Software based routing

Installing quagga

1. Downlaod quagga source code and manual.
2. Extract quagga source code
3. Configure quagga with

```
./configure --localstatedir=/var/run/quagga/ --sysconfdir=/etc/quagga/
```

4. `make clean`
5. `make`
6. `make install`

Note that we configured 'localstatedir' to '`/var/run/quagga`' so that quagga creates state files in that directory. By default quagga tries to create files in `/var/run` where user/group quagga does not have permission to create files.

Configuring Zebra

1. Create sample `/etc/quagga/zebra.conf` with following options

```
hostname labpc7
password iiit123
enable password iiit123
log file /var/log/quagga/zebra-log.log informational
log stdout notifications
log monitor warnings
log record-priority
no log syslog
service advanced-vty
service password-encryption
```

2. Open four different terminal windows.
3. In first terminal run zebra with command '`zebra`'
4. In second terminal go to directory '`/var/log/quagga`' and run command '`tail -f zebra-log.log`'.

5. In third terminal go to directory '`/etc/quagga`'. Use '`more zebra.conf`' to see current zebra.conf file.

6. In fourth terminal connect to zebra using '`telnet localhost 2601`' command. Supply 'iiit123' as login and enable password. Use '`show run`' to see current configuration.

7. Again use '`more zebra.conf`' in third terminal and verify that passwords are still shown as 'iiit123'.

8. Now use '`wr`' on fourth terminal and then again check `zebra.conf` using third terminal.

9. Use

   ```
   config t
   interface eth0
   ip address 10.3.3.<n>/24
   ```

   to set the same ip address using quagga as was obtained using DHCP.

10. Verify using '`ifconfig`' command on third terminal that IP is still present.

11. Now use '`no ip address 10.3.3.<n>/24`' command. Now verify using '`ifconfig`' command that IP actually got removed.

12. Again configure the same IP address and do '`wr`'. Check current '`zebra.conf`' file.

13. Use command '`show interface`'.

14. Use command '`show ip route`'. Notice that no default route is present for eth0.

15. Go to '`config t`' and use '`ip route 0.0.0.0 0.0.0.0 10.3.3.1`' to use 10.3.3.1 as default gateway.

16. Do '`wr`' and again see '`zebra.conf`'. Use '`show ip route`'. Also use '`route -n`' command on linux machine.

17. Use '?', 'show ?' etc. to see various commands that are supported and try few commands which look interesting.

From this point onwards the remaining part of the lab has to be done together by all students. Six computers are required in the following part of handout and all teams should work together to configure six systems as indicated in the handout to make the network work.

Static routing

1. Prepare network diagram as shown in figure 1

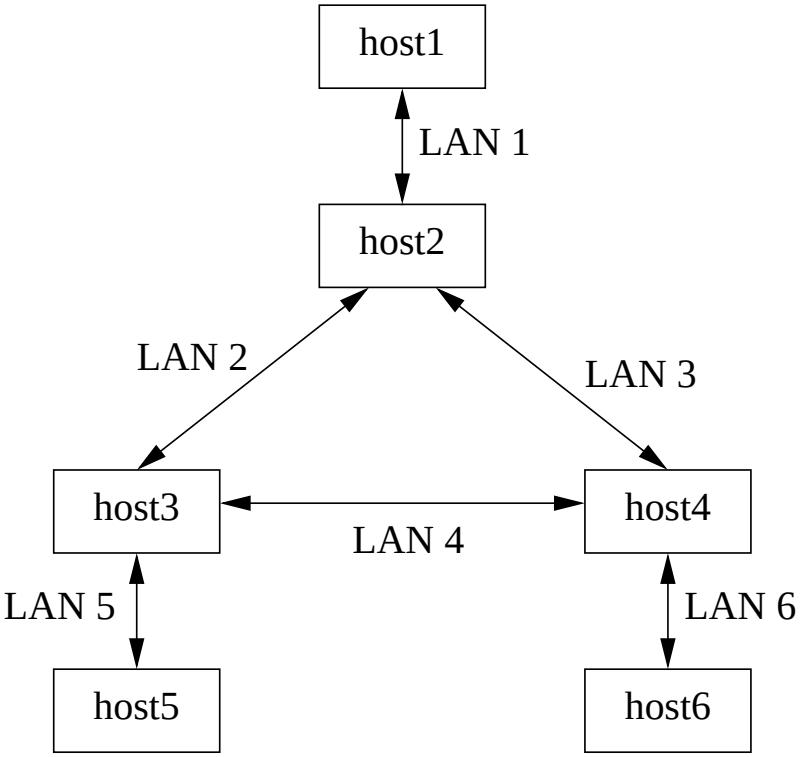

Figure 1: Static and RIP network connectivity

2. Choose IP address ranges of your choice and make all machines in network talk to each other. Note that you must use different IP ranges in all six LANs 1-6 and that you are not allowed to use hardware router / L3 switch to make machines connect to each other. You must use either software router or L2 switches to make network work.

3. Fail few links and understand the problem with static routing that it does not learn new routes automatically when links configured as active routes fail even if alternate route between hosts exists.

4. For submission save `zebra.conf` as `host1_zebra.conf` on host1, `host2_zebra.conf` on host2 etc. Put all these configuration files in folder named `static_routing`.

Hint: In case you do not have sufficient number of cross cables or cross cables are not long enough then you can use the fact that diagram shown above indicates logical connectivity between hosts and not physical connectivity. You have enough number of long straight cables and L2 switches (which support VLANs) to make logical topology as required by the lab with current equipment.

RIP routing

1. Prepare the same network as in case of static routing above.
2. Remove all static routes, if configured from all hosts.
3. Configure RIP on all machines so that network works properly. (That is all machines are able to contact each other).
4. Fail few links and verify that RIP learns new routes and even if there is one working route between two hosts they are able to communicate.
5. Capture packets using wireshark to see various packets sent by hosts using RIP protocol.
6. For submission save `zebra.conf` as `host1_zebra.conf` on host1, `host2_zebra.conf` on host2 etc. Also save `ripd.conf` on host1 as `host1_ripd.conf`, on host2 as `host2_ripd.conf` etc. Put all these configuration files in folder named `rip_routing`.

RIP Help

One is encouraged to read chapter 5 of quagga.pdf supplied with lab to learn:

1. How to start RIP?
2. How to connect to RIP daemon?
3. Which RIP commands should be used to make network above work? You should be able to understand that there are various ways in which RIP can be used to make above network work and choose two different ways that you understand well and make network work with both of them one after other.

4. You should be able to ignore information given in quagga.pdf which wont help you in lab or which you are not able to understand properly.

Ensure that you have learned at least following zebra/rip commands by end of complete RIP routing exercise:

- `router rip`
- `network <network>`
- `version 2`
- `redistribute connected`
- `distance <1-255>`
- `show ip rip`
- `show ip protocols`

OSPF routing

1. Prepare network connections as shown in figure 2 below and choose different IP ranges for each LAN as before.
2. You again have to refer to `quagga.pdf` and learn how to use OSPF.
3. Capture OSPF packets using wireshark.
4. Fail few links and verify that hosts are still connected if at least one route exists between them.
5. For submission save `zebra.conf` as `host1_zebra.conf` on host1, `host2_zebra.conf` on host2 etc. Also save `ospfd.conf` on host1 as `host1_ospfd.conf`, on host2 as `host2_ospfd.conf` etc. Put all these configuration files in folder named `ospf_routing`.

Hint: Filter information that is complex / not important and pay attention to useful commands. Try to use just one area 0.0.0.0 to get work done to simplify configuration. You should be able to make network work with very few lines and already learned / intuitive commands.

Submission

Submit all the configuration files on coures portal on or before 11th March 2011, evening 05:00pm.

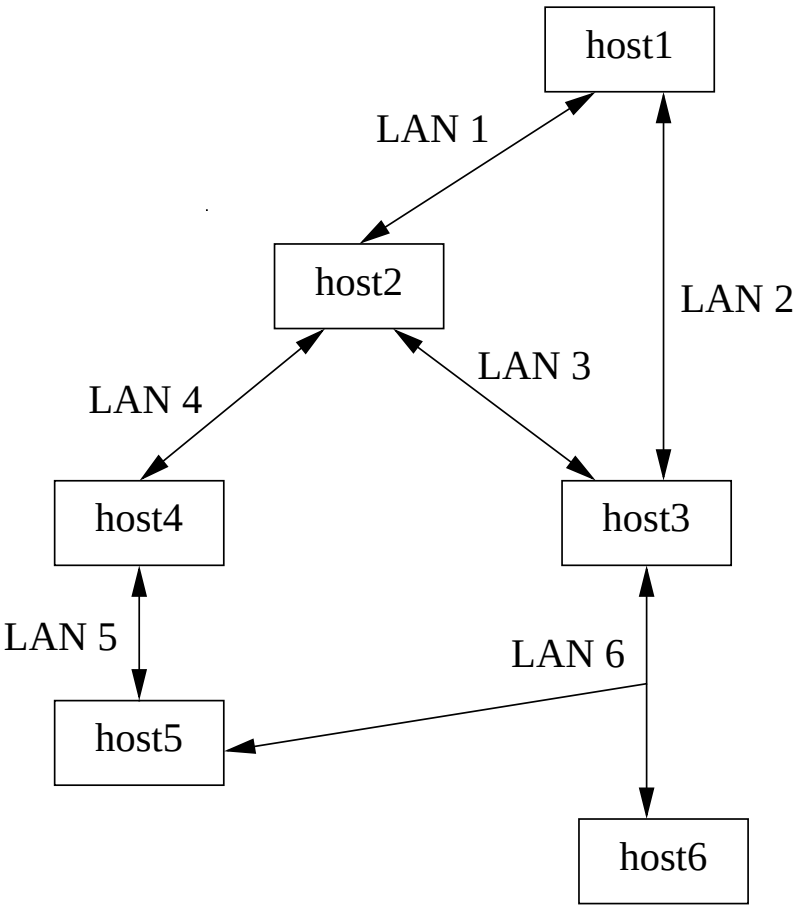

Figure 2: OSPF network connectivity