NUI Galway
OÉ Gaillimh

Semester 1 Examinations 2018 / 2019

Exam Code(s)	3BCT
Exam(s)	Third Year Computer Science & Information Technology
Module Code(s)	CT3531
Module(s)	Networks and Data Communications 2
Paper No.	1
External Examiner(s)	Dr. J. Howe
Internal Examiner(s)	Prof. M. Madden *Dr. D. Chambers

Instructions: Answer any 4 questions.
All questions carry equal marks.

Duration	2 hrs
No. of Pages	6
Department(s)	Information Technology
Requirements	None

Question 1

a) How do bandwidth and throughput differ? 4 MARKS

b) Why should you be concerned about the number of devices on a single LAN (broadcast domain)? 4 MARKS

c) How do Virtual LANs help control broadcast traffic? In this context explain the purpose of the 802.1Q protocol. 6 MARKS

d) What makes traffic flow in Voice over IP networks challenging to characterize and plan for and why are wireless LANs often implemented as individual VLANs? 5 MARKS

e) Describe the purpose and operation of the Spanning Tree Protocol. 6 MARKS

Question 2

Assume that you are working for a large corporation that wants to use the private IP address range starting at 172.16.0.0 for its internal network. The company management wants to be able to have a minimum of 30 separate sites in Ireland with a subnet for each site, with at least 2000 host IP addresses available per subnet. You are requested to design the network layout. Answer the following questions and fully explain the logic behind each answer:

a) What subnet mask will need to be used for the individual subnets in Ireland? 6 MARKS

b) What are the valid host addresses and the broadcast addresses for the first and second subnets in Ireland? 4 MARKS

c) The company has operations in 15 other European countries and each country has been allocated a /16 address range. These individual /16 address ranges are contiguous and Ireland has been allocated the first of these ranges. What route summary (or supernet) could be used to define a single routing entry for all of the European address ranges? 6 MARKS

d) What other private IP ranges could the company use if needed? 4 MARKS

e) When is it appropriate to use IP private addressing versus public addressing? 5 MARKS

Question 3

a) Explain how traceroute works and what it shows. 5 MARKS

b) State and differentiate the three main means of interconnecting an Autonomous System with another Autonomous System. 3 MARKS

c) Describe briefly each of the following: Internet Exchange Point, Border Gateway Protocol, Asymmetric Route 6 MARKS

d) Describe what a Route Server is, what function it performs and why it is necessary. 5 MARKS

e) The result of a running 'show bgp ipv4 unicast 140.203.0.0/16' on an internet facing BGP router of an ISP in Ireland is shown below. What is the best path from that ISP to the NUI Galway network (140.203.0.0/16)? Explain in your answer how the best path is chosen in this case. 6 MARKS

```
rtr01#show bgp ipv4 unicast 140.203.0.0/16

BGP routing table entry for 140.203.0.0/16

Paths: (3 available, best #x)
  174 3356 1213 1213
    154.50.192.49 from 154.50.192.49 (154.26.32.227)
      Localpref 100, valid, external
  1213
    194.88.240.15 from 194.88.240.8 (194.88.240.8)
      Localpref 400, valid, external
  1213
    83.220.203.172 from 83.220.203.172 (83.220.203.170)
      Localpref 300, valid, internal
```

Question 4

a) How does a security plan differ from a security policy and why is it important to achieve buy-in from users, managers, and technical staff for the security policy? 6 MARKS

b) What are some methods for keeping hackers from viewing and changing router and switch configuration information? How can a network manager secure a wireless network? 7 MARKS

c) Outline briefly the three main functions provided by a Packet Filter in Linux. Which firewall chain is used in IPTABLES for packets that are NOT destined for a local process running on the device itself? Explain in detail the purpose of the following two firewall rules that are defined using IPTABLES format:

```
iptables -A FORWARD –p tcp –s 93.107.200.110 --syn –j DROP

iptables -A PREROUTING -t nat -p icmp -d 137.189.89.176 \
                -j DNAT --to 137.189.89.178
```

12 MARKS

Question 5 Consider the example network shown in Figure 1 below:

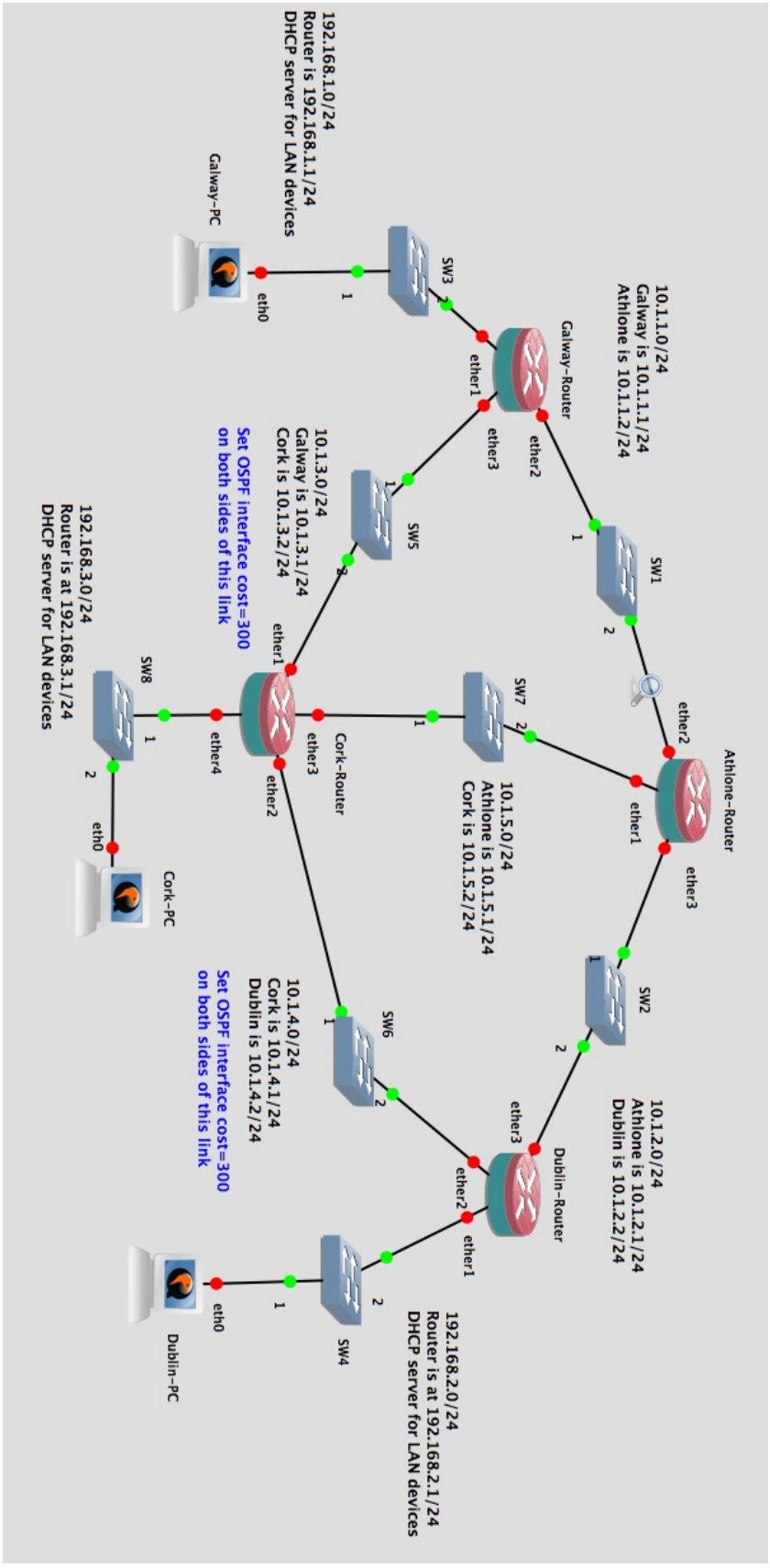

Figure 1 - Example Network

Answer the following questions in relation to this network:

a) Describe the operation and purpose of the OSPF protocol in the network shown. What is the Link State Database and how is Dijkstra's Algorithm used by OSPF in this context? 5 MARKS

b) Describe the format of an OSPF Link State Announcement. Explain how a Link State Announcement from the Galway router would be disseminated throughout the network? 6 MARKS

c) What route will a PC attached to the Galway router normally take to get to the Cork router? What would happen with OSPF if the link between the Galway and Athlone became unavailable for some reason? 5 MARKS

d) Suppose a company was using the RIP dynamic routing protocol on its routers, what reasons would you give to persuade them to change to OSPF instead? In this context explain the difference between Distance Vector and Link State routing. 5 MARKS

e) Assume that the routers are running Mikrotik RouterOS. What configuration command is required to enable the redistribution of locally connected non-OSPF networks to other routers using OSPF? 4 MARKS