Tercer control de Xarxes de Computadors (XC), Grau en Enginyeria Informàtica		7/6/2016	Primavera 2016
NAME:	**SURNAME**	**GROUP**	**DNI**

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

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

1. About CSMA/CD:
- ☐ It can be used in Ethernet.
- ☐ Collisions are usual and imply the retransmission of the frame.
- ☐ The more the number of machines that share the cable, the more the efficiency.
- ☐ It is used in WLAN.

2. About MAC format in Ethernet:
- ☐ The number of address fields is different in the case of infrastructure mode from the case of Ad Hoc mode.
- ☐ The last bytes of the frame are a CRC.
- ☐ The payload (or user data) field may be empty.
- ☐ The payload (or user data) field has a maximum size of 1.500 bytes, although in some special cases may be bigger.

3. About the switches:
- ☐ There are also collisions, as in the hubs, but they are quicker.
- ☐ A switch has 3 ports, A, B and C, running at 100 Mbps. 50 Mbps enter through A towards a machine connected in Full-Duplex mode at the B port. Another 50 Mbps enter through A towards another machine connected in Full-Duplex mode at the C port. Then, the switch will need to activate flow control in order to distribute the data.
- ☐ In a switch supporting VLAN, data entering through VLAN 1 have to go through a Router in order to go out through VLAN 2.
- ☐ In a trunk port, the frames have more information in the header than when they go through a “regular” port.

4. About WLAN:
- ☐ There are cases in which in the WLAN MAC, it is enough with two addresses.
- ☐ The BSS Identifier (BSSID) indicates the group of host that communicate between themselves, also identifying the Access Point (AP), when it exists.
- ☐ It is not possible to directly connect two AP (Access Point) with WLAN.
- ☐ In a frame arriving to a machine from an AP (Access Point), there are only 4 addresses when they come from further away than a Router.

5. About e-mail protocols and formats:
- ☐ POP3 is a symetric protocol, since both ends perform the same function.
- ☐ MIME types, contrarily to subtypes, are modified when new data structures are developed.
- ☐ In the SMTP protocol, the originator of the mail initiates the connection.
- ☐ The dialogue in the SMTP protocol starts with the interchange of credentials (user and password) between both machines.

6. About the Web:
- ☐ Inside a URL, the *Query* and *Fragment* fields are optional.
- ☐ The HTTP header has fields to control the closing of the TCP connection.
- ☐ In the HTTP’s *Get* method, the *body* is optional.
- ☐ HTML has tags to distinguish elements in a list.

7. About XML:
- ☐ Attributes are inside *tags*, while elements are between *tags*.
- ☐ A XML Schema is expressed in a language different to XML.
- ☐ The XML Schema defines things such as the way to present characters in the screen.
- ☐ One of the things that we could do with XSLT is to translate from a XML Schema to an HTML document.

8. About several things:
- ☐ MIME is not used in HTTP.
- ☐ Trunk ports in a Switch are faster tan in a Hub.
- ☐ When LLC is used, the maximum TCP segment size to be transported is reduced.
- ☐ When Reading mails with a web browser (as it is usual in the case of *gmail*), the protocol between my machine and the server of the mail service provider is POP3.

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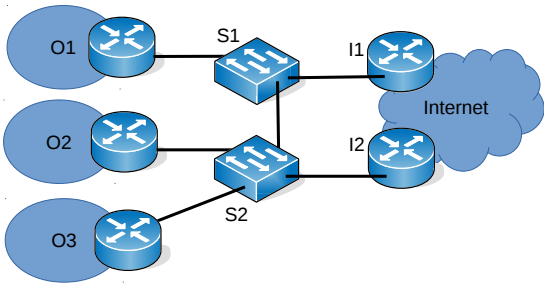
Question 1 (3 points)

A city has the following interconnection network connecting several organizations (O1, O2, O3) with several Internet service providers (I1, I2) through an interconnection exchange (IX) using two Ethernet switches (S1, S2), one at each end of the city and interconnected. All connections are 1 Gbps full duplex.



Consider the situation of saturation, where each organization (O1, O2, O3) generates unicast aggregate traffic to or from the Internet that saturates the capacity of the network infrastructure, and there is no direct traffic between them. Briefly justify each answer below.

a) If we do not use VLAN, indicate which are the collision domains and broadcast domains as lists of links, eg. {O1-S1, S1-I1}

b) If O1, O2, O3 all connect to the Internet through I1, indicates the effective aggregate speed that each organization can achieve

c) If from now O1-I1, I2-O2, O3-I2 are paired, indicate the effective aggregate speed that each organization can achieve

If from now we introduce a VLAN for each ISP (I1, I2):

d) Indicate which are the collision domains and broadcast domains (notation as in a)

e) Indicate which links must necessarily be in "trunk" mode

f) If in addition O1, O2, O3 want to exchange direct traffic between them, indicate how to organise the VLAN to minimize the unicast and broadcast traffic on the links

g) Indicate the mechanism the switches will use to slow traffic due to "bottleneck" links

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Problem 2 (3 points)

Consider the following email with its data field as shown:

```
Content-Type: multipart/related;
        boundary="_005_0FB0A6D786F22F43B8DB3ACF12D0C357FD6D78emappl013EmeraldN_";
        type="multipart/alternative"
MIME-Version: 1.0
X-Virus-Scanned: amavisd-new at ac.upc.edu

--_005_0FB0A6D786F22F43B8DB3ACF12D0C357FD6D78emappl013EmeraldN_
Content-Type: multipart/alternative;
        boundary="_000_0FB0A6D786F22F43B8DB3ACF12D0C357FD6D78emappl013EmeraldN_"

--_000_0FB0A6D786F22F43B8DB3ACF12D0C357FD6D78emappl013EmeraldN_
Content-Type: text/plain; charset="iso-8859-1"
Content-Transfer-Encoding: quoted-printable

Estimado/a Professor,
Aprovechamos la ocasi=F3n para agradecerle su aportaci=F3n y su apoyo.
Le recordamos que cualquier sugerencia es bienvenida.
Reciba un cordial saludo,


--_000_0FB0A6D786F22F43B8DB3ACF12D0C357FD6D78emappl013EmeraldN_
Content-Type: text/html; charset="iso-8859-1"
Content-Transfer-Encoding: quoted-printable

<html xmlns:v=3D"urn:schemas-microsoft-com:vml" xmlns:o=3D"urn:schemas-mic=
rosoft-com:office:office" xmlns:w=3D"urn:schemas-microsoft-com:office:word=
" xmlns:m=3D"http://schemas.microsoft.com/office/2004/12/omml" xmlns=3D"ht=
tp://www.w3.org/TR/REC-html40">
<head>
<body>
... text del missatge en HTML ...
</body>
</html>

--_000_0FB0A6D786F22F43B8DB3ACF12D0C357FD6D78emappl013EmeraldN_--

--_005_0FB0A6D786F22F43B8DB3ACF12D0C357FD6D78emappl013EmeraldN_
Content-Type: image/jpeg; name="image001.jpg"
Content-Description: image001.jpg
Content-Disposition: inline; filename="image001.jpg"; size=844;
        creation-date="Tue, 31 May 2016 11:08:54 GMT";
        modification-date="Tue, 31 May 2016 11:08:54 GMT"
Content-ID: <image001.jpg@01D1BB35.33C822F0>
Content-Transfer-Encoding: base64

/9j/4AAQSkZJRgABAQEAYABgAAD/2wBDAAgGBgcGBQgHBwcJCQgKDBQNDAsLDBkSEw8UHRofHh0a
HBwgJC4nICIsIxwcKDcpLDAxNDQ0Hyc5PTgyPC4zNDL/2wBDAQkJCQwLDBgNDRgyIRwhMjIyMjIy
orqPiO4aKTfDFiJDnI464/HNYNddKUp01KSs2ediIRp1ZQg7pO1yW3na2mWVFjZl7SIHU/UHite7
8X6zd2n2U3KxQ42lYECZHpkdvpWHRRKlCbTkrtBTr1acXGEmk+wUUUVoYn//2Q==

--_005_0FB0A6D786F22F43B8DB3ACF12D0C357FD6D78emappl013EmeraldN_
Content-Type: image/png; name="image002.png"
Content-Description: image002.png
Content-Disposition: inline; filename="image002.png"; size=845;
        creation-date="Tue, 31 May 2016 11:08:54 GMT";
        modification-date="Tue, 31 May 2016 11:08:54 GMT"
Content-ID: <image002.png@01D1BB35.33C822F0>
Content-Transfer-Encoding: base64

iVBORw0KGgoAAAANSUhEUgAAABkAAAAZCAYAAADE6YVjAAAAAXNSR0ICQMB9xQAAAAlwSFlzAAAO
xAAADsQBlSsOGwAAABl0RVh0U29mdHdhcmUATWljcm9zb2ZOIE9mZmljZX/tNXEAAALNSURBVEjH
4t5wtpn5Zehodbwapx/ryZAoTTOiNWbE0oeYQIwOySMZzdBe7UR2yWNh54u7xHdhG36sF33WDNaX
VBv/XXyMMzUwMyGcjhm+vNj43Xe8Sfx3sf5vx7YZst+ZfHQAAAAASUVORK5CYII=

--_005_0FB0A6D786F22F43B8DB3ACF12D0C357FD6D78emappl013EmeraldN_--
```

Header

Body

a) Mark the different MIME parts of the message as the header and body parts are shown. Identify where each part begins and ends.

b) Identify which attachment files it contains, what is the type of contents and the coding for each one.

The receiver of this message is doctor@ac.upc.edu who decides to resend it using a standard email client (MUA). He/she decides to send it to usuari1@lloc1.com and usuari2@lloc1.com, with a "blind carbon copy" (Bcc) to yes@bigbrother.com.
c) Complete the list of SMTP commands/responses exchanged between the client (pc.ac.upc.edu) and the mail server at UPC (mail.upc.edu). Consider the RTT between client and server of 10ms and that the body of the message is sent in a very short time. How long does it take to send the message? Count the number of RTT in the last column of the table.

Client --------Server	SMTP Command/Response	RTT
→	HELO pc.ac.upc.edu	

d) Fill the following table with the different UDP communications and TCP connections, the transport protocols, the application protocols and the destination servers, when the mail server at UPC (mail.upc.edu) forwards the mail messages.
Identify the DNS server as *ns.domini* and the mail servers as *mail.domini*

Transport Protocol	Application Protocol	Server	Action