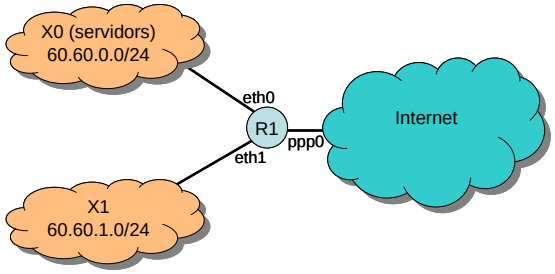
Segon control de Xarxes de Computadors (XC), Grau en Enginyeria Informàtica		5/5/2014	Primavera 2014
NAME:	**SURNAME**	**GROUP**	**DNI**

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

Test. (4 points) All questions are multi-answer: 0,5 points if correct, half if one error, 0 otherwise.

The figure shows a network using public IP addresses. There are two sub-networks: one for the public servers (X0) and the other (X1) for hosts. The router has the rules shown in the table in the firewall (access control list).



R1 interface ppp0

N	Direc-tion	IP org	Port org	IP dst	Port dst	Protocol	Action
1	IN	ANY	>=1024	X0	<1024	ANY	Accept
2	IN	ANY	<1024	X1	>=1024	ANY	Accept
3	IN	ANY		X0		ICMP	Accept
4	IN	ANY		X1		ICMP	Reject
5	IN	ANY	ANY	ANY	ANY	ANY	Reject
6	OUT	X0	<1024	ANY	>=1024	ANY	Accept
7	OUT	X1	>=1024	ANY	<1024	ANY	Accept
8	OUT	ANY	ANY	ANY	ANY	ANY	Reject

1. Mark the correct sentences:
- ☐ Servers in X0 (using well known ports) are accessible from the Internet.
- ☐ Hosts in X1 are accessible from the Internet.
- ☐ Hosts in X1 cannot access the servers in X0.
- ☐ Sub-network X0 may host clients that are accessible from the Internet

2. Mark the correct sentences:
- ☐ Hosts in X1 can send "ping" messages and receive the corresponding responses.
- ☐ Servers in X0 can send "ping" messages and receive their responses.
- ☐ Servers in X0 can receive "ping" messages sent from the Internet.
- ☐ Hosts in X1 can send "ping" messages to the servers in X0 and receive their responses.

N	direction	IP org	Port org	IP dst	Port dst	Protocol	Action
9	IN	ANY	>=1024	60.60.1.4	80	TCP	Accept
10	OUT	X1	<1024	ANY	>=1024	TCP	Accept

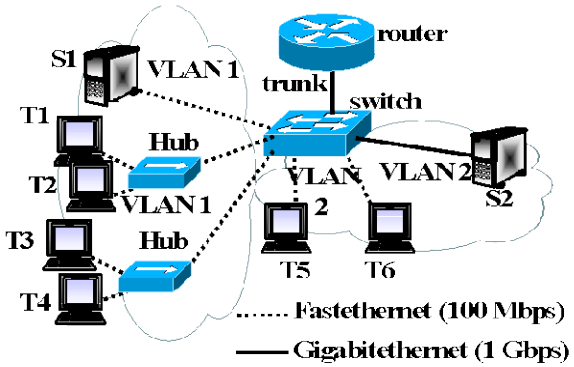
3. If rules 9 and 10 are added in the list in the correct position (interface ppp0), mark the correct sentences:
- ☐ Now all servers in X1 are accessible from the Internet.
- ☐ Web server (60.60.1.4) receives datagrams form its clients but cannot send the responses because the firewall blocs these outgoing datagrams.
- ☐ Now a web server in X1 with the IP address IP 60.60.1.4 is accessible from the Internet.
- ☐ The web server (60.60.1.4) may have clients in X0 too.

4. About the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) mechanism mark the correct sentences:
- ☐ A terminal, before transmitting a frame waits for the channel being idle and after a given time (IPG) transmits the frame.
- ☐ Collisions are detected when the frame acknowledgement does not come back.
- ☐ When a collision is detected the terminal sends a JAM frame and waits a backoff time before retransmitting the frame.
- ☐ A full duplex interface does not perform CSMA/CD.

5. Talking about VPN (virtual private networks), mark the correct sentences:
- ☐ VPN may be configured exclusively connecting private networks.
- ☐ VPN are an alternative to dedicated links between remote networks but this solution is more expensive than dedicated links.
- ☐ VPN use IP tunnels for connecting remote networks across the Internet.
- ☐ Tunnels must be configured for each one of the servers in the remote networks.

6. Consider the configuration shown in the figure and mark the correct sentences.
- ☐ The collision domain for T1 is VLAN1.
- ☐ The collision domain for S2 is VLAN2.
- ☐ The broadcast domain for T1 includes T2, T3, T4, S1 and the router.
- ☐ The broadcast domain for T1 includes all terminals, servers and the router.

7. Consider that all ARP tables and switch tables are empty. Terminal T1 sends the command "ping S2". Mark the correct sentences when T1 has received the response.
- ☐ The switch port corresponding to the trunk link has learnt the MAC addresses of T1 and S2.
- ☐ The switch port towards S2 has learnt the MAC addresses of T1 and S2.
- ☐ The switch port towards S2 has learnt the MAC addresses of S2.
- ☐ T1's MAC address is associated to only one of the ports of the ethernet switch.



8. About the STP ("Spanning Tree Protocol") mark the correct sentences:
- ☐ STP is used by the host in an Ethernet network for finding the optimal route through the VLANs.
- ☐ STP function is to avoid loops among Ethernet switches.
- ☐ In order to avoid loops the switches use the flow control mechanism in the corresponding ports.
- ☐ Ethernet switches bloc some of the ports to avoid loops in a VLAN.

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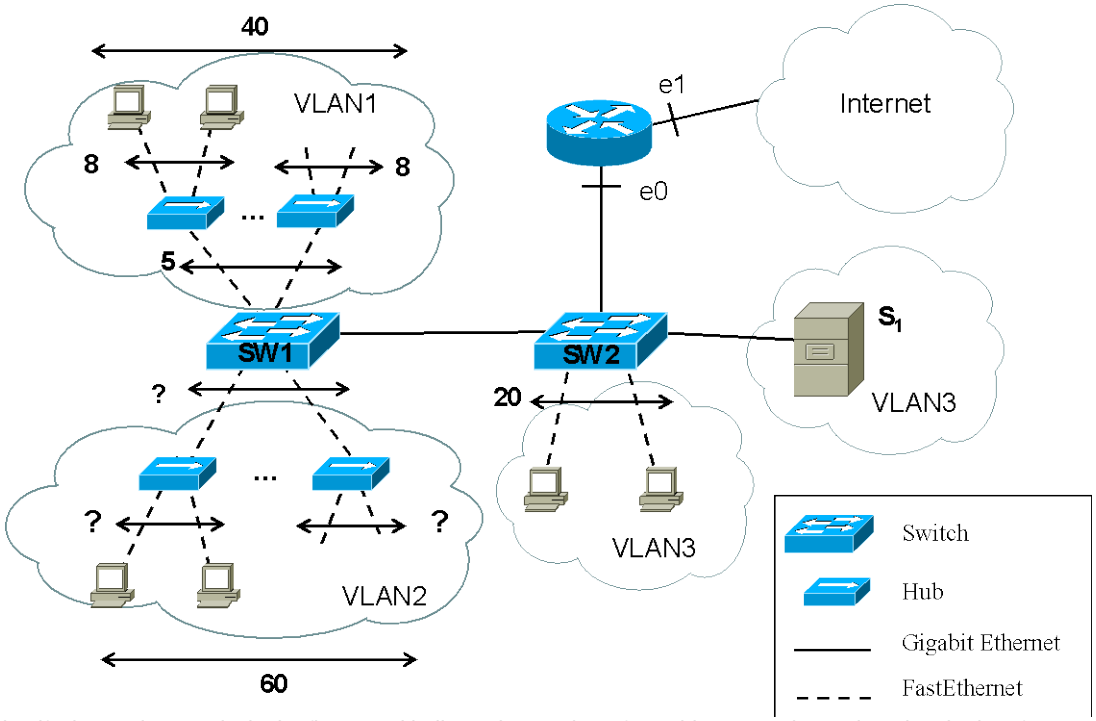
Pregunta 1. **(6 points)**

The network in the figure consists of some stations and a server. There are 3 VLANs where the number of hubs and stations per hub or switch are indicated in the figure. The links are either GigabitEthernet or FastEthernet if they are drawn as solid lines or dotted. The efficiency of the switches is 100 % while it is 50% for the hubs. Answer to each of the following scenarios assuming that only active stations transmit packets and neglecting the effect of the responses. Describe and motivate the assumptions made in your answers. Consider that numerical answers will not be accepted without explanation.



a) (0.5 points) Identify the trunk or trunks in the figure and indicate the number of IP addresses to be assigned to the interface e0 of the router.

b) (1.5 points) Only stations belonging to VLAN1 are active and transmit to server S1. Indicate:

i. The device subject to main bottleneck.

ii. The mechanism or mechanisms that regulate the throughput of the stations.

iii. The throughput achieved by the active stations. Include in this section the assumptions made, the explanations, and the calculus.

c) (2 points) Only stations belonging to VLAN1 and VLAN2 are active and transmit to server S1. Regarding VLAN2, we only known that there are 60 stations in total but do not know the number of hubs and the stations per hub. These values must be determined knowing that, with the VLAN1 and VLAN2 stations active, we want to transmit to server S1 at the maximum possible throughput without having congestion in the switches.

d) (2 points) Only stations belonging to VLAN1 and VLAN3 are active and transit to server S1. Indicate:

i. The device subject to main bottleneck.

ii. The mechanism or mechanisms that regulate the throughput of the stations.

iii. The throughput achieved by the active stations. Include in this section the assumptions made, the explanations, and the calculus.