Universidade de Aveiro
Mestrado Integrado em Eng. de Computadores e Telemática
First Test of Fundamentos de Redes – 06 November 2015

Duration: 1:30 hours. No additional Reading elements. Justify carefully your answers.

1. Define, with justification, which of the addresses 194.45.130.43 and 194.45.161.27 belong to the IP network defined with the address IP 194.45.128.0 with mask 255.255.224.0. (*1.5 points*)

R: Mask 224 corresponds to 3 bits at 1 (network) and 5 at 0 (terminal), then there are 5 bits in the 3rd byte to identify the terminal ($2^5=32$). The network following 194.45.128.0 is the network 194.45.160.0 (network between 32 and 32). The first address belongs to the network, the second does not.

2. a. In which situations do ALOHA and CSMA-CD have the same performance? Justify. (*1 point*)

R: When the media is not occupied (since ALOHA does not sense the media), when there are few users and packets in the network.

b. Which one could be more appropriate to wireless networks? Justify. (*1 point*)

R: Possible answers are accepted, well justified: from one side in wireless networks it is difficult to perform media sensing (half duplex and signal power decreases with the distance); from the other side, sensing can prevent some problems.

3. In which situations do *Stop&Wait* and *Go-Back-N* have the same performance? Justify (*1.5 points*)

R: N=1, see justification through the way they work.

4. Is DHCP important in IPv6? Justify. (*1.5 points*)

R: It is not so important in IPv4, since IPv6 has the process of automatic address configuration through the routers prefix.

5. Consider the network of the following figure composed by 8 Ethernet segments (Eth1, Eth2, …, Eth8) interconnected by bridges. All bridges have the Spanning Tree Protocol active. The figure also shows, for each bridge, its BridgeID and PortCost of each port.

a. Related to the bridge network, identify which are the root and blocked ports of the bridge. Justify. (*1.5 points*)

R:
SW13: all designated ports;
SW21: root port connected to Eth4, designated port connected to Eth2;
SW15: root port connected to Eth2, designated port connected to Eth3;
SW14: root port connected to Eth2, designated port connected to Eth1;
SW32: root port connected to Eth1, blocked port connected to Eth3;
SW63: root port connected to Eth3, remaining ports are blocked;
SW17: root port connected to Eth6, designated ports connected to Eth7 and Eth8.

b. In the Eth3 segment, which bridge sends periodically BPDU messages, and which values of *RootID*, *Root Path Cost* and *BridgeID* are specified in the messages? (*1.5 points*)

R: SW15 sends BPDUs to Eth3, since it is the designated bridge, RootID=SW13, Root Path Cost=10, BridgeID=SW15.

c. What is the information visualized in the PC C when a ping is sent from PC A to PC B? Justify. (*1.5 points*)

R: PC C sees everything since i tis in the path.

    d. Is there the possibility that SW63 includes in its routing table the PC C through the port with 20 cost? Justify. (*1.5 points*)

R: Port with cost 20 is blocked and port with cost 5 is the root; you have to change one of the costs to change the roles of the ports.

    e. Considering that the port with cost 10 of the bridge 14 is configured to change for cost 20, how does the root bridge obtain that information? (*1.5 points*)

R: SW14 sends TCN directed to the root through SW21, SW21 sends TCA backwards to confirm TCN, and sends TCN to SW13, which sends TCA backwards, also with BPDUs with TC at 1.
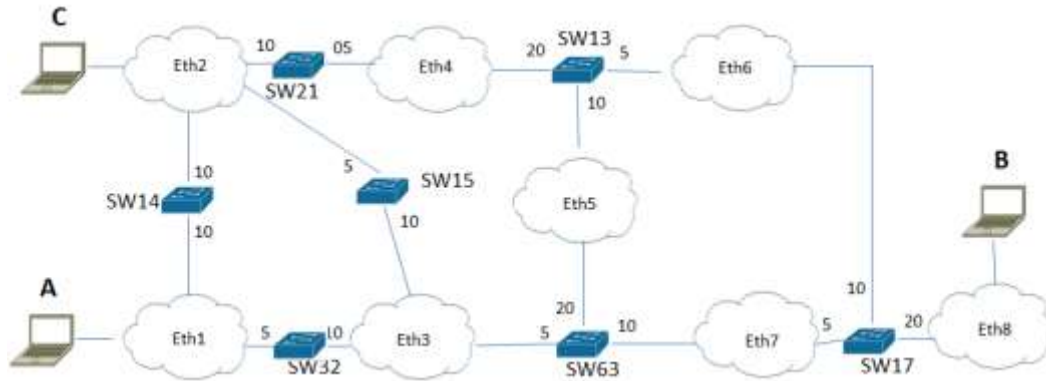
6. Consider the network of the following figure composed by PCs A to E, 1 hub, 2 switches and 1 router. The interfaces of the router are of type trunk and are configured with sub-interfaces for the IP networks correspondent to VLANs 1 and 2:

    a. Is it possible to provide communication between PC A and PC E? Justify. (*1.5 points*)

R: Yes, because the router interconnects VLANs (it has sub-interfaces for the IP networks correspondent to VLANs 1 and 2).

    b. In a ping from PC A to PC D, considering both ARP tables and routing tables of the switches empty, which are the packets captured by PC B and PC C? Justify. (*1.5 points*)

R: PC B sees nothing and PC C sees everything.

    c. Which are the Ethernet addresses of the ICMP Request in the Hub? Justify. (*1.5 points*)

R: Source Ethernet address is the MAC of PC A; destination Ethernet address is the MAC of the router interface in the network of PCs A, B and C.

    d. Considering that PCs D and E are in a public network in the Internet with address 193.92.10.0/24, identify a concrete NAT solution in the router to enable the communication of the PCs A, B e C in the private network 192.168.1.0/24 to the outside. (*1.5 points*)

R: Several possible solutions using 1 or all the possible addresses to allocate to terminals. Show the translation table of the router.