

| First Control de Xarxes de Computadors (XC), Grau en Enginyeria Informàtica | | 18/4/2016 | Spring 2016 |
|---|----------|-----------|-------------|
| 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.

- Mark the correct answers regarding the IPv4 protocol:
 - ☐ The IP header has a field to identify fragments.
 - ☐ When a router decrements the TTL field and reaches zero, it discards the datagram.
 - ☐ The checksum is calculated only with the header fields.
 - ☐ Each time a router discards a datagram due to TTL, it generates an ICMP message.
- Which of the following network addresses are incorrect:
 - ☐ 147.83.40.0/21
 - ☐ 147.83.42.0/24
 - ☐ 10.0.0.0/0
 - ☐ 192.168.48.0/20
- Mark the correct answers regarding the network 4.3.2.0/30:
 - ☐ The "broadcast" address of your subnet is 4.3.2.255
 - ☐ The "broadcast" address of your subnet is 4.3.2.3
 - ☐ The highest unicast address is 4.3.2.2
 - ☐ The IP address 4.3.2.1 can only be the router.
- Mark the correct answers regarding the DHCP protocol:
 - ☐ Customers start sending a DISCOVER message.
 - ☐ Customers must know the (unicast) IP address of the server.
 - ☐ It sends broadcast messages to 255.255.255.255
 - ☐ May require exchanging 2 messages from the client and 2 server responses.
- Mark the correct answers regarding DNS queries:
 - ☐ They typically use UDP.
 - ☐ Always use TCP.
 - ☐ A name may correspond to multiple IP addresses.
 - ☐ Always involves a root server.
- Mark all the correct answers about DNS:
 - ☐ The root servers are responsible for resolving all queries.
 - ☐ CNAME records return the server name of a domain name.
 - ☐ If you ask for a domain that does not exist DNS will not reply.
 - ☐ The reverse resolution allows to obtain a name from an IP address.
- Mark the correct answers regarding the ARP protocol:
 - ☐ To send each IP packet we must ask via ARP the MAC address of the destination.
 - ☐ In a point to point link it is not necessary to use ARP.
 - ☐ It is used only by hosts, not by routers.
 - ☐ It allows to find out the MAC address of a network interface from its IP address.
- Mark the correct answers regarding routing:
 - ☐ RIP knows all the network links.
 - ☐ OSPF knows all the network links.
 - ☐ RIP calculates its routing table from the routing table of its neighbors.
 - ☐ OSPF calculates its routing table from the routing table of its neighbors.

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Problem 1 (4 points)

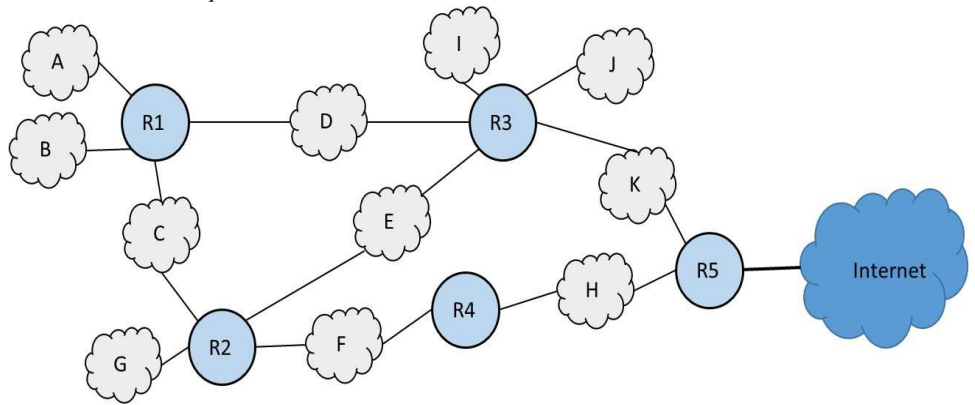
The following figure shows a network containing five routers (R1 a R5).

We want to configure the networks of the figure to provide connectivity across all devices (each host can connect to each other, independently of the network in which they are located), as well as connectivity to the Internet. In particular, the networks have the following hosting requirements:

A,B,G,I,J: 60 hosts and one router each

C,D,E,F,K,H: 2 routers each

For this purpose, we have the following IP block available: 212.15.12.0/22



a) What is the size of the hostid and the network masks associated to each network as to be able to host the number of hosts required? The hostid must be kept as short as possible. Provide the masks in the form /xx.

b) Propose an address assignment that justifies your previous answer, and indicate the network address of each of the 11 networks. Networks containing hosts should be assigned first, and later router-only networks.

c) A host located in network A (pcA) wants to send a ping to another host located in network B (pcB) based on the host name (pcB.xc.com). We know that our local dns server (dns.xc.com) is located in network G. How many DNS messages will cross R2? Which ones? For every DNS request (and response) Indicate the resource type for each requested DNS resource, as well as the source and destination address of each message. You can leave indicated the fields of the messages that you can't resolve with the provided information.

d) In this scenario, and assuming that the ARP cache is empty, how many ARP requests and responses will be seen by R1 to make the DNS resolution? Enumerate them.

| | | | | | |
|--|--|---------|--|-----------|----------------|
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Problem 2 (1.5 points)

Consider now that in the network of the previous problem all routers use the RIPv2 protocol. Router interfaces are named with the name of the attached network; that is R1c identifies R1 interface to network C.

- Complete the left part of the following table with the routing table for **Router R2** once RIP information converges.
- Complete the right part of the table crossing with an **X** the routes that router R2 will announce to its neighbours (R1, R3 and R4). Consider that "Split Horizon" is activated and that route summarization is not active.

| DST | NEXT HOP | Metric | R1 | R3 | R4 |
|---------|----------|--------|----|----|----|
| A | R1c | | | X | |
| B | | | | | |
| C | | | | | |
| D | | | | | |
| E | | | | | |
| F | | | | | |
| G | | | | | |
| H | | | | | |
| I | | | | | |
| J | | | | | |
| K | | | | | |
| default | | | | | |

Problem 3 (1.5 points)

Consider a router with five interfaces: I (Internet), G (management of communication equipment), S (servers or DMZ), T (working area). IP addressing is as follows: G (10.10.0.0/16), S (147.83.132.0/24), T (147.83.130.0/23). Router's interfaces are named as G, S and T, respectively.

The following table presents the filtering rules (access control lists) for interface **S**. Interface I (Internet) has no ACL.

- Complete rules 4, 5 and 6 for allowing the access to the servers shown in rules 1, 2 and 3.
- Complete rules 7 and 8 to allow PING to all servers in network S.

| | Interface | IN/OUT | DST IP | DST port | SRC IP | SRC port | PROTOCOL | ACTION |
|----|-----------|--------|-----------------|----------|--------|----------|----------|--------|
| 1 | S | OUT | 147.83.132.3/32 | 80 | ANY | >1024 | TCP | ACCEPT |
| 2 | S | OUT | 147.83.132.4/32 | 53 | ANY | >1024 | TCP/UDP | ACCEPT |
| 3 | S | OUT | 147.83.132.0/24 | 22 | ANY | >1024 | TCP | ACCEPT |
| 4 | S | IN | | | | | | |
| 5 | S | IN | | | | | | |
| 6 | S | IN | | | | | | |
| 7 | S | | | | | | | |
| 8 | S | | | | | | | |
| 9 | S | OUT | ANY | ANY | ANY | ANY | ANY | DENY |
| 10 | S | IN | ANY | ANY | ANY | ANY | ANY | DENY |

- Complete the rules for interface G to allow access via SSH only from the hosts in network T.

| | Interface | IN/OUT | DST IP | DST port | SRC IP | SRC port | PROTOCOL | ACTION |
|---|-----------|--------|--------------|----------|--------|----------|----------|--------|
| 1 | G | OUT | 10.10.0.0/16 | 22 | | | | |
| 2 | G | IN | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |