ELEC-H417: Lab 1 - Dynamic Routing

Objectives

- Implement dynamic routing
- Capture traces with wireshark

Graded homework

At the end of this lab, you must submit a personal report that includes:

- A snapshot image of your topology exposing all interfaces names and network subnets (use screenshot and "*text tool*" from GNS3)

- The configuration of each routers

- A step-by-step walkthrough of your implementation (only the main findings, the main commands, mains issues, etc…)

- How you did debug and validate your configuration and a Wireshark trace that validates your setup (e.g. ping messages, RIP messages etc…)

- Conclusions (What did you think of the lab, lessons learned, difficulties, etc…)

- Optional: Things to improve in future labs or any other relevant comments

Start topology for this lab

Topology
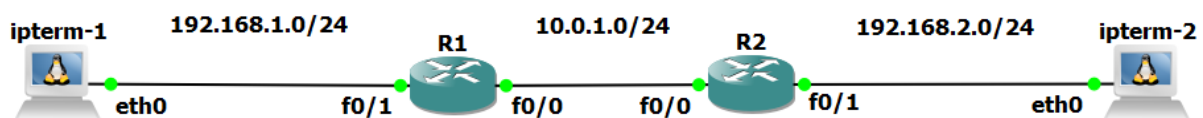
Deploy the routers from the GNS3 and draw the links between them. Then start all nodes (with the *play button*). Double-click on each router to enter in the configuration console.

Your objective is to have the following setup:

- **Left subnet 192.168.1.0/24**

    - Router F0/1 on 192.168.1.1

    - ipterm eth0 on 192.168.1.2 (default gateway 192.168.1.1)

- **Right subnet 192.168.2.0/24**

    - Router F0/1 on 192.168.2.1

    - ipterm eth0 on 192.168.2.2 (default gateway 192.168.2.1)

- **Peering between the routers on subnet 10.0.1.0/24**

    - router R1 as .1 (10.0.1.1) and the other on .2 (10.0.1.2)

Configuration

As a reminder of *Lab 0*:

- <u>**Configuration of routers**</u>**:**

```
R1# configure terminal
R1(config)# interface fastEthernet 0/0
R1(config-if)# ip address 10.0.1.1 255.255.255.0
R1(config-if)# no shutdown
R1(config-if)# end
R1# write
```

    Display the current IP addresses of the interfaces with:

```
R1# show ip interface brief
```

    Do not forget to do the second interface (fastEthernet 0/1) and the second router (R2) !

- <u>**Configuration of hosts**</u> (ipterm):

    Configure the network interface

```
root@ipterm-1:~# ifconfig eth0 192.168.1.2 netmask 255.255.255.0 up
```

    Set the default gateway

```
root@ipterm-1:~# route add default gateway 192.168.1.1
```

Display the routes

```
root@ipterm-1:~# netstat -nr
```

Do not forget the second host (ipterm-2) !

When your configuration is finished, you can use the *ping* command from an host to its router to verify the connection.

Mission 1: RIPv2

> After deploying the topology, configure ***dynamic routing*** to **share the topology between all routers**. This is done in each router with this kind of commands (we will make use of RIP dynamic routing protocol):

```
R1# configure terminal
R1(config)# router rip
R1(config-router)# version 2
R1(config-router)# network 10.0.1.0
R1(config-router)# network 192.168.1.0
```

The network command tells to RIP to propagate all routing information about all known subnets to its neighbours on that subnet. In other word, it will 'link' the different interfaces of the router.

Validation: display the router's topology database with one of those commands:

```
R1# show ip rip database
R1# show ip route
```

After a few seconds, all destinations are known from both routers (remember that routers exchange information on a 30-seconds basis).

Important: Do not forget to configure all Linux hosts and routers !

Using wireshark, capture the packets on the link between R1 and R2. It should allow you to see the RIP routing packets like:

```
*- [R1 FastEthernet0/0 to R2 FastEthernet0/0]                              —    □    ×
Fichier  Editer  Vue  Aller  Capture  Analyser  Statistiques  Telephonie  Wireless  Outils  Aide

Appliquer un filtre d'affichage ... <Ctrl-/>

No.      Time          Source              Destination         Protocol  Length  Info
      3 10.079224     c4:02:18:bc:00:00   c4:02:18:bc:00:00   LOOP         60 Reply
      4 15.348877     10.0.1.2            224.0.0.9           RIPv2        66 Response
      5 17.176127     10.0.1.1            224.0.0.9           RIPv2        66 Response
      6 19.534215     c4:01:3d:c4:00:00   c4:01:3d:c4:00:00   LOOP         60 Reply
      7 20.381360     c4:02:18:bc:00:00   c4:02:18:bc:00:00   LOOP         60 Reply
      8 25.940216                                                        350 <Ignored>
      9 29.955794     c4:01:3d:c4:00:00   c4:01:3d:c4:00:00   LOOP         60 Reply
     10 30.712448     c4:02:18:bc:00:00   c4:02:18:bc:00:00   LOOP         60 Reply
     11 40.088478     c4:01:3d:c4:00:00   c4:01:3d:c4:00:00   LOOP         60 Reply
     12 41.085010     c4:02:18:bc:00:00   c4:02:18:bc:00:00   LOOP         60 Reply
     13 45.049224     10.0.1.2            224.0.0.9           RIPv2        66 Response
     14 46.461659     10.0.1.1            224.0.0.9           RIPv2        66 Response
     15 50.358120     c4:01:3d:c4:00:00   c4:01:3d:c4:00:00   LOOP         60 Reply

> Frame 4: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface -, id 0        0000  01 00 5e 00 00
> Ethernet II, Src: c4:02:18:bc:00:00 (c4:02:18:bc:00:00), Dst: IPv4mcast_09 (01:00:5e:00:00:09)  0010  00 34 00 00 00
> Internet Protocol Version 4, Src: 10.0.1.2, Dst: 224.0.0.9                                      0020  00 09 02 08 02
> User Datagram Protocol, Src Port: 520, Dst Port: 520                                            0030  00 00 c0 a8 02
v Routing Information Protocol                                                                    0040  00 01
    Command: Response (2)
    Version: RIPv2 (2)
  > IP Address: 192.168.2.0, Metric: 1
```

Mission 2: Network Discovery

| Make use of ***ping*** and ***traceroute*** commands

1. From the host *ipterm-1* `ping` the router R1, R2 and the other host *ipterm-2*

2. Use the `traceroute` command from the host *ipterm-1* to the second host *ipterm-2*

```
root@ipterm-1:~# traceroute 192.168.2.2
```
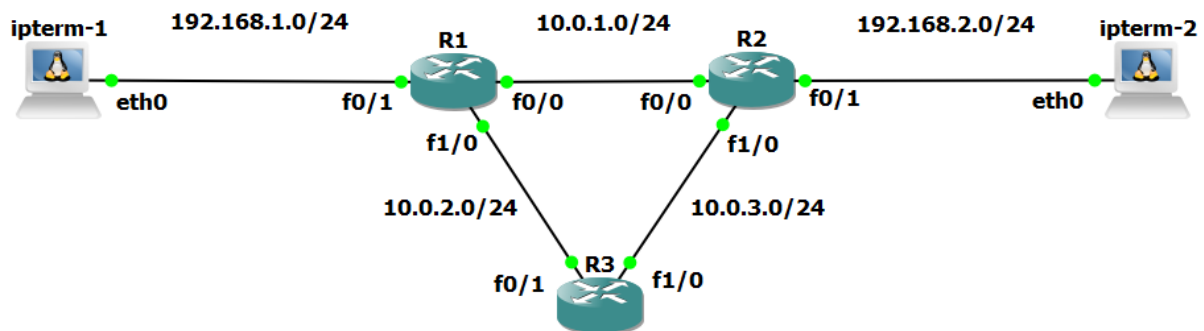
What is your observation ? What is the path and its length ?

Mission 3: Redundancy and dynamic re-routing

This is mainly done by two steps:

1. Add a new router to the topology

2. Activate the dynamic routing on that router and let the routers exchange the topology map

The topology should look like:

> ⚠️ **Do not forget to**:
>
> - Activate the new interface in router R1 and R2
> - Add the new subnet in the RIP routing of R1 and R2
> - Activate both, the interface and RIP, for the new router R3

1. Display the routing table of any router (`show ip rip database` or `show ip route`). It should contain the destination to all subnets.

2. Make a `Traceroute` from *ipterm-1* to *ipterm-2*.
   What is the current route ? Did the route change and why ?

3. Now deactivate the link between the routers R1 and R2 (i.e. remove the wire in GNS3. Then take a coffee because the RIP sends message every 30 seconds so it can take 2-3 minutes to update completely. If the update do not seems to happen, you probably have a problem in your configuration of tha lab (or GNS3 installation). You can try to click on the routers and **Reload button** to manually refresh the router's table*.*

   - Show to routing table of any router. What have changed ?

   - Make a `Traceroute` from *ipterm-1* to *ipterm-2*.
     What is the current route and its length ? Did the route change and why ?

Conclusion

You are now set for this introduction to CISCO commands and dynamic routing. Also, you have learned about dynamic routing protocols and wireshark.

This is really a "small world" Internet; you just have to add more routers (and activate dynamic routing)....

Be aware that there are many tools and commands (such as snort, tcpdump, fiddler, kismet, etc...). Do not hesitate to check the documentation if you are curious to learn more 😉