**CNT 4703C, Spring 2015**

# Project Feedback
# and
# Suggested Design of Components/Subsystems

**Feedback on groups' draft designs:**

- Many designs are not implementation ready. Note that when a design is implemented, the network's set up and configurations must follow the design diagram. A draft design does not have to be complete, but should be as close as possible, so that specific feedback on aspects of the design could be given. Many have missed this opportunity.
- Many important components are missing, such as, VLAN assignments, IP addresses for interfaces, subnets (i.e., classes of networks to be used), trunk links, etc.
- Instead of using standard symbols, new ones were invented. The standard symbols can be found in lecture notes, lab diagrams, …

**Design of components/subsystems**

In the following, you will find examples of how to setup and configure many parts of your network. Modify these and apply to your network.

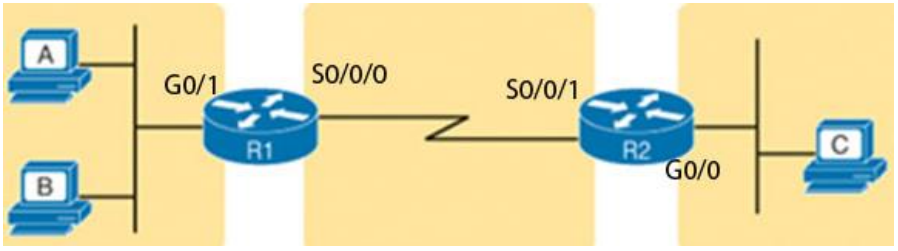
First keep in mind the goal of the design:

Deliverables: a complete design diagram, based on which the network can be setup (implementation-ready). If full connectivity is achieved, the design is considered a success. Optional features can be demonstrated if implemented.

Subnet:

Remember to use (private) IP address spaces for your network subnets (one subnet for one VLAN = Departments). Assigning IP address for interfaces connecting to ISP (for Internet access) is not required, but if you do, make sure a public IP address is used (NAT configuration is optional). For connection to the remote office, frame-relay (or HDLC or EoMPLS) can be used.

Refer to the exhibit:



Three subnets are needed: “left”, “center”, and “right.”

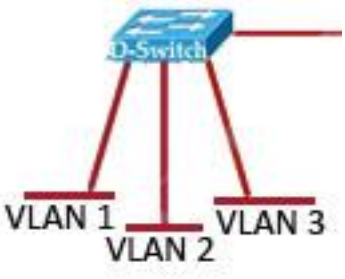
PC A, PC B, and G0/1 of R1 are in the same subnet “left.” Note that PC A and PC B shown here are representatives of subnet “left,” which could include hundreds of hosts, say 200. To have sufficient IP addresses for all hosts in this subnet, the host bit has to be at least 8, meaning the subnet mask is /24. Assuming that we use the private network 192.168.1.0 for this subnet, a possible assignment is G0/1 of R1: 192.168.1.1/24, PC A: 192.168.1.10/24, and PC B: 192.169.1.100/24.

For the “center” subnet, which needs only two assignable IP addresses (i.e., host bits is at least 2, but no penalty for using more, say 8), for simplicity we use 8, then S0/0/0 of R1: 172.16.2.1/24, and S0/0/1 of R2: 172.16.2.2/24. Note that we cannot use subnet 192.168.1.0/24 for this subnet (refer to lecture note).

For the remote subnet “right,” which requires IP addresses for, say, 10 hosts, 4 host bits suffices, but we can use more without a penalty. A possible assignment is G0/0 of R2: 10.1.1.1/24, and PC C: 10.1.1.2/24.

Observe that we can show all hosts and their assigned IP addresses for the “left” and “right” subnets, but only some are shown here (i.e., PC A, PC B, and PC C) for testing purposes. On the other hand, we do not have to show any, just the correct subnet (and mask) assignments.

<u>Assign switch ports to VLANs:</u>




In this exhibit, we do not show any host, only the subnets (VLANS): VLAN1=Depart. A, VLAN2=Depart. B, VLAN3=Depart. C. Say Depart. C houses 200 PCs, the subnet for VLAN3 could be, for example, 192.168.2.0/24. In implementation, any IP address in the range 192.168.2.1/24 and 192.168.2.254/24 can be assigned to a host in this department.

Assign Switch ports 0/7, 0/8, and 0/9 to VLAN 3:

```
Switch(config)#interface range fastethernet 0/7 - 9
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access VLAN 3
```

Trunk:

Links connecting switched should be configured to carry traffic from multi VLANs (that is, we do not need to use multiple links (and multiple interfaces) to carry multi VLANs' traffic; we can use only one link and two interfaces to carry it):

Refer to the exhibit:

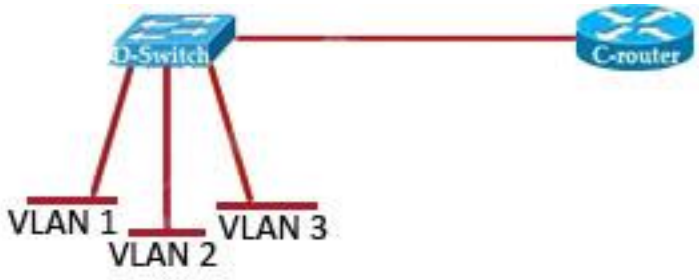

The FastEthernet0/1 port on the switches that are shown in the exhibit need to be configured trunk to carry multiple VLAN traffic to allow connectivity between all devices. The ports be configured (SwitchX is Switch1 or Switch2, both interfaces have to be trunk):

```
SwitchX (config)#interface FastEthernet 0/1
SwitchX(config-if)#switchport mode trunk
```

InterVLAN routing:

"Router-on-a-stick:" routers are needed for intervlan traffic. We can configure a single physical link (and one single interface) to pass traffic from one vlan to another by configuring subinterfaces (router end) and trunk link on the switch end:

Refer to the exhibit:




C-router is to be used as a "router-on-a-stick" to route between the VLANs. Subinterfaces' info is as follows:

F0/0.1 – 172.19.1.245/24 VLAN 1

F0/0.2 – 172.19.2.245/24 VLAN 2
F0/0.3 – 172.19.3.245/24 VLAN 3

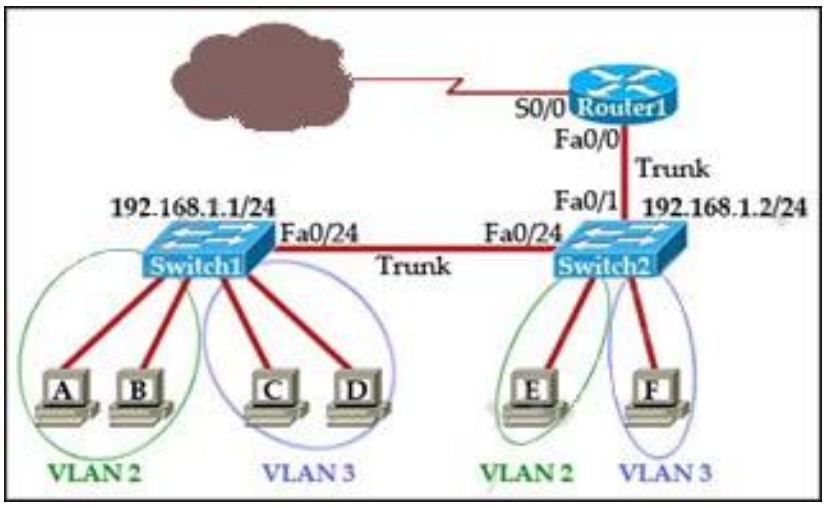
Configure the router and switch for intervlan connectivity:

Router(config)#interface fastethernet 0/0
Router(config-if)#no shutdown
Router(config)#interface fastethernet 0/0.1
Router(config-subif)#encapsulation dot1q 1
Router(config-subif)#ip address 172.19.1.245 255.255.255.0
Router(config-subif)#interface fastethernet 0/0.2
Router(config-subif)#encapsulation dot1q 2
Router(config-subif)#ip address 172.19.2.245 255.255.255.0
Router(config-subif)#interface fastethernet 0/0.3
Router(config-subif)#encapsulation dot1q 3
Router(config-subif)#ip address 172.19.3.245 255.255.255.0

Switch1(config) # interface fastEthernet 0/1
Switch1(config-if)# switchport mode trunk

Symbols:

Refer to the exhibit:




Note the symbols that are used. Observe that subnets (VLANs) can be replaced with vertical/horizontal lines (refer the earlier exhibits) if preferred. Also, IP addresses for PC hosts should be shown if connectivity testing is planned.

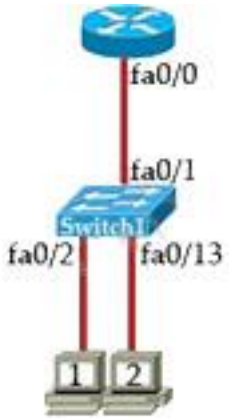
Two more examples:

**1.** To make it work, the above network must be configured with trunk and subinterfaces:

- **a.** The FastEthernet 0/0 interface on Router1 must be configured with subinterfaces.
- **b.** The FastEthernet 0/0 interface on Router1 and Switch2 trunk ports must be configured using the same encapsulation type.

**2.** Another example:

Refer to the exhibit:




The current configurations of the devices are as follows:

Switch 1:
IP address: 192.168.1.2/24
Ports 2-12 VLAN 10
Ports 13-24 VLAN 20

Host 1:
IP address: 192.168.10.5/24
Default Gateway: 192.168.10.1

Host 2:
IP address: 192.168.20.5/24
Default Gateway: 192.168.20.1

What commands must be configured on the switch and the router to allow communication between host 1 and host 2?

Answer:

Router(config)#interface fastethernet 0/0
Router(config-if)#no shutdown
Router(config)#interface fastethernet 0/0.1
Router(config-subif)#encapsulation dot1q 10
Router(config-subif)#ip address 192.168.10.1 255.255.255.0

```
Router(config-subif)#interface fastethernet 0/0.2
Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip address 192.168.20.1 255.255.255.0

Switch1(config) # interface fastEthernet 0/1
Switch1(config-if)# switchport mode trunk
```

If you can't find it here:

Should you have questions or can't find the configurations of parts specific to your network, Please ask.