TCP/IP Computer Networks

Laboratory guides

Session 6: Multicast routing, IGMP, PIM-SM

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Goals

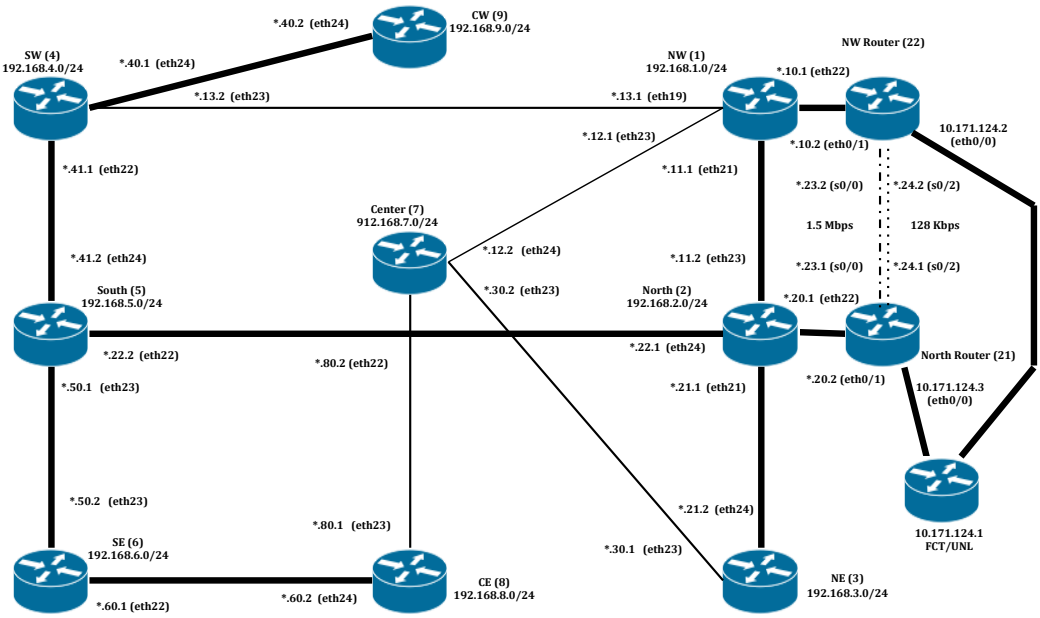
To analyze the functioning of several IP Multicasting related protocols: IGMP and PIM-SM (Sparse Mode).

Report

Use this guide to take notes during the session lab and after, if asked, write a report on the subject of the session including your most important findings as well as the explanations of these findings you think are the most important. The report should have not more than 5 pages and be written with double spacing, 11 dots.

Network Configuration

The following network configuration should be setup with the same parameters as of the end of session 5, i. e. same addressing plan, OSPF routing protocol and quality of service features in the link connecting routers RouterNorthWest and RouterNorth.



All hosts connected to the workbenches should have IP addresses in the local LAN, be allowed to route correctly to the IP prefix of the lab as well as to all IP multicast group addresses. For that purpose use the following commands in your computers:

`ifconfig eth? 192.168.?.?/24  (for example ifconfig eth1 192.168.1.10/24)`

`route add –net 192.168.0.0/16 gw 192.168.?.1  (for example 192.168.1.1)`

`route add –net 230.0.0.0/8 dev eth?`

Commands **`netstat -rn`** and **`netstat -gn`** should allow you to verify your routing table as well as the groups your host belongs to.

Protocol-Independent Multicast PIM Sparse Mode

Activate IP multicasting routing with protocol **pim sparse-mode**. For this purpose use the following commands (the last one in each interface that may participate in the protocol trees building process):

```
configure terminal
ip multicast-routing distributed
ip pim rp-address 192.168.0.1
ip pim spt-threshold infinity
end

interface interface-id
ip pim sparse-mode
end
```

The command below should be applied to all routing interfaces plus to the VLAN 1 interface.

IGMP — Internet Group Management Protocol

IP Multicast Clients and Servers

The command: `sock –u –i –t 32 –w 80 -n 100 230.100.100.100 1500`

sends (option –i) 100 (option -n 100) UDP packets (option –u) with TTL = 32 (option –t 32) packets with 80 bytes as payload (option –w 80) to the IP multicast group 230.100.100.100 port 1500.

Note: you will find a gziped file in the lab-docs section of the course site with all the sources needed to compile socks in your system be it Mac OS X, Linux, ... (**`unzip the file; cd to the new directory; configure; make; make install`**).

The command: `sock –u –s –j 230.100.100.100 1500`

launches a process that joins (option -j) IP multicast group 230.100.100.100 port 1500 and displays the incoming UDP packets (options -s and -u) . Each group should launch one such process. In another terminal of the same machine you can use **`tcpdump`** or **`wireshark`** to register the related traffic. For example, using commands:

```
tcpdump –i eth1 ip multicast –w session6-multicast-traffic

tcpdump –i eth1 igmp –w session6-igmp-traffic
```

for registering IP multicasted packets and IGMP datagrams respectively. Analyze the IGMP observed traces. For example, try to leave and join the group.

Shared Tree Routing

What is the purpose of the rendez-vous point router and of the command **ip pim spt-threshold infinity**?

Use commands **`show ip mroute, show ip mroute summary, show ip mroute count, show ip pim neighbor`** and **`show ip pim interface`** to analyze the status of the PIM protocol and the existing trees with command **`mstat`**. You can also use the command **`show ip igmp ?`** to see the status of IGMP in your router.

Source Routed Trees

Modify the threshold used to build source-rooted diffusion trees using the command in all routers:

configure terminal

ip pim spt-threshold 0

end

Start several IP multicasting receivers in several workbenches using, for example, the command:

sock –u –s –j 230.150.150.150 1500

Observe the build trees with command **`mstat`** and latter start and emitter for this group in the centre workbench for example.

sock –u –i –t 32 –w 80 230.150.150.150 1500

Repeat the observation regarding diffusion trees with **`mstat`**. How many trees are there ?

Discussion

Describe briefly the IP Multicasting PIM-SM protocol

Compare the advantages and the drawbacks of using shared trees and source-rooted trees

Multicast Video Streaming (optional)

Stop all instances of the **sock** program and start application **`VLC`** and receive the traffic sent to the group **`rtp://230.200.200.200/`**. Use command **`Wireshark`** to observe the received traffic.

PIM-SM and Tree Rebuilding (optional)

Unplug links going from the NortWest switch to the Center, North and South West switches so as to force an IP routing reconfiguration and the rebuild of the IP multicasting tree diffusion. Register what happened and observe the impact of the quality of service policies in the received traffic.