COMPSCI 314 S2T Assignment 3
2009
Switching and Routing

Department of Computer Science
The University of Auckland

*This assignment contributes **5%** of your overall course mark. Submit your assignment in **PDF** format to the **Assignment Drop Box**. Include all **workings** and **explanations**. Marks will be deducted for ambiguous solutions. Zero marks are awarded if the answers contain no explanation. Also, refer to the Departmental Policy on Cheating on Assignments.*

Assignment Drop Box *(*https://adb.ec.auckland.ac.nz/adb/*).*
Departmental Policy on Cheating on Assignments *(*http://www.cs.auckland.ac.nz/CheatingPolicy.php*)*

[Total: 50 marks]

Q1. Choice of solution [20 marks]

For each of the following cases, state whether you would choose a *repeater*, a repeating *hub*, a bridging *switch*, or a small IP *router* to connect the systems together. Explain each answer in one or two sentences. Assume that all these devcices are available on the local market, and that you are trying to save as much money as possible. [5 marks each]

a) Two PCs and an IP telephone in the same house need to be connected to a single-port ADSL modem.
A repeating hub. We have 4 ports to connect together but there will not be enough traffic to justify a switch.

b) You have agreed to let your neighbours use your broadband connection by connecting their Ethernet switch to a spare 10 Mb/s port on your modem, using Category 5 UTP cable. Their house is 150 metres away.
Needs a repeater.
[Note: Practically connecting both ends (150m) without a repeater could work. This may also depends on the cable types, too]

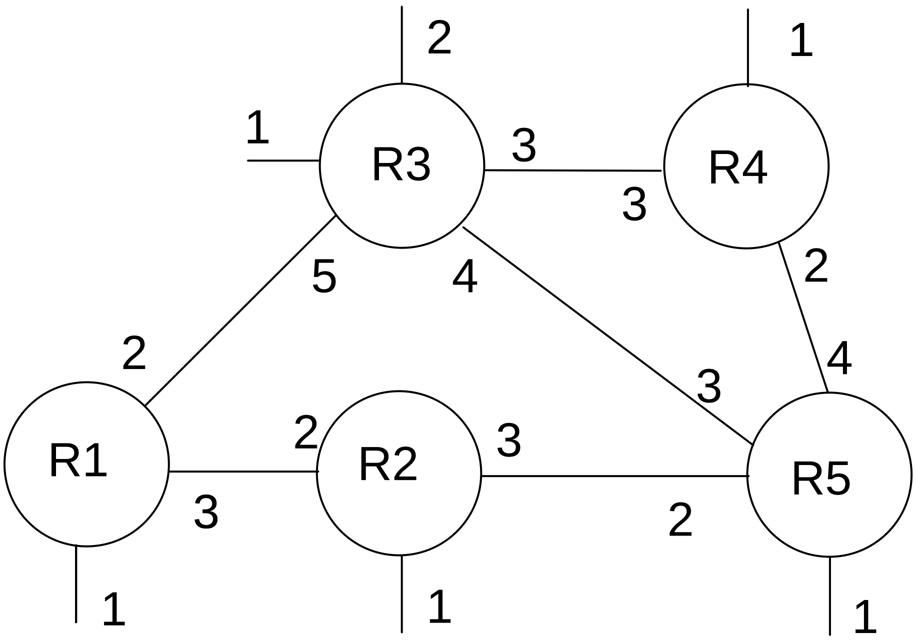
c) Same as b) but running 100Mb/s (100BaseTX) Ethernet.
Needs a bridge/switch or repeater with a 100Mb/s capability.
[Note: Again, connecting both ends without any devices could work.]

d) Three small businesses in the same building agree to share a single connection to the Internet, and they have negotiated with an Internet Service Provider to share a block of IP addresses. They need to keep their internal traffic secret from each other. What device should they buy to connect their Ethernet switches (one per business) to the Ethernet port on the ISP's modem?

A 4-port router is the best solution. They need to prevent the traffic from one business getting onto another one's Ethernet switch, and an appropriately configured router (e.g. subnets and handling IP packets) is the best way to do that. [A VLAN solution could be another answer, but only if all devices support VLAN.]

Q2. Distance Vector Routing [30 marks]

Consider the following network of RIP routers:



The routers are named R1 to R5 and each one has its interfaces numbered starting from 1. They have the following (fictional) IP addresses:

R1	192.0.2.1
R2	192.0.2.2
R3	192.0.2.3
R4	192.0.2.4
R5	192.0.2.5

They also each connect to one or more local subnets with (fictional) address ranges:

R1	172.16.*.*	(interface 1)
R2	10.1.*.*	(interface 1)
R3	192.168.1.*	(interface 1) and 10.2.*.* (interface 2)
R4	192.168.10.*	(interface 1)
R5	192.168.100.*	(interface 1)

a) Draw up the **initial** RIP Distance Vector routing table for **R3**, as shown for another example in slide 23 of lecture 20. (A simple tabulated list is OK.) [10 marks]

Name	**Destination IP**	**First Hop IP**	**Interface**	**Distance**	**Timestamp**
R1	**192.0.2.1**	**0.0.0.0**	**5**	**16**	**0**
R3	**192.0.2.3**	**0.0.0.0**	**0**	**0**	**0**
R4	**192.0.2.4**	**0.0.0.0**	**3**	**16**	**0**
R5	**192.0.2.5**	**0.0.0.0**	**4**	**16**	**0**
-	**10.2.*.***	**0.0.0.0**	**2**	**1**	**0**
-	**192.168.1.***	**0.0.0.0**	**1**	**1**	**0**

[Marking note: the order of the entries doesn't really matter; this order seems logical. These are the entries that have to be manually configured. Deduct marks for incorrect, missing or extra entries.]
Students with more knowledge of RIP, may give answers using proper IP mask notation such as 192.0.2.1/32 and 10.2.0.0/16, and may choose to configure the initial distances to R1, R4 and R5 as 1 instead of 16. This would be OK. They may also comment that the routers should have different addresses on each interface. Same for parts b) and c).

b) Assuming the link metrics are all 1, work out the **final** DV table for **R2 (not R3)** in the same format. Don't bother with the timestamps. (Hint: you don't need to write any software to work out the result that the Bellman-Ford algorithm would find, especially when ignoring the timestamps.) [10 marks]

Name	**Destination IP**	**First Hop IP**	**Interface**	**Distance**	
R1	**192.0.2.1**	**192.0.2.1**	**2**	**1**	
R2	**192.0.2.2**	**0.0.0.0**	**0**	**0**	
R3	**192.0.2.3**	**192.0.2.1**	**2**	**2**	**
R4	**192.0.2.4**	**192.0.2.5**	**3**	**2**	
R5	**192.0.2.5**	**192.0.2.5**	**3**	**1**	
-	**10.1.*.***	**0.0.0.0**	**1**	**1**	
-	**10.2.*.***	**192.0.2.1**	**2**	**3**	**
-	**172.16.***	**192.0.2.1**	**2**	**2**	
-	**192.168.1.***	**192.0.2.1**	**2**	**3**	**
-	**192.168.10.***	**192.0.2.5**	**3**	**3**	
-	**192.168.100.***	**192.0.2.5**	**3**	**2**	

**** These could alternatively be through First Hop 192.0.2.5, Interface 3 with equal distance.**
[Note: the order of the entries doesn't really matter; this order seems logical. Deduct marks for incorrect, missing or extra entries.]

c) Assume the link between **R2** and **R5** breaks. Describe what happens to the table you have worked out for **R2** and give the new table after things have settled down again. [10 marks]

All entries in R2's table referring to interface 3 (the link to R5) will be removed. So R2 will no longer have routes to R4, R5, 192.168.10.* and 192.168.100.*. It will send out its new DV to R1 and later get back a new DV from R1 with new information. We will get:

Name	**Destination IP**	**First Hop IP**	**Interface**	**Distance**
R1	**192.0.2.1**	**192.0.2.1**	**2**	**1**
R2	**192.0.2.2**	**0.0.0.0**	**0**	**0**
R3	**192.0.2.3**	**192.0.2.1**	**2**	**2**
R4	**192.0.2.4**	***192.0.2.1***	***2***	***3***
R5	**192.0.2.5**	***192.0.2.1***	***2***	***3***
-	**10.1.*.***	**0.0.0.0**	**1**	**1**
-	**10.2.*.***	**192.0.2.1**	**2**	**3**
-	**172.16.***	**192.0.2.1**	**2**	**2**
-	**192.168.1.***	**192.0.2.1**	**2**	**3**
-	**192.168.10.***	***192.0.2.1***	***2***	***4***
-	**192.168.100.***	***192.0.2.1***	***2***	***4***

[Note: any students who used the alternative route to R2 in b) will have more changes to make, but the result should be the same.]