Primer Control Xarxes de Computadors (XC), Grau en Enginyeria Informàtica		3/04/2017	Primavera 2017
Name:	**Surname:**	**Group:**	**DNI:**

Duration: 1h15m. The quiz will be collected in 25 min. Answer in the same exam sheet..

Quiz. (4 points). All questions are multianswer: count half if an error, 0 if more. Mark the correct answers.

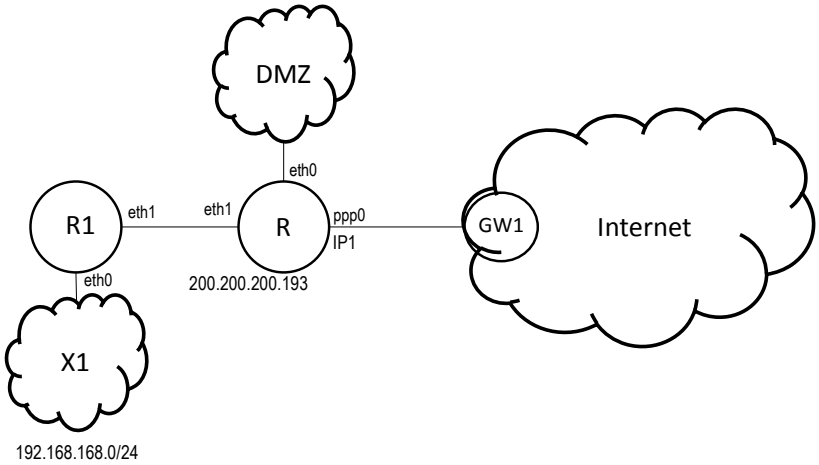
1. Regarding the TCP/IP and ISO OSI models:
   - ☐ When an application sends a few bytes, the corresponding TCP segment is larger than the IP datagram.
   - ☐ Over a connection-less network protocol, we can use both connection-oriented and connection-less transport protocols.
   - ☐ DNS protocols are located at the network layer.
   - ☐ A Router receives TCP segments, converts them to IP and resends them.
2. Regarding IPv4 addresses:
   - ☐ 192.170.100.0/28 is a private address.
   - ☐ 192.170.100.0/28 is a subnet address.
   - ☐ 192.170.100.14/28 can be a host.
   - ☐ 192.170.100.0/30 and 192.170.100.4/30 could be subnets of the range 192.170.100.0/28.
3. We have the address range 10.0.3.0/27. We want to address in that range 2 networks of 1 host, 1 of 5 hosts and another of 7 hosts.
   - ☐ We do not have enough addresses to get there.
   - ☐ 10.0.3.8/29 and 10.0.3.8/30 may be the two subnets of 1 host.
   - ☐ 10.0.3.8/29 may be one of the subnets.
   - ☐ 10.0.3.0/26 could be the 7-host subnet.
4. Regarding IP support protocols:
   - ☐ ARP messages are encapsulated in an IP packet.
   - ☐ ICMP messages are encapsulated in an IP packet.
   - ☐ The DNS is used to obtain an IP address from a name.
   - ☐ ARP messages travel over UDP.
5. In the IPv4 header:
   - ☐ The two addresses occupy more than a third of the header.
   - ☐ The length of the header is measured in 32-bit blocks.
   - ☐ The Protocol field indicates the protocol over which the datagram travels.
   - ☐ Up to two bytes are available to request a certain Quality of Service.
6. About Routers:
   - ☐ Each time they receive a datagram they generate an informative ICMP control message.
   - ☐ A router can implement several link level protocols.
   - ☐ Use the DHCP protocol to be able to fragment the datagram when it is to be delivered to the host.
   - ☐ They use the routing table to know to whom the datagram is to be delivered.
7. On security in IP:
   - ☐ If we add an output tunnel to a router, we must change the values of the routing table.
   - ☐ An ACL is used to filter datagrams to prevent them from exiting or entering a Router based on information that is not only found in the IP header.
   - ☐ If we want to avoid an attack to a Web server that we have in our subnet, it is imperative to use DNAT and to be on a subnet separated from the rest by another Router.
   - ☐ One way to implement a tunnel is to include the datagram that we want to go through the tunnel in the header of an output datagram.
8. In relation to RIP:
   - ☐ If we have a Routing table with two entries with metrics of 100 and 200, the RIP Update messages that are sent for those two entries will be different.
   - ☐ RIP Update messages are only sent when there are changes to Routing tables.
   - ☐ The OSPF protocol is the same as the RIP when using Split Horizon and Poisoned Reverse at the same time.
   - ☐ The Split Horizon allows you to prevent a Router from sending, to another, information obtained from it.

First Midterm. Xarxes de Computadors (XC), Grau en Enginyeria Informàtica		03/04/2017	Spring 2017
NAME (in CAPITAL LETTERS):	FAMILY NAME (in CAPITAL LETTERS):	GROUP:	DNI:

Duration: 1h 15 minutes. The quiz will be collected in 25 minutes.

Problem 1 (4 points).

The figure shows a company's network and its configuration. It uses the block of private addresses 192.168.168.0/24 for the network X1. The block of public addresses available is 200.200.200.192/28. The IP address of the router R is IP1 and it is assigned by the ISP and the IP address of the ISP's router is GW1.



a) (0'5 points) From the block of public IP addresses the address 200.200.200.193 is assigned to the internal interface of the router R which connects with R1. Find out what is the largest subnetwork we may use for the DMZ (public addresses) and how many servers can be allocated there.

b) (0'5 points) Complete the routing tables of R1 and R.

R1			
Network	**Mask**	**Gateway**	**Iface**

R			
Network	**Mask**	**Gateway**	**Iface**

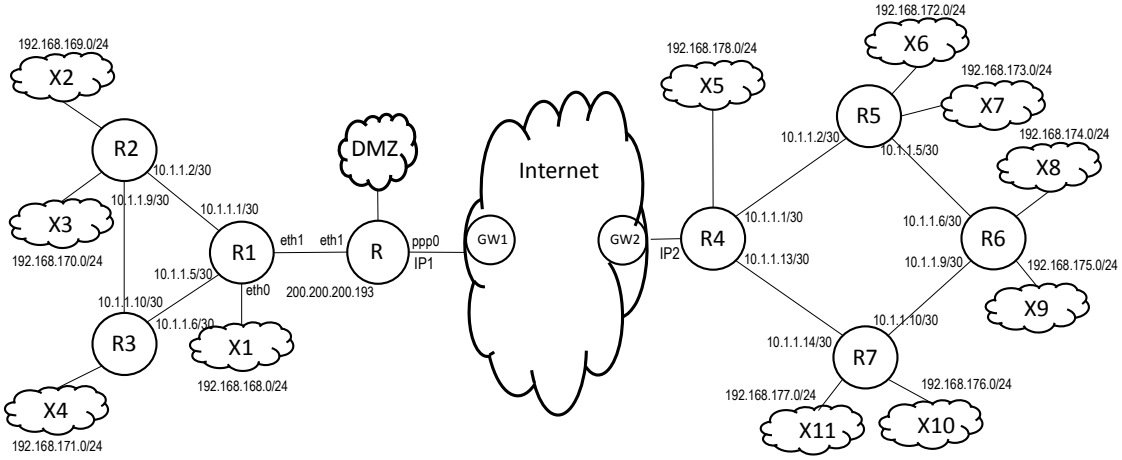
c) (0'75 points) A device connected to X1 issues the command "ping 200.200.200.193". Complete the sequence of Ethernet frames and datagrams going through X1 considering that the device is configured and the ARP tables are empty. The IP address of the device is "A", its MAC address is "a"; the IP address of the router's interface is "R1" and its MAC address is "r1".

Ethernet header		ARP message		IP header			data
src	**dst**	**type**	**contents**	**source**	**destination**	**prot**	**message**

d) (0'5 points) Router R1 performs NAT (PAT or PNAT) so that router R does not manage private addresses.
Complete the information of the IP datagrams going through the link between R and R1 when A executes "ping 200.200.200.193".

IP header			data
source	**destination**	**protocol**	**message**

The figure shows the complete configuration of the company's network with two sites using private addresses connected via Internet.



Subnetworks Xn have private addresses of the type 192.168.x.0/24. The links between routers have private addresses of the type 10.1.1.x/30. To connect both sites a tunnel between R1 and R4 is established. The tunnel uses private addresses from 192.168.0.0/30. Subnetworks X5 ... X11 have Internet access using the tunnel and going through R1.

e) (0'75 points) Complete the routing table for R1 including the tunnel and the minimum number of routes (aggregate subnetworks when possible).

Network	Mask	Gateway	Iface
10.1.1.0	/30		eth2
10.1.1.4	/30		eth3

f) (0'5 points) A device in subnetwork X11 executes the command "traceroute 200.200.200.202". The latter address corresponds to a server in DMZ. Determine the sequence of IP addresses returned by the execution of the "traceroute" command.

g) (0'5 points) If the MTU of all the subnetworks is of 1500 bytes, identify if there is a case when fragmentation is required. If so, what is the size of the corresponding fragments?

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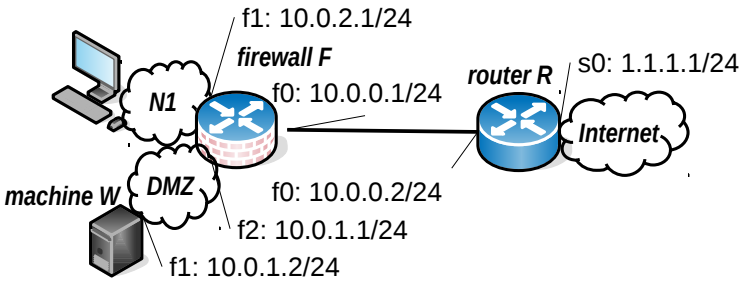

The figure shows the names of the interfaces and the IP addresses assigned to them.

Problem 2 (2 points)

The network of the figure has only one public address which the **router R** uses for PAT/DNAT. There are no more networks that those shown in the figure. Suppose that R is already configured according to the addresses shown in the figure. There is also the **firewall F** that must be configured to achieve the following **objectives** between N1/DMZ and the Internet:

1. From the **network N1** it must be possible to connect to any standard server (**well known port**) in the Internet.
2. **ICMP** messages can be sent and received from N1/DMZ and the Internet.
3. From the **DMZ** it is possible to connect to **name servers** (port 53) in the Internet.
4. From the Internet it is possible to access the **web server** (port 80) that is in the machine **W**.

We want to configure the **firewall F** to achieve these objectives according to the following **conditions** (in order of preference):

1. Do not allow connections between N1/DMZ and the Internet that does not correspond to the objectives above.
2. Minimum number of rules.
3. Rules as restrictive as possible.

Fill the following table considering that the columns protocol/IP/port correspond to the fields of the transport and IP headers (when applicable). The rule applies to **packets that enters (in)** by the **interface f0** of the **firewall F**. For each objective there can not be used more rules than rows in the table, although it is possible to use less. In any box "**any**" means any value; and "-" means not applicable. The list ends with the rule "deny everything". Put the IP addresses in dotted notation/mask. For the ports there can be used the operators <, >, =.

Objective	protocol	source-@IP/mask	source-port	destination-@IP/mask	dest-port	Accept: A, Deny: D
1						
1						
2						
2						
3						
3						
4						
4						
	any	any	-	any	-	D