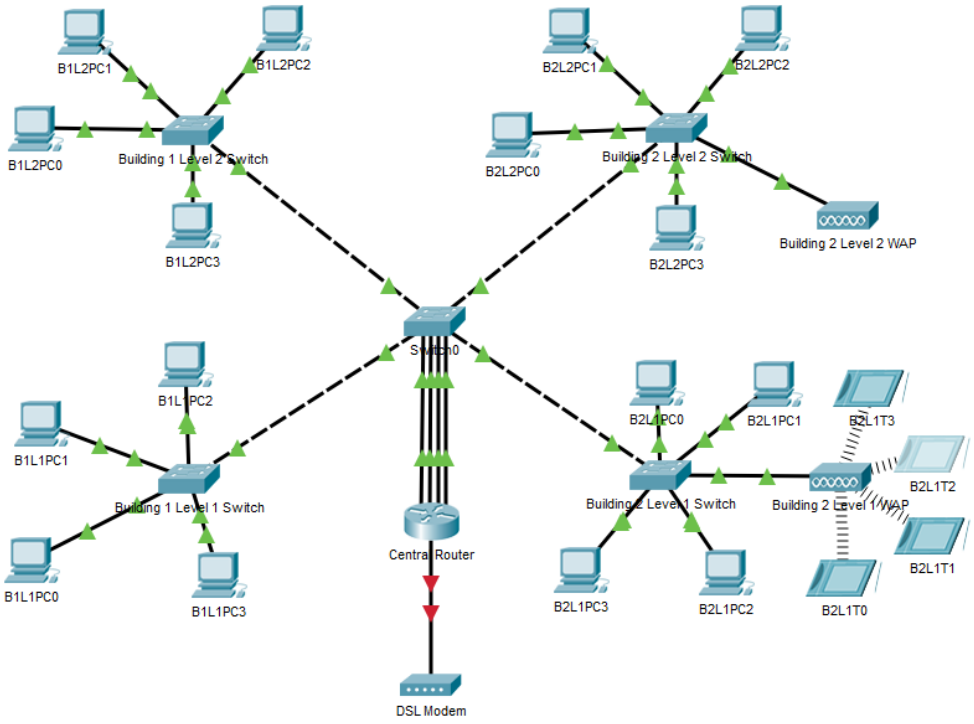
CSG1105 Workshop Six

1 Introduction

This week we are going to explore aspects of VLANs (Virtual LANs). VLANs create virtual broadcast domains, allowing individual ports on switches to be assigned to different VLANs and therefore different broadcast domains. Recall that each broadcast domain will be a separate IP subnet.

2 Exercise: VLANs in Packet Tracer

I have created a network in Packet Tracer that is similar to the first VLAN with router diagram in the lecture. Load into Packet tracer, the file CSG1105_201_Module_Six.pkt.



2.1 Mapping VLAN configuration

1. This network has four VLANs:
    a) Accounting - VLAN 100
    b) Procurement - VLAN 200
    c) Human Resources - VLAN 300
    d) Public WiFi - VLAN 800
2. Each VLAN, as a broadcast domain, has a subnet associated with it. This network has four equal sized subnets using a /26 mask
    a) VLAN 100 - 192.168.0.0/26
    b) VLAN 200 - 192.168.0.64/26
    c) VLAN 300 - 192.168.0.128/26
    d) VLAN 800 - 192.168.0.192/26
3. The dotted connections (which are crossover cables in PT), are **Trunk** links
4. The router has a DHCP server running to provide IP configuration for each of the devices. Each of the ports is connected to the core switch with **Access mode** for the appropriate VLAN
5. Hover the cursor over each PC or Table to see the assigned IP address.
6. Use the IP address to determine what VLAN each device is connected to.
7. When you have done this, hover the cursor over each of the peripheral switches to confirm your answers.

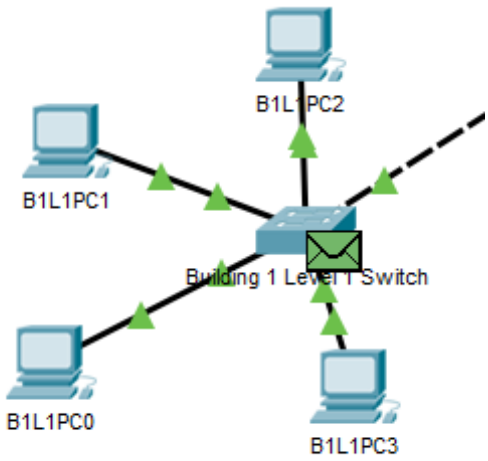
2.2 Observing VLAN operation

In this exercise, you will observer the VLANs in operation.

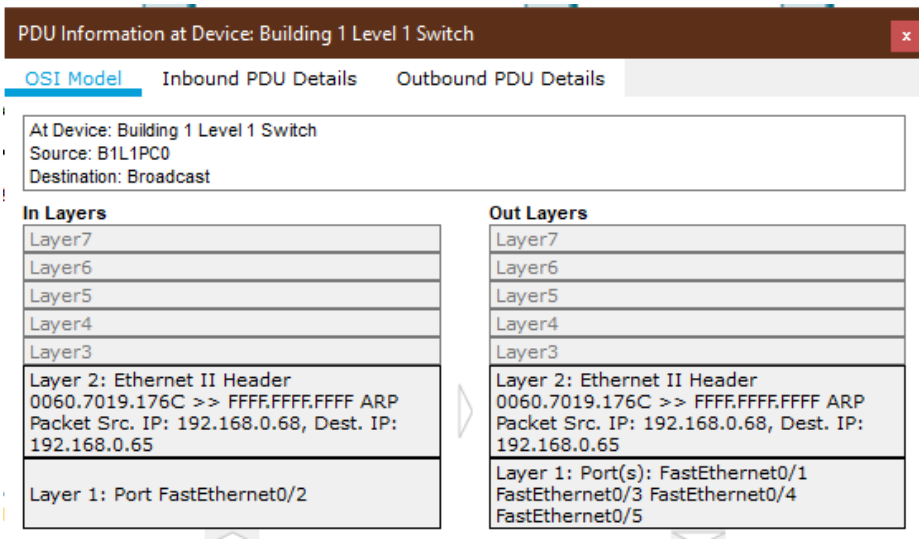
1. Put Packet Tracer into sumulation mode as done in a previous exercise.
2. Send a message from PC B1L1PC0 on the bottom left, to PC B2L2PC2.
3. What you should see is that the ARP and Ping packets don't go to the router. From the previous section, you should have discrovered that these two PCs are in the same VLAN and therefor the same broadcast domain. The ARP can locate the IP address and MAC of the target PC allowing the Ping packet to be sent.
4. Send a message from PC B2L1PC3 in the bottom right, to tablet B2L1T3 in the same area connected to the same switch.
5. The first Ping may fail due to a timeout from the ARPs as we have seen in previous exercise. Send the message again and observe the path it takes.
6. You should observe that, even though these devices are connected via the same switch, the message must pass through the router as these devices are on two separate VLANs and therefore different broadcast domains.
7. Try some additional messages from devices on different switches and VLANs and observe the results.

2.3 Examining Frames in a VLAN

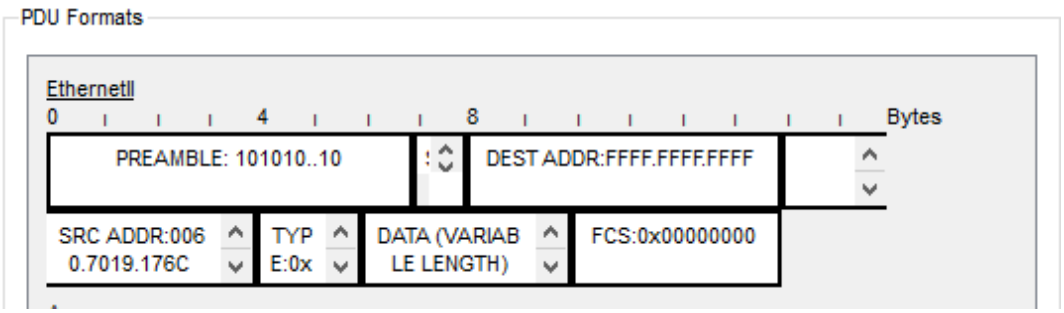
1. Remain in simulation mode and send a message from PC B1L1PC0 on the bottom left, to PC B1L2PC0 on the top left. These PCs are connected to VLAN200 and VLAN100 respectively
2. Click the advance button (Right arrow and vertical bar) **once**.
3. You will see the message advance to the first switch.



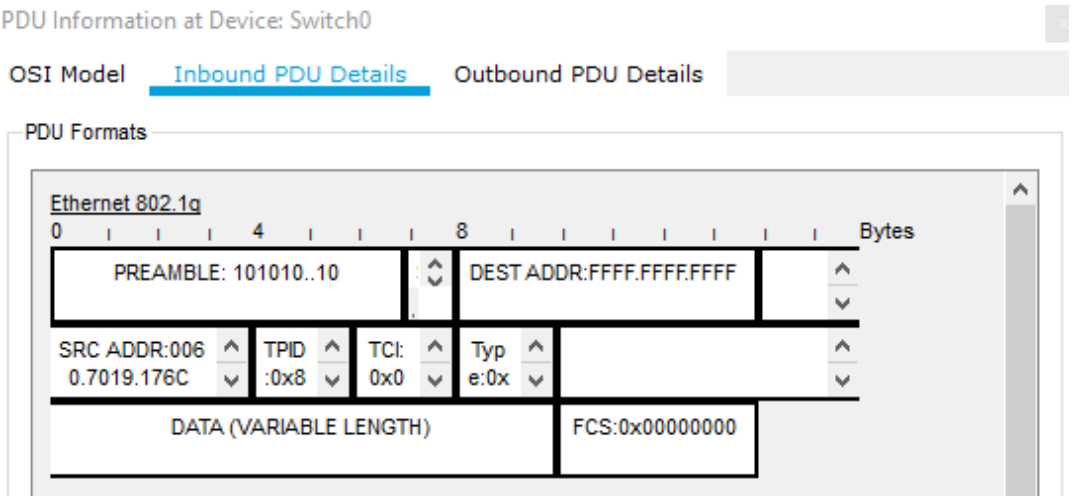
4. Click on the evalope icon (green in the capture, yours may be a different colour)
5. You will see a dialog like below. This is the equivalent of a Wireshark frame capture.



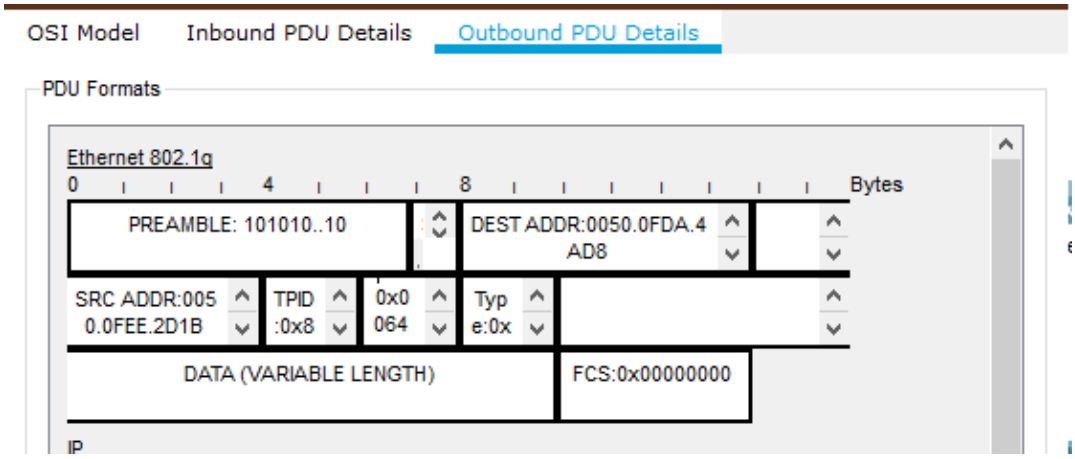
6. Click on the **Inbound PDU Details** tab.



7. You will see an Ethernet frame that has the same fields as you have seen previously in Wireshark
8. Click the advance button (Right arrow and vertical bar) again and the frame will advance to the core switch.
9. Click the message and seclect the Inbound PDU Details tab.



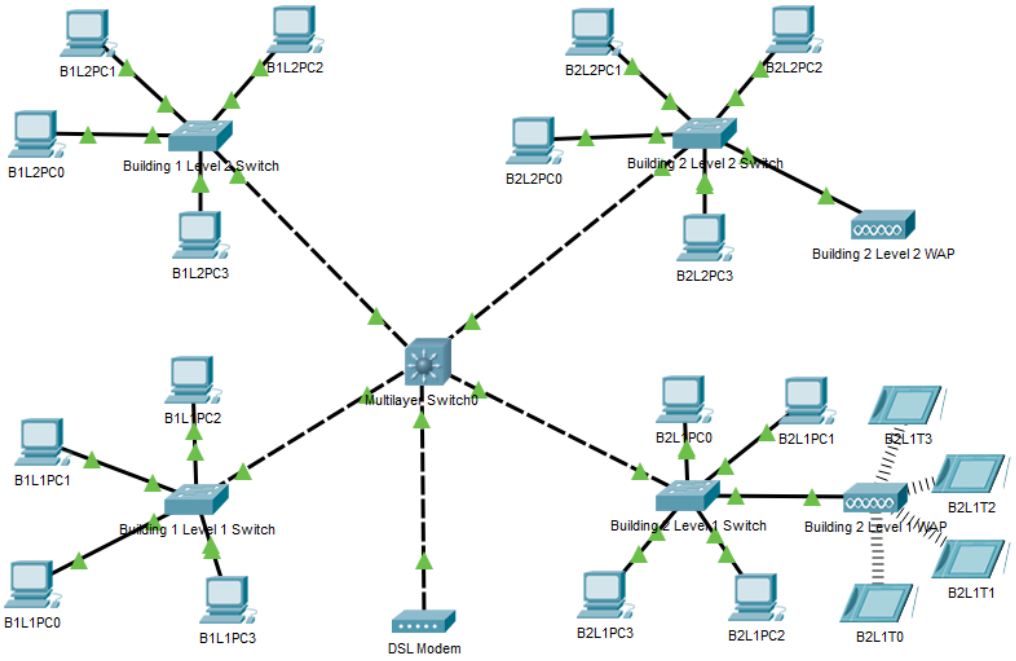
10. You will see that the Frame type changes from **EthernetII** to **Ethernet 802.1q**.
11. You can now observe the VLAN tag fields following the source address. This is something we can't do in Wireshark as we don't have access the cables between switches :-).
12. look at the field labeled TCI. Click the down arrow to see the value: it will be 0xC8 a hexidecimal value. In decimal, this 200, the VLAN that has been configured for devices on the original switch.
13. Continue clicking on the advance button. This message will eventually fail.
14. Send a second message between the two PCs. Advance the message until it has gone to the router and back to the core switch.
15. Examine the **Outbound PDU Details**.



16. You will see that the TCI value is now 0x64 hexadecimal or 100 decimal, the VLAN number for the target switch.

2.4 Multilayer Switch

1. Close the previous packet tracer file and load **CSG1105_201_Module_Six_MLS.pkt**.
2. This is the same network. implemented with a Multilayer switch rather than a layer two core switch and a router (We have skipped the "Router on a stick" as it doesn't add to what we need to know)



3. Repeat the second two exercises, now using the multi layer switch and compare the results.
4. Re-open the router network at the same time as the multilayer switch network. For both the router and the multilayer switch, open the CLI.

5. Enter the command `enable` followed by `show run`. This shows the configurations of both devices to compare. In the router network you will need to open the CLI for the core switch as well to see the VLAN configuration using the same two commands.

3 SUMMARY

We have looked at a how VLANs are used to implement a network design that allows us to locate users anywhere that is appropriate for the physical space rather than being dicated by the necessity to connect to an individual non-VLAN switch. We have seen that each VLAN is a broadcast domail and requires it's own IP subnet. We have looked at how in a VLAN environment, Ethernet frames are tagged using 802.1q in order to establish which VLAN they should be connected to. Lastly we compared two networks, one implemented with a router and one with a multilayer switch.