Primer control de Xarxes de Computadors (XC), Grau en Enginyeria Informàtica		31/03/2014	Primavera 2014
Name:	**Surname**	**DNI**	

Duration: 1h15m. The quiz will be collected in 30 minutes. Answer in the same questions sheet.

Test. (3.5 punts) All questions are multi-answer: 0,5 points if correct, half if on error, 0 otherwise.

1. Say with statements are true regarding IP:
- ☐ It is a layer 3 protocol (in the OSI reference model from ISO).
- ☐ The default network mask is 0.0.0.0
- ☐ 10.0.0.10/24 is an address of class C.
- ☐ The broadcast address of the network to which the IP address 147.83.30.25/28 belongs is 147.83.30.40.

2. Assume that we have the base address 200.0.0.0/24. Say which subnetting is possible (in the following you have the maximum number of hosts we wish in each subnet):
- ☐ 1 subnet of 130 hosts and 2 subnets of 50 hosts.
- ☐ 5 subnets of 40 hosts.
- ☐ 1 subnet of 120 hosts, 1 of 60, 1 of 25, 1 of 10 and 1 of 5.
- ☐ 2 subnets of 50 and 4 subnets of 25 hosts.

3. Say with statements are true regarding DHCP:
- ☐ The clients must know the IP address (unicast) of the server.
- ☐ The clients always send a DHCPDISCOVER message.
- ☐ It is possible that the configuration needs 4 messages (2 sent by the client and 2 by the server).
- ☐ It can be used to configure the default route.
- ☐ The clients must know the well known port of the server.

4. Say with statements are true regarding DNS:
- ☐ Each time a name server initiates a name resolution, it sends a message to a root-server.
- ☐ A resource record of type CNAME allows having several names for the same IP address.
- ☐ If is requested an unknown name, a name server returns an ICMP error message.
- ☐ The root-servers have the addresses of the top level domain authorities.

5. Say with statements are true regarding a router:
- ☐ When discards a datagram because a buffer overflow, it sends an ICMP message “destination unreachable”.
- ☐ If NAT is used, for returning datagrams it first changes the destination address of the header, and then does the forwarding consulting the routing table.
- ☐ It checks the IP header checksum, and discard the datagram if fails.
- ☐ In the routing table it is possible to have overlapping networks, for instance 10.0.0.0/8 and 10.0.1.0/24.

6. Assume that a router receives a datagram of 1500 bytes to be sent in a network with MTU=1480 bytes:
- ☐ If fragmentation occurs, two fragments of the same size will be generated.
- ☐ If fragmentation occurs, two fragments with total length of 1480 and 40 bytes will be generated.
- ☐ If fragmentation occurs, two fragments with total length of 1476 and 44 bytes will be generated.
- ☐ It can only be fragmented is the IP payload is a TCP segment.

7. Say with statements are true regarding RIP routing algorithm:
- ☐ The infinite RIP metric is 16.
- ☐ The RIP metric of a directly connected network is 1.
- ☐ RIP only send update messages to neighbor routers.
- ☐ The RIP update messages can be smaller if Split horizon is used.

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Pregunta 1. (6,5 points)

We have the private address bloc 192.168.8.0/22. The network manager defines a sub-network X1 with the network prefix 192.168.8.0/26

a) (0'5 points) How many IP interfaces can be configured? Which is the range of IP addresses that may be assigned?

Once sub-network X1 is defined make the addressing plan splitting the rest of the address bloc with the minimum number of sub-networks; that is with the biggest network size.

b) (1 point) Complete the following table with all the sub-networks.

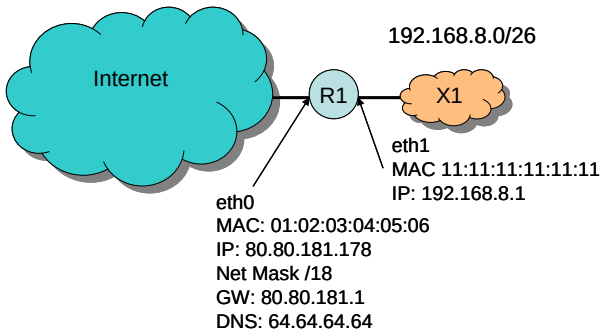
Sub-Network	Sub-Network prefix	Mask /n	Number of assignable IP addresses	Address for the sub-network router
X1	192.168.8.0	/26		192.168.8.1
X2				
X3				

Sub-network X1 is connected to the Internet through router R1, as shown in the figure.

c) (0'5 points) Considering the configuration of the interface eth0 shown in the figure, which is the network prefix?

Give the network prefix using the decimal dotted / mask whose address 80.80.181.178/18 belongs to.

Which is the "broadcast" address for this sub-network?



d) (0'5 points) Complete the routing table for router R1:

Destination network	Mask /bits	Router (IP gw)	interface
192.168.8.0 (X1)	26	192.168.8.1	eth1

R1 performs NAT (sub-network X1 has private addresses). R1 is the DHCP too and allows automatic configuration of the terminals in X1.

Terminal A belongs to sub-network X1 and executes the command "ping www.upc.edu".

Terminal A IP address is 192.168.8.8, its MAC address is aa:aa:aa:aa:aa:aa, and its ARP table is empty.

Be aware that R1 performs NAT. DNS will answer that the IP address for UPC's web server is 147.83.2.135.

e) (2 points) Complete the following table with the sequence of frames and IP datagrams transmitted through router R1until the first "echo" response comes back to terminal A.

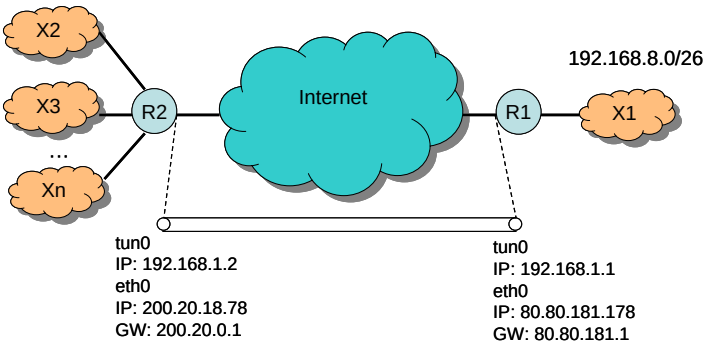
For the sake of simplicity use the following notation for the pairs IP address and MAC address:

Terminal A: A, a. Router R at interface eth0: R0, r0. Router R at interface eth1: R1, r1. DNS server: D, d.

ISP router (GW): G, g. Web server at UPC: U, u.

Ethernet Header		ARP Message		IP Header		IP packet
MAC source	MAC destination	Type Req/Resp	Solicited IP address	IP source	IP destination	Contents

Sub-network X1 is connected with the rest of sub-networks X2 ... Xn through the Internet, as shown in the figure. To do this, a tunnel is configured between routers R1 and R2.



f) (1'5 points) Complete the routing tables for routers R1 and R2.

Router R1

Destination	Mask /bits	Router (IP gw)	Interf.
192.168.8.0 (X1)	26	192.168.8.1	eth1

Router R2

Destination	Mask /bits	Router (IP gw)	Interf.

Terminal A (192.168.8.8) executes the command "ping 192.168.9.33".
g) (0'5 points) Show the contents of the IP datagram going through the Internet. Be aware of the NAT and tunnel configurations. Include the IP headers (IP source address, IP destination address) of the datagram in the Internet going from router R1 to router R2.

External IP header		Internal IP header		
IP source	IP destination	IP source	IP destination	protocol