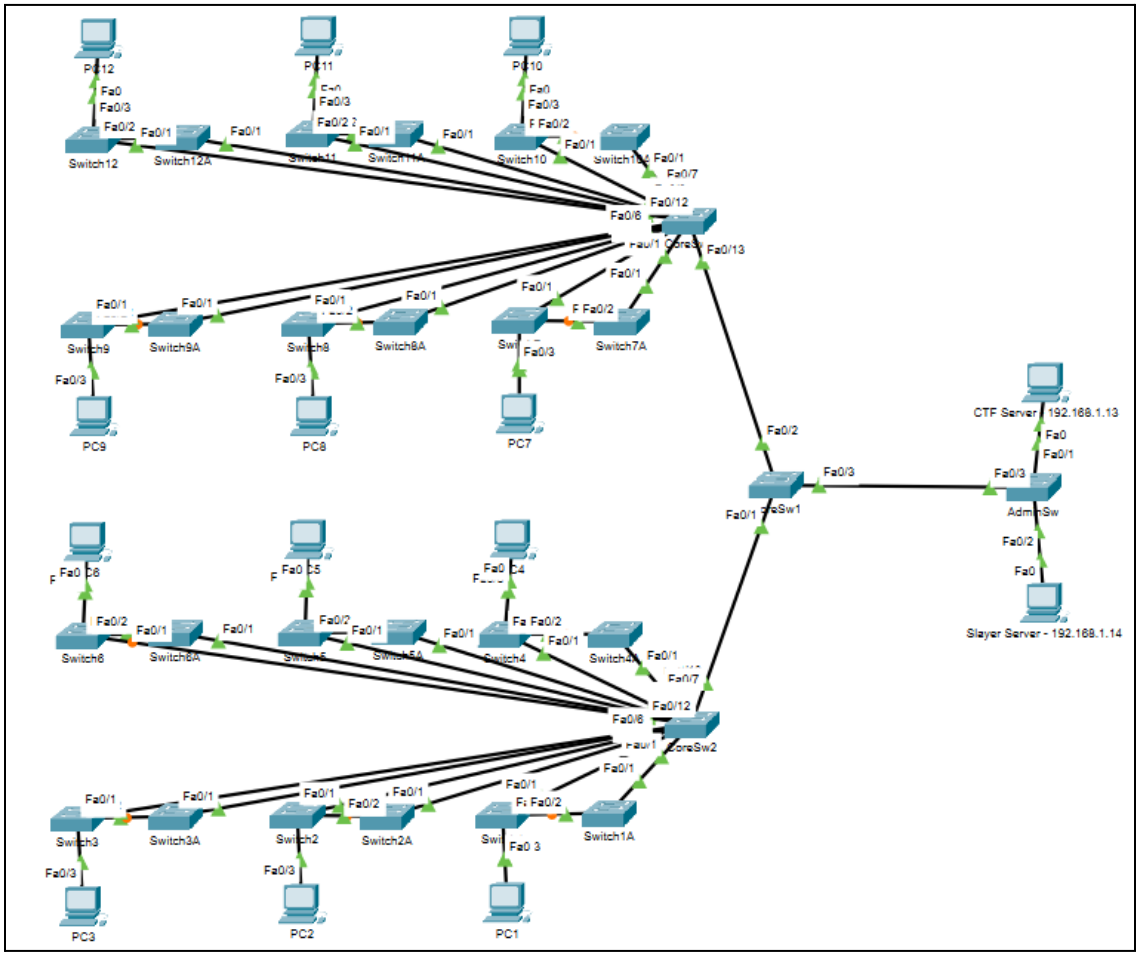
Halo PVST+

Purpose:
Students will learn how to load balance network traffic by utilizing Rapid PVST+ on a game server LAN, then test the reliability of the network using Windows Command Prompt and WireShark.

Note: Any direction that includes an “X” is representative of the station number you are working at. Please enter the station number you are at anytime there is an “X”.



Part 1:

First, statically configure the IP address of the PC.

- Follow the instructions below to set the IP Address on the PC
  - Control Panel> Network and Internet> Network and Sharing Center> Change adapter settings> Ethernet> Properties> Internet Protocol Version 4 (TCP/IPv4)> Use the following IP address> 192.168.1.X> OK.
  - **DO NOT** CLICK THE RED X, CLICK **OK** TO SAVE CONFIGURATIONS.

Part 2:

Next, install basic configurations on the top switch in your rack with things such as hostname, password and also include a welcome message.

- Plug in the blue console cable into the PC and connect it to the console port on the switch
- On your PC, open Device Manager and click on the COMM tab
- Open Putty, select the Serial button and enter the COMM port the console cable is connected to
- Now that you're in the the CLI, use the following commands to name the switch
  - `switch> enable`
  - `switch# configure terminal`
  - `switch(config)# hostname CiscoX`
  - `CiscoX(config)# enable secret aggies`
  - `CiscoX(config)# service password-encryption`
  - `CiscoX(config)# banner motd "Welcome to Cisco Academy at TAMU!"`

Part 3:
Create VLANs 10 and 20 on the switch.

- Enter the following commands to create VLAN 10 and 20
  - `CiscoX(config)# vlan 10`
  - `CiscoX(config-vlan)# name CTF`
  - `CiscoX(config-vlan)# exit`
  - `CiscoX(config)# vlan 20`
  - `CiscoX(config-vlan)# name Slayer`
  - `CiscoX(config-vlan)# end`
  - `CiscoX# show vlan`

Part 4:
Assign port Gi1/0/3 to access VLAN 10, port Gi1/0/4 to access VLAN 20, and ports Gi1/0/1 and Gi1/0/2 to be trunk ports.

- Enter the following commands to configure trunk ports on the switch
  - `CiscoX# configure terminal`
  - `CiscoX(config)# interface range gi1/0/1-2`
  - `CiscoX(config-if)# switchport mode trunk`
  - `CiscoX(config-if)# exit`

- Enter the following commands to configure access ports on the switch
  - `CiscoX(config)# interface gi1/0/3`
  - `CiscoX(config-if)# switchport mode access`
  - `CiscoX(config-if)# switchport access vlan 10`
  - `CiscoX(config-if)#exit`
  - `CiscoX(config)# interface gi1/0/4`
  - `CiscoX(config-if)# switchport mode access`
  - `CiscoX(config-if)# switchport access vlan 20`
  - `CiscoX(config-if)# exit`

Part 5:

Enable Rapid PVST+ on the switch and designate the switch as the root switch for VLAN 10, and the secondary switch for VLAN 20.

- Enter the following commands to enable rapid PVST+ and assign root switches
  - `CiscoX(config)# spanning-tree mode rapid-pvst`
  - `CiscoX(config)# spanning-tree vlan 10 root primary`
  - `CiscoX(config)# spanning-tree vlan 20 root secondary`
  - `CiscoX(config)# exit`

- Enter the following commands to verify that CiscoX is the root switch on VLAN 10, and the secondary switch on VLAN 20
  - `CiscoX# show spanning-tree vlan 10`
    i. You should see a message in the interface that says **"This bridge is the root"**
  - `CiscoX# show spanning-tree vlan 20`
    i. You should not see a message for this, since it is not the primary root switch for VLAN 20.
- Enter the following command to save all configuration we made on the switch
  - `CiscoX# copy run start`

Part 6:

Now, we will repeat parts 2-5 on the second switch. But with some changes to the STP settings.

- Unplug your console cable from the top switch and plug it into the bottom switch. Use the following commands to set up the basic configurations.
  - `switch> enable`
  - `switch# configure terminal`
  - `switch(config)# hostname CiscoXA`
  - `CiscoXA(config)# enable secret aggies`
  - `CiscoXA(config)# service password-encryption`

- `CiscoXA(config)# banner motd "Welcome to Cisco Academy at TAMU!"`

- Enter the following commands to create VLAN 10 and 20
  - `CiscoXA(config)# vlan 10`
  - `CiscoXA(config-vlan)# name CTF`
  - `CiscoXA(config-vlan)# exit`
  - `CiscoXA(config)# vlan 20`
  - `CiscoXA(config-vlan)# name Slayer`
  - `CiscoXA(config-vlan)# end`
  - `CiscoXA# show vlan`
- Enter the following commands to configure trunk ports on the switch
  - `CiscoXA# configure terminal`
  - `CiscoXA(config)# interface range gi1/0/1-2`
  - `CiscoXA(config-if)# switchport mode trunk`
  - `CiscoXA(config-if)# exit`
- Enter the following commands to configure access ports on the switch
  - `CiscoXA(config)# interface gi1/0/3`
  - `CiscoXA(config-if)# switchport mode access`
  - `CiscoXA(config-if)# switchport access vlan 10`
  - `CiscoXA(config-if)#exit`
  - `CiscoXA(config)# interface gi1/0/4`
  - `CiscoXA(config-if)# switchport mode access`
  - `CiscoXA(config-if)# switchport access vlan 20`
  - `CiscoXA(config-if)# exit`
- Enter the following commands to enable rapid PVST+ and assign root switches
  - `CiscoXA(config)# spanning-tree mode rapid-pvst`
  - `CiscoXA(config)# spanning-tree vlan 20 root primary`
  - `CiscoXA(config)# spanning-tree vlan 10 root secondary`
  - `CiscoXA(config)# exit`

- Enter the following commands to verify that CiscoXA is the root bridge on VLAN 20, and the secondary bridge on VLAN 10

- `CiscoXA# show spanning-tree vlan 10`
    i. You should not see a message for this, since it is not the primary root switch for VLAN 10.
- `CiscoXA# show spanning-tree vlan 20`
    ii. You should see a message in the interface that says **"This bridge is the root"**

- Enter the following command to save all configuration we made on the switch
    - `CiscoXA# copy run start`

Part 7:

Use WireShark to monitor the network.

- Open the WireShark application
- Select the **LAN interface** of the PC
- Start collecting packets

Part 8:

Start a continuous ping command to the CTF server at the IP address 192.168.1.13.

- Open Windows Command Prompt
- Split your screen between Command Prompt and WireShark
- Type the following command and hit enter
    - `C:\Users\CiscoX> ping 192.168.1.13 -t`
- Leave your screen as is and continue to Part 9

Part 9:

Verify that PVST+ works by cutting primary connections of VLANs and observing the failover. **Do not** physically cut the cable.

- At the moment, your PC is using SwitchX to send traffic to the server. Follow the directions below to shift traffic over to SwitchXA.
    - On SwitchX, unplug the blue cable in port 1
        - Your pings should fail for around 10 seconds

        - Pay attention to the types of messages being sent across the network in the WireShark terminal, you should see the switches sendings messages to each other regarding STP. They are updating each other about a failure in the network, and are bringing the alternate port on SwitchXA online. This is because on VLAN 10, which involves ports 1(trunk), 2(trunk), and 3(access VLAN 10) on your switch, are having to re-route their packets to the secondary root switch which is Switch Xa on VLAN 10.
    - Plug the blue cable back into port 1 on SwitchX
        - Wait for 10 seconds and observe how the network will temporarily go down again, as it attempts to re-establish the previous network flow it had before we unplugged the cable.
    - Next, unplug the black cable in port 3, and plug it into port 4. In the command prompt terminal, you will also need to change the ping command from `192.168.1.13 -t` to → `192.168.1.14 -t`.
        - Press enter to start the ping command
        - Wait for port 4 to come online
    - Once the connection is established (after about 10 seconds), unplug the blue cable going into port 1 of SwitchXA.
        - Your pings should fail for around 10 seconds like they did on the other switch
        - Pay attention to the types of messages being sent across the network in the WireShark terminal, you should see the switches sendings messages to each other regarding STP, like before. They are updating each other about a failure in the network, and are bringing the alternate port on SwitchX online. This is because on VLAN 20, which involves ports 1(trunk), 2(trunk), and 4(access VLAN 20) on your switch, are having to re-route their packets to the secondary root switch which is SwitchX on VLAN 20.

Part 10:

To verify that the VLANs have been configured correctly, test connectivity by connecting to the Halo multiplayer servers.

- If you are sitting at an odd numbered station, physically connect the PC to port 3 on your switch. You should be connected to VLAN 10.
    - You should see the CTF server when you open the Halo lobby

- If you are sitting at an even numbered station, physically connect the PC to port 4 on your switch. You should be connected to VLAN 20.
    - You should see the Slayer server when you open the Halo lobby

- To open Halo, click on the Halo icon in the taskbar. Use the following directions to get to the Halo lobbies:
    - Multiplayer> Connect to LAN> Click on the name of the server

- After playing a match on the respective server, switch VLANs by unplugging the ethernet cable from either port 3 or 4 and plug it into the other one. You should see the other game mode server.

Part 11:

Now, wipe the switch of all VLAN data, and wipe the running configuration.

- Plug your console cable into the top switch again. Use the following commands wipe the VLANs from the switch's memory
    - `CiscoX# show vlan`
    - `CiscoX# show interface trunk`
    - `CiscoX# configure terminal`
    - `CiscoX(config)# interface range gi1/0/1-2`
    - `CiscoX(config-if-range)# switchport mode access`
    - `CiscoX(config-if-range)# end`
    - `CiscoX# show interface vlan`
    - `CiscoX# delete vlan.dat`

        - Press **enter** to the questions that pop up
    - `CiscoX# erase startup-config`
    - `CiscoX# reload`
        - Enter **no** to any questions that ask if you'd like to save the running configuration
    - `CiscoX> enable`
    - `CiscoX# show vlan`
    - `CiscoX# exit`

- Repeat these directions for the other switch

- Lastly, reset your IP address by setting it to DHCP.
    - Follow the instructions below to set the IP Address on the PC
    - Control Panel> Network and Internet> Network and Sharing Center> Change adapter settings> Ethernet> Properties> Internet Protocol Version 4 (TCP/IPv4)> Obtain IP Address Automatically> OK.
    - **DO NOT** CLICK THE RED X, CLICK **OK** TO SAVE CONFIGURATIONS.

- Close out of any remaining windows and unplug your console cable

Conclusion:

Now you are able to load balance LANs using Rapid PVST+ and increase reliability on the network.