

First Midterm. Xarxes de Computadors (XC), Grau en Enginyeria Informàtica		16/04/2018	Spring 2018
NAME (in CAPITAL LETTERS):	FAMILY NAME (in CAPITAL LETTERS):	GROUP:	DNI/NIE:

Time: 1 hour and 30 minutes. The quiz will be collected in 25 minutes.

Quiz. (4 points). All questions are multi-answer: the mark is half if an error, 0 if more. Mark the right answer.

- Regarding the TCP/IP model:
 - ☐ An IP datagram transports TCP information, but not application information.
 - ☐ Over a connection-less network protocol, we can only use a connection-less transport protocol.
 - ☐ DNS protocols are located at the application layer.
 - ☐ A level N entity must process level N headers.
- Given the subnetwork 10.10.10.0/28:
 - ☐ Its addresses are private.
 - ☐ 10.10.10.1/28 may be a subnet.
 - ☐ 10.10.10.2 may be the address of a Router in that subnetwork.
 - ☐ 10.10.10.3 and 10.10.10.100 may be host addresses in that subnetwork.
- We have the address range 100.0.0.0/29. We want to address in that range 2 subnetworks of 1 host.
 - ☐ We do not have enough addresses to achieve it.
 - ☐ 100.0.0.0/29 and 100.0.0.4/30 may be the two subnets.
 - ☐ 100.0.0.6 may be a host in one of the subnets.
 - ☐ 100.0.0.3 may be the broadcast address in one of the subnets.
- Regarding IP support protocols:
 - ☐ ARP messages are sent to obtain the physical address corresponding to an IP address.
 - ☐ A Router does not generate ICMP messages as an answer to errors of datagrams encapsulating other ICMP error messages.
 - ☐ The DNS allows to obtain the address of the local name server.
 - ☐ DNS messages travel over UDP.
- In the IPv4 header:
 - ☐ We only include the Offset field in case of fragmentation.
 - ☐ There is a field to indicate the header length, but not to indicate the complete datagram length.
 - ☐ The Protocol field indicates the protocol that travels in the payload.
 - ☐ If Options are not used, no option fields are sent.
- About Routers:
 - ☐ They analyze the payload of the datagram to optimize the route based on the application protocol in the datagram.
 - ☐ A router uses to include a DHCP server and may provide a NAT service.
 - ☐ They communicate with other Routers to jointly provide the NAT service.
 - ☐ They do not send any datagram until they have consulted the routing table to know to whom the datagram is to be sent.
- On security in IP:
 - ☐ Adding an output tunnel to a Router does not affect the routing table.
 - ☐ An ACL allows filtering datagrams to prevent them from exiting or entering a Router based on information that is only found in the IP header.
 - ☐ If we want to allow external access to a Web server that we have in our subnet, it is imperative to include it in a subnet separate from other hosts that we do not want to be accessed.
 - ☐ One way to implement a tunnel is to include the datagram that we want to go through the tunnel in the payload of another datagram.
- In relation to RIP:
 - ☐ When building a RIP Update, the metrics value is increased in one with respect to the one in the routing table.
 - ☐ RIP Update messages may be sent once there are changes to routing tables, even though 30 seconds have not passed since the last update.
 - ☐ Messages interchanged by Routers in OSPF are more complex than those with RIP.
 - ☐ When using Split Horizon in RIP, the information sent between Routers increases.

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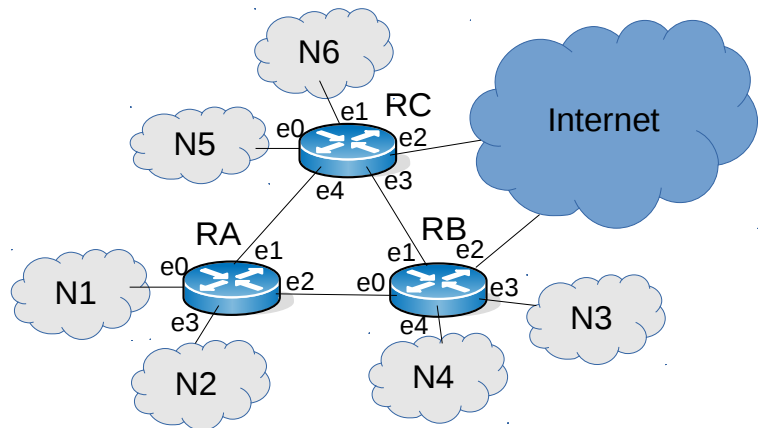
Problem 1 (4 points).

A group of schools (A, B, C) has a network as shown.

Each school has a small management network with 5 PCs each (N1, N3, N5) and another for classrooms (N2, N4, N6, all three of the same size).

The schools are interconnected and share two Internet connections.

We use the address range 192.168.0.0/24 for all addresses in this network.



- a) (1 point) Starting with the assignment at one end, either the highest (192.168.0.255) or the lowest (192.168.0.0) addresses, explain which addresses to assign to each end of the RA-RB, RA-RC and RB-RC links.

Interface	Net/num	IP
RAe1		
RAe2		
RBe0		
RBe1		
RCe3		
RCe4		

- b) (1.5 point) What address ranges would you assign to each network so that N2, N4, N6 have the maximum (and the same) number of PCs? Explain which addresses would remain unallocated.

Network	Net/num
N1	
N3	
N5	
N2	
N4	
N6	
Unallocated	

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RIPv2 is activated with split horizon in the routers:

c) (0.75 point) Fill in the routing table of the RB router

Destination	Gateway	Interface	Metric
N3	*	e3	1
N4	*	e4	1
NAB			
NBC			
NAC			
N1			
N2			
N5			
N6			
0.0.0.0/0	*	e2	1

d) (0.25 point) If the link RA-RB fails, what metrics will RA and RB announce when they detect it?

e) (0.5 point) If, in addition to the RA-RB link, the Internet connection of RB also fails, then how will the routing table look in the end? (Write only the changes)

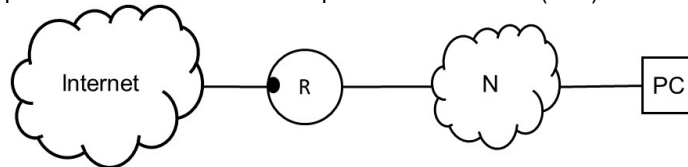
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N3	*	e3	1
N4	*	e4	1
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N1			
N2			
N5			
N6			
0.0.0.0/0			

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Problem 2 (1 point)

The external interface of the router applies the following access control list (ACL), also known as Firewall rules. Port 53 corresponds to the DNS server and port 80 to the HTTP (web) server.



	IN/OUT	IP src	port src	IP dst	port dst	Protocol	Action
1	IN	ANY		N		ICMP	ACCEPT
2	IN	D1	53	N	>1024	UDP/TCP	ACCEPT
3	OUT	N	>1024	D1	53	UDP/TCP	ACCEPT
4	IN	ANY	80	N	>1024	TCP	ACCEPT
5	OUT	N	>1024	ANY	80	TCP	ACCEPT
6	IN	ANY	>1024	N	80	TCP	ACCEPT
7	OUT	N	80	ANY	>1024	TCP	ACCEPT
8	ANY	ANY	ANY	ANY	ANY	ANY	DENY

For each of the following transactions complete the sequence of datagrams that go through the external interface of the router.

The arrows means the transmission direction: ← to the Internet, → to the internal network N. In the column "Action" put an X when the firewall does not allow the transit of the datagram. For example: PC tries to establish a connection with the mail server M and sends an SMTP packet to the external server.

← / →	Application	Protocol	Rule	Action
←	Mail (SMTP)	TCP	8	X

a) From an external device the command "ping PC" is executed

← / →	Application	Protocol	Rule	Action

b) The PC issues a DNS query to the external DNS server D1

← / →	Application	Protocol	Rule	Action

c) The PC issues a DNS query to the external DNS server D2

← / →	Application	Protocol	Rule	Action

d) Are connections from external clients to HTTP servers in network N allowed? Which ACL rules allow or forbid them?

e) From clients in network N, are connections to HTTP external servers allowed? Which ACL rules allow or forbid them?