbps:

```
ping -I tap1 13.0.0.2 -s 3000 -i 1 # from C2 to R2
```

4.2 Analysis

Simultaneously the "Wireshark" program was used to capture the interface R1-s1/0 for 42 seconds. After, to compute the different average rates a shell script was implemented using "tshark" application commands. The command to execute the script and the output are shown in the following figure:

```
radu@radu-TM1701:~/PycharmProjects/CommunicationServicesAndSecurity/Lab 3$ bash
 script.sh
Analyzing....
Trace duration: 42.145957000 s.
--------IP Precedence 7--------
Total bytes: 35504 bytes.

Average rate: 6739 bps.
------------------------------

--------IP Precedence 1--------
Total bytes: 32344 bytes.

Average rate: 6139 bps.
------------------------------

----IP Without Precendence-----
Total bytes: 107800 bytes.

Average rate: 20462 bps.
------------------------------
```

Figure 3: Script Execution

4.3 Results

The following table shows the obtained results after executing the script:

Precedence	Bytes	Avg Rate (bps)
7	35.504	6739
1	32.344	6139
No - Precedence	107.800	20.462

As it's the average rate from 11.0.0.1 with precedence 7 and 1 are very approximate. We conclude that this fact is caused by the rate limit which is configured to 8.000 bps. From the interface tap0, it's sent 2.000 bytes every second, which is 16.000 bps. So every second, the first 8.000 bits are considered conforming traffic and the rest of the bits are considered exceeding traffic. The traffic from tap1 is not marked, so it doesn't have any rate limit and has a higher average rate than tap0.