Segon Control de Xarxes de Computadors (XC), Grau en Enginyeria Informàtica		23/12/2015	Tardor 2015
Name:	**Surname:**	**Group**	**DNI**

Duration: 1h15m. The quiz will be collected in 20 minutes. Answer in the same questions sheet.

Test. (3 points) All questions are multiple choice: Count as half if there is one error, 0 if more.

1. A student from FIB has done a capture of a wifi frame with his laptop received from the AP of the Campus where hi is connected. The dump of the 802.11 header shows the following: Destination Address=24:df:6a:79:05:88, Source Address=ac:de:48:54:18:b6, BSSID=00:3a:99:a9:05:92; and the dump of the IP header shows: Destination Address=10.183.124.112, Source Address=147.83.2.3. Say which statements are true:

- ☐ The AP has the MAC address 00:3a:99:a9:05:92.
- ☐ The AP has the MAC address:48:54:18:b6.
- ☐ The laptop has the MAC address 24:df:6a:79:05:88.
- ☐ We can state that the network card with MAC address ac:de:48:54:18:b6 has the IP address 147.83.2.3.

2. Say which statements are true regarding an Ethernet HUB:

- ☐ It can only be half duplex.
- ☐ All ports belong to the same collision domain.
- ☐ All ports belong to the same broadcast domain.
- ☐ There can be ports configured with different bit rates.

3. Say which statements are true regarding an Ethernet switch:

- ☐ If 2 ports of the same switch configured in the same VLAN are connected with a cable, the STP protocol will block one of them to avoid the loop.
- ☐ If 2 ports of the same switch configured in different VLANs are connected with a cable, the STP protocol will block one of them to avoid the loop.
- ☐ The MAC table of a switch is configured automatically using the Ethernet destination addresses of the frames that arrive to the switch.
- ☐ If an Ethernet frame with a broadcast destination address arrives, the switch will transmit the frame for all ports, but the port where the frame arrived, independently of the VLAN to which the ports belong.

4. Say in which cases a congested device can generate and send Ethernet pause frames:

- ☐ A switch in ports configured in half duplex mode.
- ☐ A switch in ports configured in half full mode.
- ☐ A router in ports configured in half duplex mode.
- ☐ A router in ports configured in full duplex mode.
- ☐ A hub in ports configured in half duplex mode.

5. Say which statements are true regarding the email:

- ☐ Using MIME it is possible to send email messages in HTML format.
- ☐ When the recipient receives the email he will see the email address provided in the RCPT TO: command of SMTP.
- ☐ In the same TCP connection of SMTP it is possible to send more than one email message.
- ☐ In general, the SMTP server name of the recipient of the email message is obtained using the DNS service.

6. Say which statements are true regarding web:

- ☐ The javascript code is executed in the browser of the client.
- ☐ The client can send data added to an HTML form using a POST.
- ☐ In some cases, the usage of a web proxy can reduce significantly the download time.
- ☐ If a client access to his mailbox using a web browser, he will download the email messages using SMTP.

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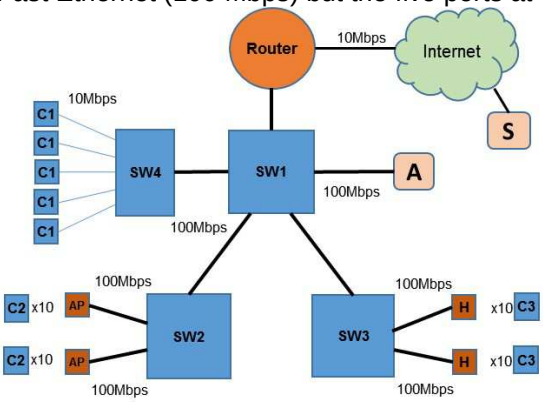
Problem 1 (4 points)

The figure shows the network configuration of a LAN and its connection to the Internet at 10 Mbps. All switch ports are Fast Ethernet (100 Mbps) but the five ports at SW4 that connect with the 5 computers (C).



The efficiency of the Hubs is 80% and the WLAN Access Points operate at 125 Mbps and have an efficiency of 80%.

Each Access Point (AP) and each Hub (H) serve 10 computers

For each of the following scenarios, identify the bottleneck link, how the flow control applies, and what is the maximum achievable throughput for the computers and servers involved.

Use **C1** to identify the computers connected through SW4, **C2** for the ones in the WLAN, and **C3** for the ones connected through the Hubs at SW3.

a) Scenario 1: All computers send traffic to server A.

Flow control (which devices apply it and how it works):

Maximum throughput for all the computers:

b) Scenario 2: Three VLANs are set up. VLAN1 includes the 5 computers at SW4 (C1) and server A. VLAN 2 includes all the computers in the WLAN (C2). VLAN3 includes all the computers attached to the hubs (C3). All the computers send traffic towards server A.

Flow control (which devices apply it and how it works):

Maximum throughput for all the computers:

c) Scenario 3: Consider the three VLAN from the previous scenario and that all the computers download data from server A at the same time.

Flow control (which devices apply it and how it works):

Maximum throughput for all the computers:

d) Scenario 4: All computers download data from the external server S at the same time.

Flow control (which devices apply it and how it works):

Maximum throughput for all the computers:

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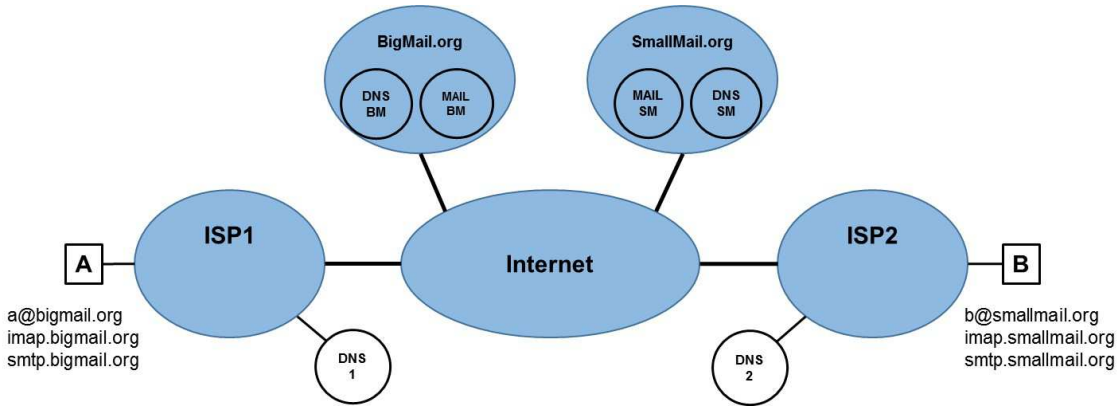
Problem 2 (1.5 points)

Two users, A and B, access the email from home. A's email service is BigMail.org, and B's email service is SmallMail.org. The figure shows the network configuration and the email clients.



a) A sends an email to B (b@smallmail.org).

In the following table, complete the sequence of messages exchanged by the different devices (including the corresponding protocols).
Consider that the email message fits in one single data packet. SMTP and IMAP servers are running in the same MAIL server. Consider that the DNS tables are empty.
As IP addresses use the name of each device or server.

Source	Destination	Transport Protocol	Application Protocol	contents

b) BigMail server sends the message to SmallMail server.
List the interactions needed, and for each, which hosts and protocols are involved.

c) User B read the email from his/her email server.
List the interactions needed, and for each, which hosts and protocols are involved.

Problem 3 (1.5 points)
A web client sends a request to the page "www.serveiweb.org/index.htm". This page contains an embedded header image, three images stored in an external server, an advertisement stored in another server and a big image stored in the external server along with the other images.

Consider the following data:

DNS server:	RTT= 10ms;	
serveiweb.org server:	RTT= 30ms;	contains the page index.htm (it fits in one data segment) and the header image (it fits in 1 data segments)
images' server:	RTT= 50ms;	contains the three small images (1 segment/image) and the big image (it fits un 4 data segments)
Ads server:	RTT= 200ms;	the advertisement fits in 1 data segments

This connection uses **persistent HTTP without "*pipelining*"** and the web client opens **a single** TCP connection per server. The order when downloading the objects is: 1) index.htm, 2) header image, 3) the three small images, 4) the advertisement, and 5) the big image.
Show the sequence of the transactions (from 1 to 5) and estimate the time required for each of them. Do not consider the TCP disconnection time. Show a simple time diagram for each transaction.
Compute the total amount of time required for the complete download of the page. State the assumptions you make.