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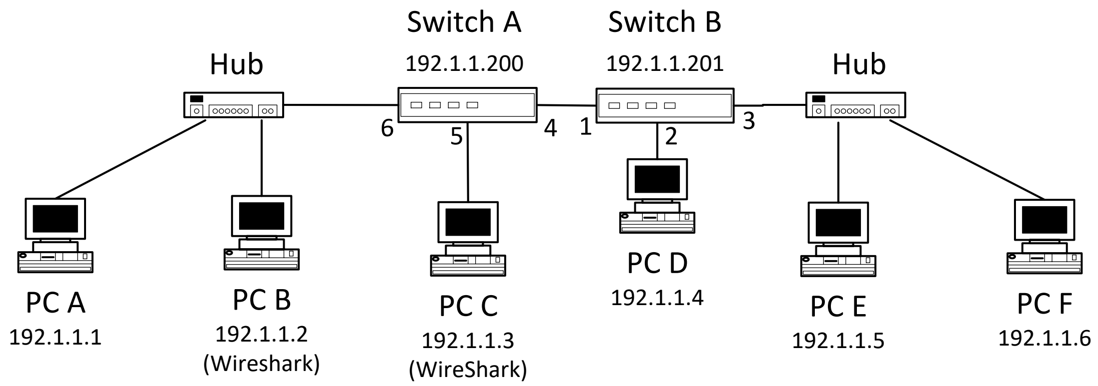
DEPARTAMENTO DE ELETRÓNICA, TELECOMUNICAÇÕES E INFORMÁTICA

LICENCIATURA EM ENGENHARIA DE COMPUTADORES E INFORMÁTICA

REDES DE COMUNICAÇÕES 1

SELF-EVALUATION

1. Consider the following network. The figure shows the assigned IP addresses to all network elements (with the netmask 255.255.255.0). The figure also indicates the number of the ports used on switches. Both PC B and PC C have WireShark permanently capturing all packets. The hub spreads everything it receives through all ports, so PC B can observe everything that traverses the links on the left part of switch A.



The current MAC address table of Switch A is:

VID	VLAN Name	MAC Address	Port	Type
1	default	00-0A-F4-3B-80-A5	6	Dynamic
1	default	00-0A-F4-3B-80-B0	4	Dynamic
1	default	00-0A-F4-42-CC-34	6	Dynamic
1	default	00-0A-F4-45-2D-23	4	Dynamic
1	default	00-0A-F4-45-2E-A7	5	Dynamic
1	default	00-0A-F4-46-2F-B5	4	Dynamic
1	default	00-1C-F0-A8-BD-C4	CPU	Self
1	default	00-1C-F0-A9-12-F3	4	Dynamic

The current MAC address table of Switch B is:

VID	VLAN Name	MAC Address	Port	Type
1	default	00-0A-F4-3B-80-A5	1	Dynamic
1	default	00-0A-F4-3B-80-B0	3	Dynamic
1	default	00-0A-F4-42-CC-34	1	Dynamic
1	default	00-0A-F4-45-2D-23	3	Dynamic
1	default	00-0A-F4-45-2E-A7	1	Dynamic
1	default	00-0A-F4-46-2F-B5	2	Dynamic
1	default	00-1C-F0-A8-BD-C4	1	Dynamic
1	default	00-1C-F0-A9-12-F3	CPU	Self

In a run of a ping command on PC A to PC F, one of the ICMP packets captured on PC B was:

```
⊞ Frame 4: 118 bytes on wire (944 bits), 118 bytes captured (944 bits)
⊞ Ethernet II, Src: 00:0a:f4:3b:80:b0 (00:0a:f4:3b:80:b0), Dst: 00:0a:f4:3b:80:a5
⊟ 802.1Q Virtual LAN, PRI: 0, CFI: 0, ID: 3
    000. .... .... .... = Priority: Best Effort (default) (0)
    ...0 .... .... .... = CFI: Canonical (0)
    .... 0000 0000 0011 = ID: 3
    Type: IP (0x0800)
⊟ Internet Protocol Version 4, Src: 192.1.1.6 (192.1.1.6), Dst: 192.1.1.1 (192.1.1
    Version: 4
    Header length: 20 bytes
  ⊞ Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00: Not-ECT (N
    Total Length: 100
    Identification: 0x0006 (6)
  ⊞ Flags: 0x00
    Fragment offset: 0
    Time to live: 255
    Protocol: ICMP (1)
  ⊞ Header checksum: 0x3989 [correct]
    Source: 192.1.1.6 (192.1.1.6)
    Destination: 192.1.1.1 (192.1.1.1)
⊞ Internet Control Message Protocol
```

1.1. With the provided information, indicate and justify the Ethernet addresses of all switches and all PCs.

1.2. What type of ICMP packet is the one shown above? Justify.

2. Consider the previous network. On each of the following experiments (2.1, 2.2, 2.3 and 2.4), consider an initial state where all MAC address tables and all ARP tables are empty (remember that both PC B and PC C have WireShark permanently capturing all packets). Assume that the execution of a ping command generates 5 ICMP Echo Request messages both on PCs and on switches. The hub spreads everything it receives through all ports, so PC B can observe everything that traverses the links on the left part of switch A. For each of the following experiments, indicate which packets are captured on PC B and on PC C:

2.1. Running a ping command on PC D to the address 192.1.1.3.

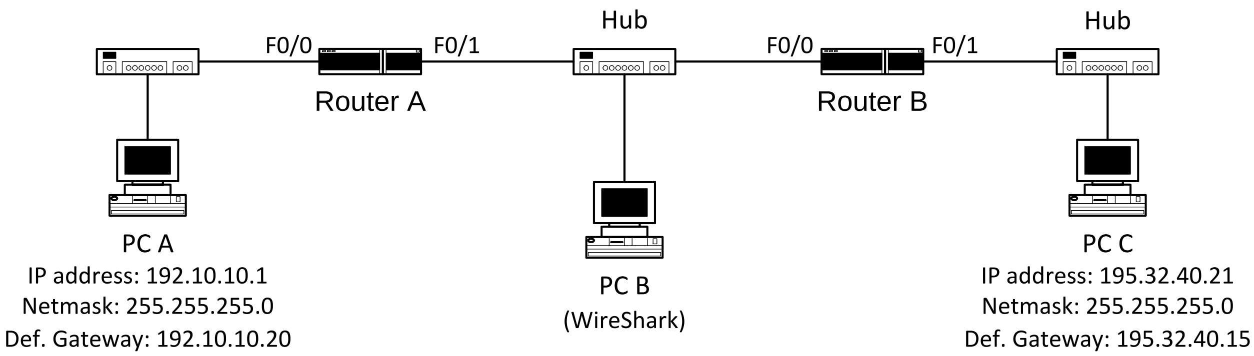
2.2. Running a ping command on PC A to the address 192.1.1.200.

2.3. Running a ping command on PC F to the address 192.1.1.4.

2.4. Running a ping command on Switch A to the address 192.1.1.10.

3. Starting on the initial state (where all MAC address tables and all ARP tables are empty), consider that experiments 2.1, 2.2, 2.3 and 2.4 were all run. Indicate and justify the resulting MAC address table of Switch A.

4. Consider the network shown in the following figure. The figure shows all IP addressing information of PC A and PC C and the name of the interfaces used on the routers. Routers have static routing. PC B is used only to capture packets through WireShark (and it is why it is connected through a hub, to be able to observe of packets in that link).



The current IP routing table of Router A is:

```
C    192.10.10.0/24 is directly connected, FastEthernet0/0
C    192.30.30.0/24 is directly connected, FastEthernet0/1
S    195.32.40.0/24 [1/0] via 192.30.30.2, FastEthernet0/1
```

The current IP routing table of Router B is:

```
R    192.10.10.0/24 [1/0] via 192.30.30.1, FastEthernet0/0
C    192.30.30.0/24 is directly connected, FastEthernet0/0
C    195.32.40.0/24 is directly connected, FastEthernet0/1
```

In a run of a ping command on PC A to PC C, one of the packets captured on PC B was:

```
⊞ Frame 3: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)
⊟ Ethernet II, Src: 00:04:dd:0d:5a:fd (00:04:dd:0d:5a:fd), Dst: 00:30:1b:3d:95:f6 (00:30:1b:3d:95:f6)
  ⊞ Destination: 00:30:1b:3d:95:f6 (00:30:1b:3d:95:f6)
  ⊞ Source: 00:04:dd:0d:5a:fd (00:04:dd:0d:5a:fd)
    Type: ARP (0x0806)
    Trailer: 000000000000000000000000000000000000
⊟ Address Resolution Protocol (reply)
    Hardware type: Ethernet (0x0001)
    Protocol type: IP (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: reply (0x0002)
    [Is gratuitous: False]
    Sender MAC address: 00:04:dd:0d:5a:fd (00:04:dd:0d:5a:fd)
    Sender IP address: 192.30.30.2 (192.30.30.2)
    Target MAC address: 00:30:1b:3d:95:f6 (00:30:1b:3d:95:f6)
    Target IP address: 192.30.30.1 (192.30.30.1)

0000  00 30 1b 3d 95 f6 00 04  dd 0d 5a fd 08 06 00 01   .0.=.... ..Z.....
0010  08 00 06 04 00 02 00 04  dd 0d 5a fd c0 1e 1e 02   ........ ..Z.....
0020  00 30 1b 3d 95 f6 c0 1e  1e 01 00 00 00 00 00 00   .0.=.... ........
0030  00 00 00 00 00 00 00 00  00 00 00 00               ........ ....
```

4.1. With the provided information, indicate and justify the IP addresses of all router interfaces.

4.2. What type of packet is the one shown above? Give an explanation for the reason why this packet was captured.

5. Consider the previous network. Assume that the execution of a ping command generates 5 ICMP Echo Request messages both on PCs and on routers. Assume also that the ARP tables of all PCs and all routers are complete. On each of the following experiments, indicate which ARP and ICMP packets are captured on PC B (for the ICMP packets, indicate the IP origin and destination addresses):

5.1. Running a ping command on PC A to the address 192.10.10.20.

5.2. Running a ping command on PC A to the address 192.30.30.1.

5.3. Running a ping command on PC A to the address 192.30.30.10.

5.4. Running a ping command on PC A to the address 192.30.30.2.

5.5. Running a ping command on PC A to the address of PC C.

5.6. Running a ping command on Router A to the address of PC C.

6. Consider the previous network. Consider that you run ping commands on PC A. For each of the following alternatives, indicate a possible ping command whose run generates the following answers:

   6.1. `Reply from 192.30.30.2: TTL expired in transit.`

   6.2. `Reply from 192.10.10.20: Destination host unreachable.`

   6.3. `Request timed out.`

7. Consider the previous network again. Consider that PCA has now only a private address, 192.168.1.1 with a default gateway to the router 192.168.1.254. With a pool for NAT public addressing of 193.1.1.128/29 to be used by Router A for the communication to the outside (from its interface F0/1), answer as true or false:

   7.1. The NAT pool has 16 addresses.

   7.2. A translation table in the router can be:

```
Inside global | inside local | outside global | outside local
193.1.1.139 | 192.168.1.1 | 195.32.40.15 | 195.32.40.15
```

   7.3. A translation table in the router can be:

```
Inside global | inside local | outside global | outside local
192.168.1.1 | 192.168.1.1 | 195.32.40.15 | 195.32.40.15
```

   7.4. A translation table in the router can be:

```
Inside global | inside local | outside global | outside local
193.1.1.131 | 193.1.1.131 | 195.32.40.15 | 195.32.40.15
```

   7.5. A translation table in the router can be:

```
Inside global | inside local | outside global | outside local
193.1.1.131 | 192.168.1.1 | 195.32.40.15 | 195.32.40.15
```

   7.6. With NAT/PAT only 8 PCs can reach the Internet.

8. Still in the previous network and with the PC A in a private network, 1) is it possible to allocate IPs through DHCP? 1) What can be the pool of addresses? 3) What is the source address used by the PC A to contact the DHCP server?

9. Considering IPv6 in the previous network, answer as true or false:

   9.1. PC A has always a local IPv6 address FE80::/10.

   9.2. PC A has always a global IPv6 address, such as 2001::/16.

   9.3. PC A can have an IPv6 address without the help of the router.

   9.4. PC A can have several global IPv6 addresses.

   9.5. PC A needs its MAC address to generate the local IPv6 address.

   9.6. PC A needs its IPv4 address to generate the local IPv6 address.