**TCP/IP Computer Networks**

*Laboratory guides*

# Session 5: Quality of Service

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## Goals

Setup an interconnection of several routers and hosts and do some experiences with different queuing policies on a 2 Mbps link.

## Report

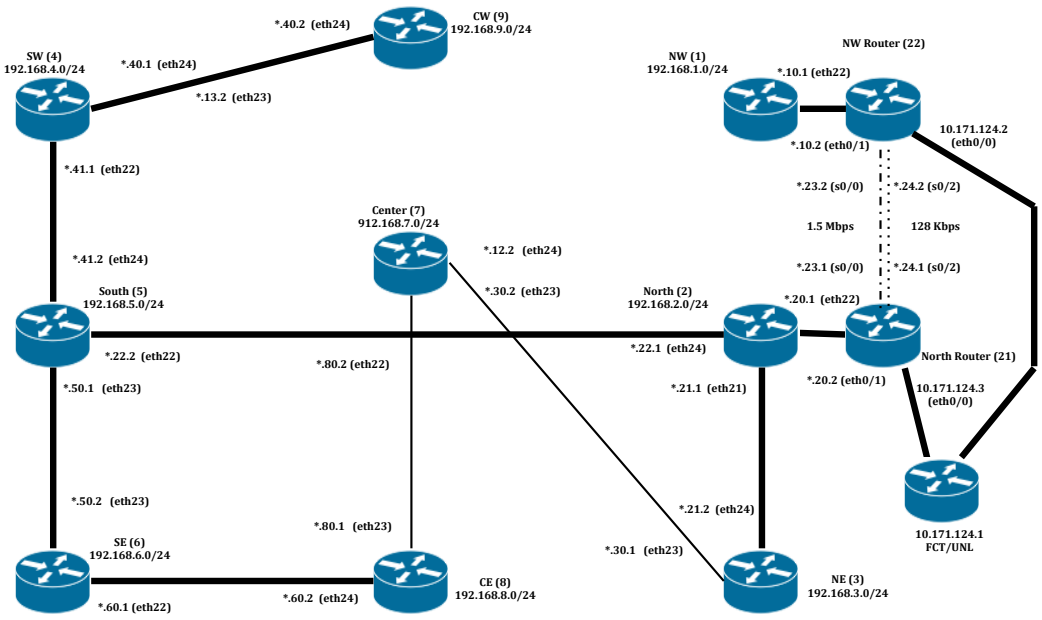
Use this guide to take your notes during the lab class. Write a report on your most relevant findings and try to explain them. The report should have around 3 pages (double spaced, 11 dots).

## Work Plan

Setup the active configuration corresponding to the following network configuration. The routing protocol should be OSPF. Shutdown the Ethernet connections from NorthWest to other benches to force all traffic flowing from NorthWest to East and Centre workbenches to use the 2 Mbps link among the two routers (RouterNorthWest and RouterNorth).

## Network Design and Addressing Plan

See next page.


CW (9)
192.168.9.0/24
*.40.2 (eth24)
SW (4)
192.168.4.0/24
*.40.1 (eth24)
*.13.2 (eth23)
NW (1)
192.168.1.0/24
NW Router (22)
*.10.1 (eth22)
*.10.2 (eth0/1)
10.171.124.2
(eth0/0)
*.41.1 (eth22)
*.23.2 (s0/0)
*.24.2 (s0/2)
1.5 Mbps
128 Kbps
Center (7)
912.168.7.0/24
*.12.2 (eth24)
*.41.2 (eth24)
*.23.1 (s0/0)
*.24.1 (s0/2)
South (5)
192.168.5.0/24
*.30.2 (eth23)
North (2)
192.168.2.0/24
*.20.1 (eth22)
*.22.2 (eth22)
*.22.1 (eth24)
North Router (21)
*.80.2 (eth22)
*.20.2 (eth0/1)
*.50.1 (eth23)
*.21.1 (eth21)
10.171.124.3
(eth0/0)
*.50.2 (eth23)
*.21.2 (eth24)
*.80.1 (eth23)
*.30.1 (eth23)
10.171.124.1
FCT/UNL
SE (6)
192.168.6.0/24
*.60.1 (eth22)
*.60.2 (eth24)
CE (8)
192.168.8.0/24
NE (3)
192.168.3.0/24

## FIFO Queuing

Force interfaces serial 0/0 in routers RouterNorthWest and RouterNorth to use FIFO queuing. In configuration mode execute the commands:

```
interface serial 0/0
no fair-queue
```

Connect one PC to the North LAN and another PC to the NorthWest LAN workbenches. Do not forget to setup their interfaces and routing. For example for the PC in the North LAN issue the commands:

```
sudo ifconfig eth?  192.168.2.100/26
sudo route add 192.168.0.0/16  192.168.2.1
```

Now lunch two flows, first a TCP one and after an UDP one, using the iperf utility. The UDP stream should use at most 2 Mbps of capacity.

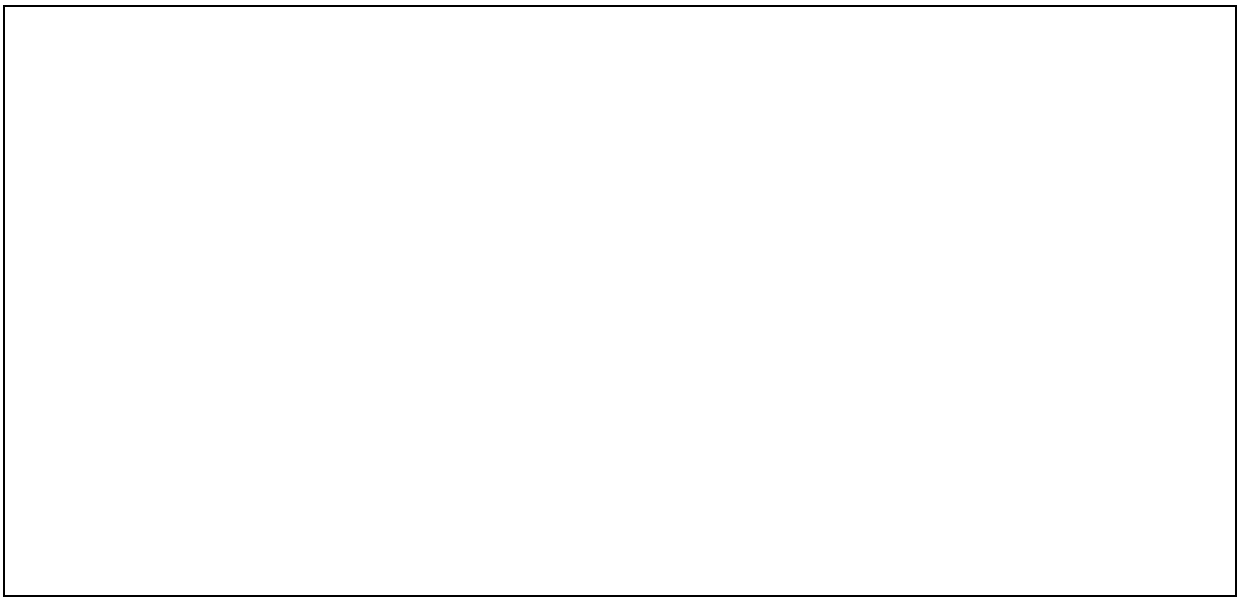
```
iperf –s   -i 5 -t 3600   // TCP server, for example in host 192.168.2.100
iperf –c 192.168.2.100 -t 3600   // TCP client
iperf –s –u -i 5 -t 3600  // UDP server
iperf –c 192.168.2.100 –u -t 3600 -b 2m  // UDP client using 2 Mbps bandw.
```

You may also start with two TCP flows instead of only one.

Now, repeat the experience with the UDP client using only 1500 Kbps.

And finally, from the iperf client PC send a flood of pings to the iperf server PC.

Take notes of the performance of the two flows and explain what is going on.

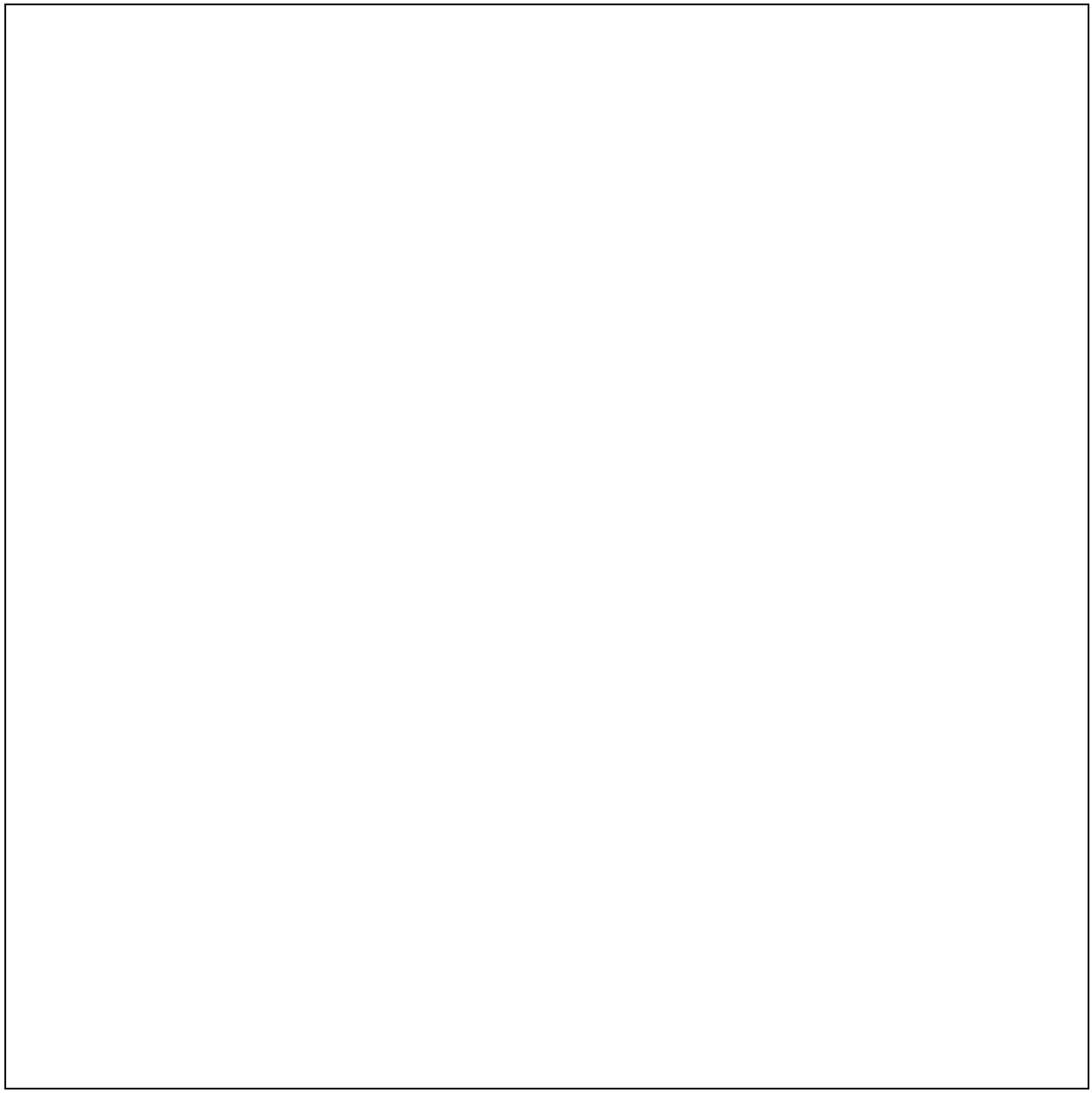


## Fair Queuing

Force interfaces serial 0/0 in routers NorthWest and North to use fair queuing. In configuration mode execute the commands:

```
interface serial 0/0
fair-queue
```

Repeat exactly the same three experiences as before and explain the results.



## Class-Based Weighted Fair Queuing

Force interfaces serial 0/0 in routers NorthWest and North to use class based weighted fair queuing. In configuration mode execute the commands:

```
access-list 110 permit udp any any
access-list 120 permit tcp any any
access-list 130 permit icmp any any
class-map udp-acl
match access-group 110
class-map tcp-acl
match access-group 120
class-map icmp-acl
match access-group 130

policy-map test
class udp-acl
    bandwidth percent 10
class tcp-acl
    bandwidth percent 60
class icmp-acl
    bandwidth percent 10
class class-default
    fair-queue

interface serial 0/0
no fair-queue
service-policy output test
```

Repeat exactly the same three experiences as before and explain the results.