



Praktikum RouterLab SS 2009 Work Sheet 3: Routing Information Protocol (RIP)

The purpose of this work sheet is to introduce the Routing Information Protocol (RIP) as an example for a dynamic routing protocol. The goal is to understand the advantages and disadvantages of the distance vector approach.

Important Notes:

For each work sheet we have references to relevant literature on the website. Please check!
An additional link has been established between ham-sc1/muc-sc1 and ham-sc2/muc-sc2 for this work-sheet.

Table 1: Assignment of devices to groups

Group	Ham-Cloud	Muc-Cloud
Router	ham-rc1, ham-rj1, ham-rj2	muc-rc1, muc-rj1, muc-rj2
Switches	ham-sc1, ham-sc2	muc-sc1, muc-sc2
Loadgens	loadgen10[2/3/4]-ham	loadgen10[2/3/4]-muc
IP range	10.1.0.0/16	10.2.0.0/16
VLAN IDs	x00 – x99 where x is your team number	

Question 1: (20 Points) *Dynamic Routing*

In the previous work sheet, we configured static routes, RIP is instead a dynamic routing protocol.

- Describe briefly the difference between static routing and dynamic routing.
- Dynamic routing introduces several advantages compared to static routing. Briefly describe (1-2 sentences) at least two of them.
- List four examples of dynamic routing protocols.

Question 2: (30 Points) *Routing Information Protocol (RIP)*

RIP belongs to the class of distance-vector routing protocols. For more information on RIP, please have a look at RFC 2453 (see link on Course Website).

- Which entities exchange routing information (updates)?
- How far (in terms of IP hops) does a RIP update message travel?
- What routing information does each entity generally keep in its routing database?
- Does a RIP routing update contain all routes or only a partial set of routes?
- When are update messages sent?
- How do routing entities detect that a neighbor is not reachable any more?
- Briefly describe what the “Count-to-Infinity” problem of distance-vector protocols is.

- (h) Briefly describe at least two mechanisms that RIP uses to deal with the “Count-to-Infinity” issue.
- (i) “Count-to-Infinity” is one disadvantage of distance vector protocols. Can you think of another one?
- (j) What is a possible advantage of distance vector protocols?

Question 3: (50 Points) *Routing Information Protocol (RIP) Configuration*

Take the configuration of Question 1 of Work Sheet 2 (including configured VLANs and IP addresses), here we assume that you already created the same VLANs. Now, instead of using static routing to make these VLANs communicate we configure RIP. For this purpose, RIP needs to be enabled on all interfaces of the four “logical networks”. Note that on *loadgen103-xxx* and *loadgen104-xxx* you have to add static routes like in the previous worksheet. The *loadgen102-xxx* is already pre-configured (IP address see Figure 1) and it originates also another prefix: 10.20.30/24.

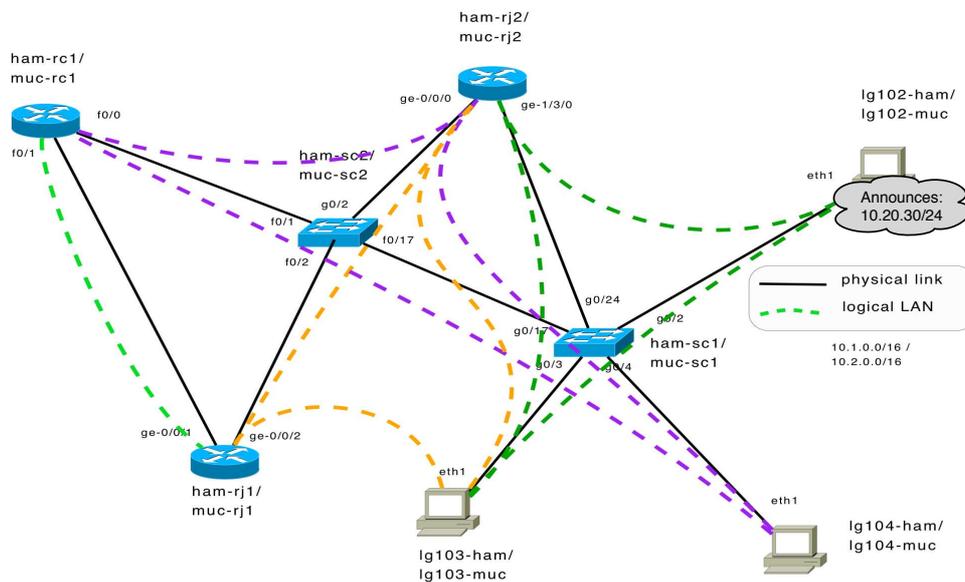


Figure 1: Topology: Mapping of VLANs to physical links.

Beforehand, please log on to your *loadgen102-xxx* and use the following command to ensure that no firewall entries are currently configured on it:

```
iptables -F
```

Note that this is the only configuration command you need to use for this worksheet on *loadgen102-xxx*.

The following documents explain how to configure RIP for Cisco and Juniper (see website):

1. CiscoRIP
2. JunosRIP

After convergence, *xxx-rc1*, *xxx-rj1*, and *xxx-rj2* in the network of Figure 1 should have a route towards each sub-network you configured. After convergence the prefix 10.20.30.0/24 should be reachable from all routers (*xxx-rc1*, *xxx-rj1*, and *xxx-rj2*). You can test it by pinging the address 10.20.30.40.

- (a) Which route is selected by *ham-rc1/muc-rc1* to reach 10.20.30.0/24? (use the command: `show ip route`).

- (b) Which route is selected by ham-rj2/muc-rj2 to reach 10.20.30.0/24? (use the command: `show route`).
- (c) What is the metric associated with the selected route?
- (d) For each loadgen (including `loadgen102-xxx`) of your cloud: traceroute every other configured interface (the ones *you* have given IP addresses) of the routers and loadgens of your cloud to verify they're all reachable, and to see which path the packets are taking.
- (e) Is it theoretically possible that the "Count-to-Infinity" problem occurs for the prefix 10.20.30/24 if link from ham-rj1/muc-rj1 to ham-rc1/muc-rc1 fails?
 - If no, explain why.
 - If yes, give an example.

Now we will check what happens if the link from ham-rj2/muc-rj2 to the `loadgen102-xxx` is experiencing problems.

To monitor what happens, activate a debug session on ham-rc1/muc-rc1:

```
debug ip rip
```

(To switch off debugging mode use: `no debug ip rip`)

Simulate packet loss between ham-rj2/muc-rj2 and `loadgen102-xxx`. For this purpose just make the `loadgen102-xxx` drop all packets outgoing from interface `eth1`. This can be achieved with the `iptables` command, read "man `iptables`" for the details.

- (f) How much time elapses approximately until ham-rc1/muc-rc1 deletes the route to prefix 10.20.30/24 from its routing table?
- (g) Explain what you see in the debug output (4-6 sentences). Can you see the effect of any of the RIP mechanisms that are supposed to prevent instabilities?

Don't forget to undo the `iptables` command, when you're done:

```
/sbin/iptables -F
```

Submission details: read the FAQ on

http://www.net.t-labs.tu-berlin.de/teaching/ss09/RL_labcourse/

Submit the following:

- Topology map from Question 3
- All configuration inputs on routers, switches and loadgens (no trials, only the final ones)
- The outputs of all commands such as `ping`, `tcpdump`, etc.
- The completed evaluation form (extra sheet)

Due Date: Friday, May 15th, 2009, 08:00 am