Mittuniversitetet
MID SWEDEN UNIVERSITY

DT112G Network Technology I

Homework Assignment: Routing Protocol and Concepts

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1 Introduction

This assignment belongs to the second part of the course Network Technology 1 and covers IP addressing, routing protocols, cost calculations and routing table behaviour.

2 Examination

Always motivate your answers, show all your calculations when needed. Give proper references on all your answers. Failure to do this will result in an F on the assignment even though your answers may be correct.

This assignment is to be performed individually and all the answers must be written in your own words such that you show that you have understood both the question and your answer. This assignment will be checked against Urkund, which is an anti-plagiarism tool. The grade on this assignment will be pass (P) or fail(F). If you get an F you will be given the chance to supplement your assignment.

3 Aim

After completion of this assignment you will have shown that you

- have a good understanding of routing protocols,

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- know how to troubleshoot a network configuration, and
- know how to correctly subnet a network, without unnecessary waste.

4 Reading instructions

Before starting this assignment you must have read up to and including chapter 11 in [1].

5 Tasks

5.1 The corporate punishment

Assume that you have just completed your studies at Mid Sweden University and applied for a job as a network technician at a major company. Within a couple of hours from that you e-mailed your curriculum vitae to the company, you get a phone call from them informing you that they have received your application and wants you to come down for an interview – right now.

5.1.1 The Interview

Even though you get a bit suspicious of the desperate behaviour of the company, you agree on the interview and jump on the first buss to the city center. Your interview starts the moment you put your foot in the lobby. After a couple of minutes of the ordinary boring interview questions about your good and bad qualities the interviewer calls in the head of IT to ask you some IT related questions. A couple of the questions he asks are the following:

Explain the following:

1. Convergence time,
2. distance vector,
3. link state routing protocol,
4. classful routing behavior,
5. classless routing behavior,
6. route summarization, and
7. the difference between CIDR and VLSM.

What is your answer to these questions? Since time is short and the interviewer seems eager to get back to posting some witty remark on his Facebook page, keep your answers to a few sentences.

5.1.2 Main office

Your interview went well and you got the job. The first task they give you is to see if you can speed up the network at the company without having to buy new "fancy" equipment. The topology can be seen in Figure 1 .

1. When you examine the routers you see that they have been configured with RIPv2 as the routing protocol. You decide to perform a traceroute from router A to router F just to see how bad the situation is. Which path will this package take, what is the metric of this path and what is the maximum bandwidth you will get using this path?
2. Since you have studied computer networking you know this isn't the most optimal path the packet can take through this network, why?
3. This setup is of course not good enough for you, and you would like to improve this by changing the routing protocol. Since you recently have studied CCNA Routing Protocols and Concepts you have a good understanding of the more advanced routing protocols and therefore change the routing protocol from RIPv2 to EIGRP. which path will the package from router A to F take now? What metric will this path have, and what is the maximum bandwidth you can get by using this path?

4. You get curious to see if you will get another result using OSPF, so once more you change the routing protocol. Which path will the package take now? What cost do this route have?

5. You get an angry text from your boss telling you to stop playing around with the network and just select a routing protocol and be happy. Which one do you choose?

Even though you did an excellent job on the network at the main office, your boss got annoyed at you for disrupting his precious Facebook time during ~~work~~ lunch hours. However since "the internet now works much better" he decides to punish you by sending you to one of the companies old forgotten branches, that have been running the same network setup since 1994, and fix the network over there as well.

5.1.3 The forgotten branch

After you have been on a bus for 14 hours straight, you arrive at an old building that seem to have been a sanatorium in its glory days. You enter the lobby and follow the blue line on the floor till you get to your padded office. The first thing you do is to go through the network topology, the hardware and the configuration of the routers so you know what you are dealing with. You also find an old note that seems to be stained with what you hope is coffee, containing the IP-address ranges `174.12.54.0/24` & `174.12.55.0/24` that the main branch allocated to this office.

Your analysis of the network have given you the topology that can be seen in Figure 2 on the next page.

When you check the router configurations you see that RIPv1 is running, all interfaces are up and that you can from router A ping both router B and C, and also the interfaces on router B and C that are connected to their other directly connected network, even though every other package or so is dropped. You are not able to ping from router B to router C. Obviously the previous network administrator at this company had cheated his way through his networking classes.

You get tired of doing all this mapping and analysing of the unprofessionally configured network and therefore decides to get a cup of coffee. You follow the yellow line on the floor that leads you to the cafeteria. After having to stand in line behind two stiff hippies for 10 minutes, you finally get to pay an outrageous sum of money for some coffee-like substance after which you sit down with some employees from the IT-department. You see this as a golden opportunity to get some user input on how well the users experience the network.

Sadly you were not able to get any new information out of them, and all they told you is that it is not possible to reach the `174.12.54.0` network from `174.12.55.0` and vice versa, and that the only time they can access these networks is if they connect to the temporary (`192.168.1.0/24`) network on router A that the last "network technician" configured and even then it seems to be working at random.

1. Since you recently had studied the network topology and have a good understanding of networking, you know why the network is acting in this way. Explain to them why. Be as thorough as possible.

2. You tell them of your grand plan to fix this problem by just adding two simple commands on each router. What commands do you tell them that you will use?

Your colleagues from the IT-department got really annoyed at you since you managed to solve the networking problem without the help from neither Google nor Youtube, as they usually have to do. Therefore as soon as you left the cafeteria to fix the network, they contacted your boss to inform him that you fixed the network problem and that you now seemed bored so he should give you something more and preferable something really difficult to do.

5.1.4 The impossible task

Once back in your comfy but smelly office, you got a new text from your boss telling you that the head of IT wants you to free an entire /24 network. Since you had two of them, you will now have to settle with one.

The boss thought that this would be an impossible task for you to solve, and it should therefore keep you occupied for a while.

During your initial study of the network you found out that you actually only need one /24 network, since the `174.12.54.0/24` network only used 140 out of 254 available addresses, and that the 174.12.55.0/24 network only used 29 out of 254. You also see this as an opportunity to remove all those

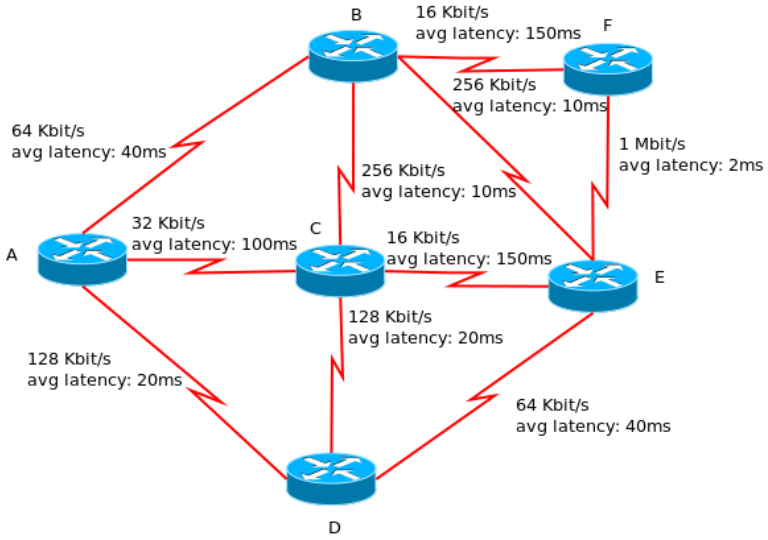

Figure 1: Main branch topology.

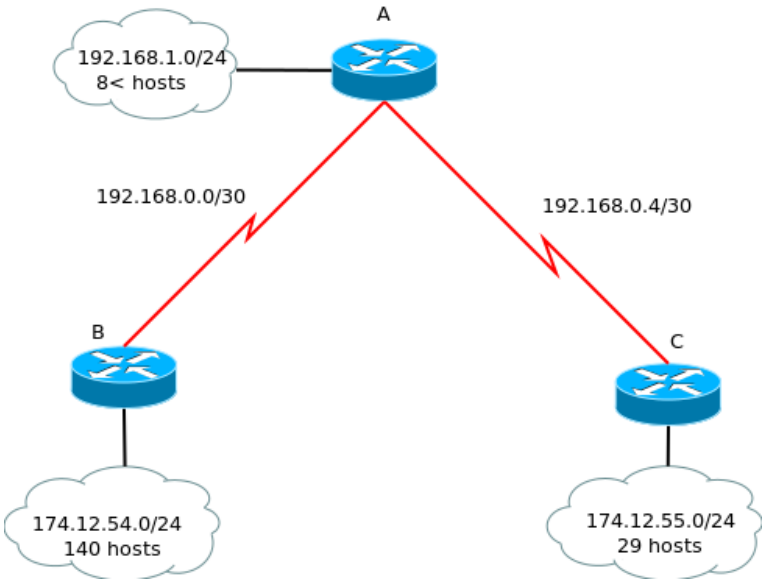

Figure 2: The forgotten branch topology.

RFC1918 addresses. You therefore redesign the entire IP address scheme used at the office to only use the 174.MM.DD.0/24[1] address range.

1. After an undetermined amount of time, you finish with the redesign of the IP-addressing scheme. Now all the subnets are within the same 174.MM.DD.0/24 network. You even got some extra addresses over, so you allocate them to the temporary network that the previous "network technician" set up to reach the networks on router B and C. Show your newly designed IP-addressing scheme.

6 Submissions

To pass this assignment your solutions to all the numbered questions must be submitted in PDF-format to Moodle. Make sure that your solutions follow the criterias given in section 2.

References

[1] Rick Grazuani and Allan Johnson. *Routing Protocols and Concepts: CCNA Exploration Companion Guide*. Cisco press, 800 East 96th Street, Indianapolis, IN, 2012. ISBN 978-1-587-13272-8.

[1] Where MM and DD is the month and date of your birthday.