

# Advanced Networking 2020

LAB #2: COS AND DSCP  
Total points: 15 pts

## ASSIGNMENT

LAB DATE: FEBRUARY 14 AND FEBRUARY 18, 2020  
SUBMISSION DATE: FEBRUARY 20, 2020 AT 23:59 CET

*Author: Sara Shakeri, Jamila Alsayed Kassem, Peter Prjevara , Vincent Breider and Paola Grosso*

Email: [s.shakeri@uva.nl](mailto:s.shakeri@uva.nl), [j.alsayedkassem@uva.nl](mailto:j.alsayedkassem@uva.nl), [peter@os3.nl](mailto:peter@os3.nl), [vincent@os3.nl](mailto:vincent@os3.nl), [p.grosso@uva.nl](mailto:p.grosso@uva.nl)

UNIVERSITY OF AMSTERDAM

## Abstract

The first goal of this assignment is to let you familiarize with the basic configuration of an Ethernet switch; the second goal is to be able to configure basic QoS, by using CoS and DSCP.

## Preparation

Work in groups of 4 people. You will have to register in a group in Canvas. More instructions will be given during the lecture. You will be configuring Cisco 3750 switches. The user documentation is available at <http://software.os3.nl/AdvancedNetworking/> (available only from the OS3 network).

You might find it useful to refer to the following:

- Cisco: QoS Configuration Examples (esp. Egress QoS Features) <http://www.cisco.com/c/en/us/support/docs/switches/catalyst-3750-series-switches/91862-cat3750-qos-config.html#topic3>
- Cisco: Configuring QoS Guide ([http://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst3750/software/release/12-2\\_52\\_se/configuration/guide/3750scg/swqos.html](http://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst3750/software/release/12-2_52_se/configuration/guide/3750scg/swqos.html))
- Cisco: Cisco Catalyst 3750 QoS Configuration Examples (<https://www.cisco.com/c/en/us/support/docs/switches/catalyst-3750-series-switches/91862-cat3750-qos-config.html>)

There are two serial console servers, serialserv3 and serialserv4 located near the switches. You can use these to connect to the switches' serial ports for configuration as follows. First, connect one of your machines via UTP to one of the switches labeled "Mgmt" (Nortel 5510s or Dell 5524). These Mgmt switches form a management network for this and other labs, and are located near your servers. Next, assign your machine an IP address in the range 10.0.1.64-254. Then, ssh into the serial server (10.0.1.4, 10.0.1.5 ) using the following credentials:

Username is: dialout

Password: os3xsjun

Once logged in, you can access the four serial ports via

```
minicom -b 9600 -D /dev/ttyUSBz
```

where z is 0...3. Port 0 is the leftmost serial port, port 3 the rightmost. Coordinate with your fellow students who uses which port. Finally, use a serial cable (e.g. light blue with RJ45 ) to connect to the switch's console (located at the back of the switch).

## Task 0: Connection to the switch

1. Connect to the serial console of the switch (directly, or via the serial servers).

2. Assign a private IP address, in range of 10.0.1.0/24 except IP addresses 10.0.1.1 - 63 (63 IPs), to the switch for its management.
3. Every group member should connect his/her server to the switch and configure the appropriate IP addresses on their server. Verify connectivity to each other.
4. Create user accounts for each group member and set password for Telnet and console login on the switch.

*Please note that Telnet is just acceptable when you have an internal network otherwise you have to use SSH.*

At the end of this task you should all be able to connect to the switch from your server using your own account.

*Notes:*

- Remember to regularly save your running configuration to the startup configuration; you might consider copying also your configuration to an TFTP server you have set up for this purpose.

## **Task 1: Data transfer without and with CoS configuration (10 points)**

In this task you are asked to perform data transfers between the nodes connected to the switch.

### **Task 1.1**

1. Use *iperf* (*version 2 or 3*) to transfer data between a pair of nodes.
  - Tune the data transfer to achieve maximum throughput.
  - Plot the achieved throughput values.
2. Set up the network based on table [1](#).
  - Plot achieved throughput values for all streams.
  - Explain what you observe.

Server	Role	Traffic Protocol	Traffic Port
Server 1	Rcvr.	N/A	N/A
Server 2	Sender	UDP	8001
Server 3	Sender	TCP	8002
Server 4	Sender	TCP	8003

Table 1: Network traffic

## Task 1.2

Now you have to overcome the interference by applying CoS. Try to improve the performance of the communication by starting from the degraded scenarios above.

1. Configure CoS marking on both the switch ports and the source machine based on the priority which is mentioned in Table 2. You will apply CoS labelling on the server side for the service that is running on server4 using iperf/iptables, and on the switch side for the services that are running on Server 2, 3.

Server	Role	Protocol	Traffic Port	CoS Labelling	CoS Value
Server 1	Rcvr.	N/A	N/A	N/A	N/A
Server 2	Sender	UDP	8001	on Switch	5
Server 3	Sender	TCP	8002	on Switch	6
Server 4	Sender	TCP	8003	on Server	7

Table 2: Network CoS configuration

2. Start iperf simulation.
  - Show the configuration required.
  - Plot your achieved throughput values.
  - Explain what you observe.

## Task 1.3

You will now have to understand traffic Shaping and Sharing and show the difference between them.

### Cisco Configuration

1. Show what is the current setting of shaping/sharing applied on your switch.
2. For testing SRR Shaping, implement the settings in table 3, and start iperf simulation.
  - Show the configuration required.

- Plot your achieved throughput values.
- Show the statistics that are related to queues.
- Explain what you observe.

<b>Scenario1</b>	SRR Shape	SRR Share
UDP Queue	1/8	25%
TCP Queue	1/2	25%

Table 3: Cisco SRR Shape testing

3. Now, for testing SRR Sharing, implement the settings in the table 4. Start iperf simulation.

- Show the configuration required.
- Plot your achieved throughput values.
- Show the statistics that are related to queues.
- Based on the results explain the difference between SRR shaping and sharing.

<b>Scenario 2</b>	SRR Shape	SRR Share
UDP Queue	0	15%
TCP Queue	0	70%

Table 4: Cisco SRR Share testing

## Task 2: DSCP and Statistics (3 points)

In this task, we are trying to achieve QoS by marking the packets deploying DSCP.

1. Explain the difference between CoS and DSCP, why these are relevant?
2. Mark your network and the corresponding outgoing packets using iptables and DSCP based on table 5.

Server	Role	Traffic Protocol	DSCP
Server 1	Rcvr.	N/A	N/A
Server 2	Sender	UDP	CS2
Server 3	Sender	TCP	CS5

Table 5: DSCP Labeling

3. Find the queues to which the outgoing packets are sent.

4. Show that the packets are marked (with Wireshark).
5. Show the statistics that are related to queues.

### Task 3: Monitoring (2 points)

1. Enable logging of events (syslog) to an external server.
2. Monitor your switch so that its statistics can be viewed online. This requires to poll via SNMP. You have to use Cacti for monitoring.
  - Cacti : <http://www.cacti.net/>
3. Monitor also your servers via the IF-MIB from RFC2863.
4. Start a webserver on one of the group's servers and make sure it can be accessed from within OS3. Monitoring must still be live at the time the exercises get corrected (in the week of February 20 and 27 2020)! The monitoring pages should still clearly show the test you made and the traffic through the switch. Historical data is fine, as the Cisco will be reused for the next lab.

### Submission

The submitted file have to be named:

AN2020-Lab02-QoS-group\${groupnumber}. [zip]

And the submission must contain following:

- The final switch configuration (txt).
- PDF document containing:
  1. Configuration explanation.
  2. Results of the data transfer tests:
    - (a) Without CoS/DSCP (Task 1.1) : describe the scenarios you have defined and show the transfer results.
    - (b) With CoS (Task 1.2 and Task 1.3): explain if the results are the one you expected given the CoS configuration. Explain the difference between Shaping and Sharing.
    - (c) With DSCP (Task 2): Show marking and explanations given.
  3. Link to the monitoring server (the data transfers need to be visible on the monitoring site!)

**Please note that sharing the configuration progress on the Wiki is strictly prohibited, and copying from others will be considered as plagiarism.**