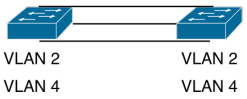
NOVA SCHOOL OF SCIENCE & TECHNOLOGY

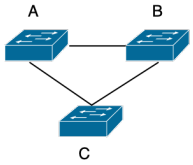
Configuração e Gestão de Redes
Mestrado Integrado em Engenharia Eletrotécnica e Computadores
Pedro Amaral
1º Teste

1. In the figure there are three links connecting two switches on the interfaces f0/1, f0/2 and f0/3 interfaces the switches operate in **Layer 2 and Layer 3**. **VLANs 2 and 3** exist on the left switch were **two** Switch Virtual Interfaces (SVIs) exist, one for VLAN 2 with address 172.16.2.253/24 and another for VLAN 3 with address 172.16 3.253/24. On the other switch the same VLANs (2 and 3) exist and **no SVIs** are configured. The hosts **ARP tables are empty,** and switches **have not learned** any MAC addresses yet.

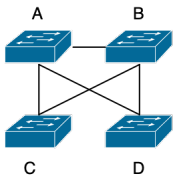


   a. A host connected to the switch on the left with IP address 172.16.2.3 pings another host with IP 172.16.3.3. Describe how the **host determines the MAC address** where to send the packet indicating, in a justified way, **which IP** this MAC address corresponds to.
   b. B. Indicate if it is possible to get the 3 links to be seen as one, indicating the technology to use if so.
   c. If there is only one link between the two switches (see the 3 links in the figure as only 1) indicate, justifying if: (i) it is possible to communicate between hosts **of the same** VLAN; (ii) it is possible to communicate between hosts **of different** VLANs.

2. Consider the scenario in the figure on the side where all switches have VLANs 3, 4 and 5. Consider which STP protocol to use, CST (common spanning tree) with an instance for all VLANs or PVST (per-VLAN spanning tree) with one instance for each VLAN? Indicate what the differences are in terms of the usable ports for transporting frames and where the root bridge(s) should be.



3. In the network represented in the figure, VLAN 4 has access ports **only on switch C** and VLAN 5 **only on switch D**. Communication **between the hosts of VLAN 5 and VLAN 4** as well as between **hosts of the same VLAN** must be possible. Consider two scenarios (i) An **SVI is configured for VLAN 4 on switch A** and an **SVI for VLAN 5 on switch B**, there are **no more** SVIs configured (ii) Similar but with the **SVI of VLAN 4 on switch C** and the **SVI of VLAN 5 on switch D.**

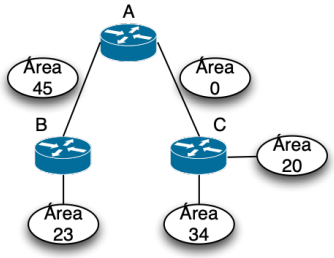


   a. Consider scenario (i) is **all the needed communication (intra and inter VLAN)** possible? Justify indicating if it is necessary to add something to the configuration, in **which mode (routed or trunk)** the links of the topology should be and **the path that each type of communication follows**.
   b. B. Answer the same question but now for the scenario (ii).

4. An EIGRP router has in its Topology Table **3 routes to the same destination** with the following values of Feasible Distance (**FD**) and Advertised Distance (**AD**). **Route 1 FD 410 AD 100; Route 2 FD 200 AD 50; Route 3 FD 310 AD 300**. What is the route chosen as (current) successor? If the **max-paths 2** and **variance 2** commands are introduced which routes can be used simultaneously for load balancing? justify.

5. A router has interfaces with the following addresses: F0/1:172.16.10.1/16 F0/2:172.16.20.1/30 and F0/3:192.168.4.2/24. Indicate **which address and wildcard mask** to enter in the **network command** of the EIGRP configuration so that neighborhoods are only formed through the **interfaces F0/1 e F0/2**. Indicate also which networks are advertised in that case.

6. Consider the scenario in the figure with routers A, B and C that are **using OSPF**. **Router A** has Interfaces**: F0/1: 172.16.45.1/24 in area 45 and F0/2 IP: 172.16.0.1/24 in area 0**. **Router B** has interfaces **F0/1: 172.16.45.2/24 in area 45 and F0/2: 172.16.23.1/24 in area 23** finally **router C** has interfaces **F0/1: 172.16.0.2/30 in area 0 F0/2:172.16.20.1/24 in area 20 and F0/3 :172.16.34.1/24 in area 34**.



   a. Indicate the steps required to configure OSPF routing on router C according to the interfaces and areas described above.
   b. When running the show ip route command on router C, **NO entry** for the 172.16.23.0/24 network appears. State the reason for this, and how it can be resolved.

Solution

1.a

Since the recipient is not on the same network (172.16.3.3 is from a different network than the source 172.16.2.3), the host will have to obtain the MAC address of its gateway since that is where it will send the IP packet (inside an Ethernet frame addressed with the gateway's destination MAC address). The MAC address obtained will thus correspond to the address 172.16.2.253 AND NOT to the address of the final destination. This address is the VLAN 2 SVI address on the left switch that will serve as the gateway. The MAC address is obtained through an ARP request for the Gateway IP that will reach the entire Broadcast domain and then also the SVI.

Explanatory note: An ARP request to the final destination would not reach the destination host as it is in a different Broadcast domain. The gateway DOES NOT OPEN ARP requests whose IP target is not its own address, that is, it does not open an ARP request to 172.16.3.3 (discards it).

1.b

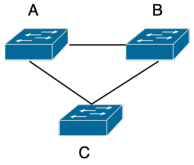
The three links can be viewed as one using an EtherChannel. For this, all ports must be aggregated in the same channel-group and all be in the same mode (Switchport Trunk or routed).

1.c

(i) Communication between hosts on the same VLAN is possible if the link is configured in trunk mode with both VLANs allowed. So broadcast traffic from the left switch arrives at the right switch in the same VLAN.

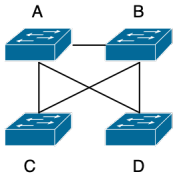
(ii) Communication between hosts of different VLANs is also possible because there is an SVI for each VLAN on the left switch. So the traffic between a host from VLAN 2 and a host from VLAN 4 goes to the switch on the left (either because it originates there or because it comes through the trunk on the other side) and this switch, that has the two networks directly connected, forwards the packet to the other VLAN where it arrives at the destination (on the switch itself if this is the case or on the next switch via the trunk).

2. If CST is used, all VLANS have the same tree and therefore the same port will be cut for all of them. If PVST is used, we have a tree for each VLAN and if we place the roots (root bridges) on different switches, the port that will be cut will be different for each of the VLANs, in this way they are all being used and each one will be being used by two VLANs and cut off for the third.



3.a

In scenario (i) intra VLAN communication is always possible since it is local to the access switches and there are only hosts on this switch, the rest of the topology is not even necessary. For inter VLAN communication to be possible, it is necessary to configure the links up to switches A and B in Layer 2 (the ideal is to be trunks allowing both VLANs for redundancy reasons) the links must be in Layer 2 to expand the broadcast domains from the VLANs to the SVIs (which will be the gateways) that are on switches A and B. As there is only one SVI on each switch, they do not know both networks, so the A-B link must be in Layer 3 and there must be a routing protocol to advertise the networks between them.



Intra VLAN Path: C to C and D to D

Inter-VLAN Path: C-A-B-D or D-B-A-C

3.b

In scenario (ii) Intra VLAN communication bis the same as in (i), nothing changes. Inter-VLAN communication is possible if links to A and B are at Layer 3 and there is a forwarding protocol that allows C to advertise the network from VLAN 4 to D and vice versa.

Intra VLAN Path: C to C and D to D

Inter-VLAN path: C-B-D or D-A-C (shortest path)

4. The chosen route (current successor) is the one with the lowest FD, route 2. As a Feasible successor, routes with their AD lower than the FD of the current successor can be chosen.

Only route 1 has the AD (100) lower than the FD of 2 (200), with max-paths 2 only two could be used at the same time,1 and 2, however the variance 2 command does not allow route 1 since it has an FD (410) greater than twice the best FD (2x200=400). Therefore, there is no feasible successor.

5. A possible command is network 172.16.0.0 0.0.255.255. This rule only includes F0/1 and F0/2. The networks to be announced will be the ones that are actually on the interfaces that comply with the rule of the network command, in this case they would be the networks 172.16.10.0/16 and the network 172.16.20.0/30.

6c. Router osfp 1

network 172.16.0.2 0.0.0.3 area 0

network 172.16.20.0 0.0.0.255 area 20

network 172.16.34.0 0.0.0.255 area 34

6d. The network 172.16.23.0/24 is in router B and in area 23 which is disconnected from the backbone area (area 0) in this way the LSAs of this area are not announced to anyone since the inter-area announcements are always made through the area 0. To solve the problem, you would have to create a virtual-link between router B and A crossing area 45, which would put an interface on B in area 0 and thus connect area 23 to area 0 through router B.