INFR 2421U – Advanced Networking II
Case Study - Winter 2018

VLANS

ALS1:

Name	VLAN	Subnet
Data1	x0	10.x.0.0/24
Voice1	x1	10.x.1.0/24
Management	x9	10.x.9.0/24

ALS2:

Name	VLAN	Subnet
Data2	x2	10.x.2.0/24
Voice2	x3	10.x.3.0/24
Management	x9	10.x.9.0/24

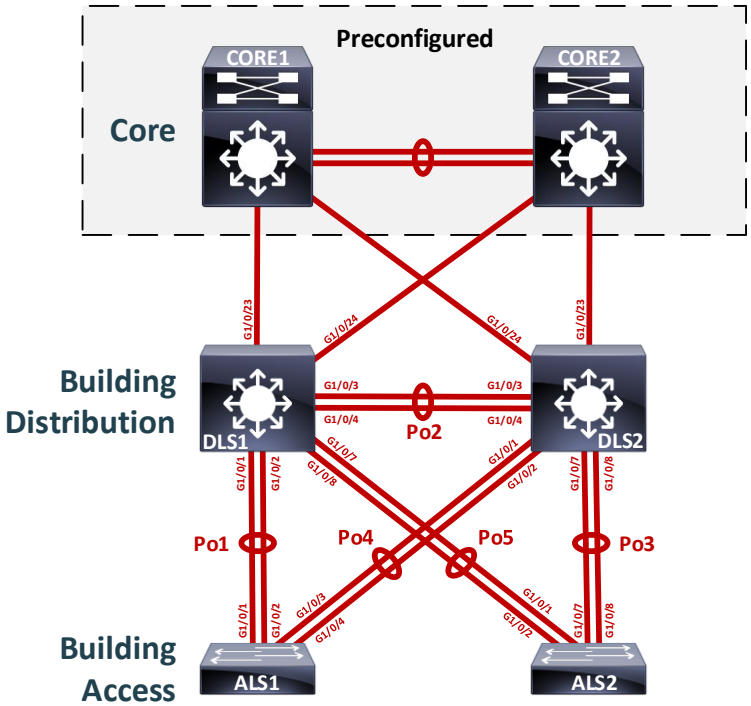
DLS1-to-DLS2 subnet: 10.99.x.0/24

DLS1-to-Core1 subnet: 10.100.x.0/25

DLS1-to-Core2 subnet: 10.200.x.0/25

DLS2-to-Core1 subnet: 10.100.x.128/25

DLS2-to-Core2 subnet: 10.200.x.128/25



x Represents the Group ID assigned in Blackboard

Objectives

- Plan, design, and implement the UOIT Student Help Desk switched network as shown in the diagram and described below
- Implement the design on the lab set of switches and routers
- Verify that all configurations are operational and functioning according to the guidelines
- Expand the design to include the rest of the UOIT Student Help Desk network

Implementation Requirements

The UOIT Student Helpdesk network uses a hierarchical network model, with access, distribution, and core layers. For each task, document the commands used to complete the task as well as the result of implementing those commands. Be thorough such that there is no doubt the commands implemented were entered successfully. Full marks are awarded only if ALL requirements are met in the step and the documentation is thorough.

Configure the switches as follows:

1. Disable all unused links between the switches – use your own methods of discovery to learn which ports these are. **2 points**
2. Place all switches in the VTP domain UOIT and set all switches to VTP mode transparent. **4 points**
3. Configure all switches for Rapid PVST+. Make DLS1 the root bridge for VLANs **x**0 and **x**1, and make DSL2 the root bridge for VLANs **x**2, **x**3, and **x**9. Manipulate the spanning tree port costs so that Po5 on DLS1 will always become the root port for VLAN **x**9. **7 points**
4. Configure all Access-to-Distribution links statically as 802.1q trunk links and disable DTP negotiation. Enable LACP EtherChannels along links between the Access Layer switches and DLS1. Enable PAgP EtherChannel between the Access Layer switches and DLS2. Configure the Etherchannel between the Distribution Layer switches to be statically defined and Layer 3, using the subnet specified in the table above. It's your decision on how the dynamic channel groups are formed. **8 points**
5. Create the required VLANs on each switch as specified in the table above. Configure DLS1 and DLS2 SVIs for each VLAN and assign addresses in the appropriate subnets as specified in the table above. **5 points**
6. Configure DLS1 and DLS2 to use HSRP for VLANS **x**0, **x**1, **x**2, **x**3 and **x**9. Make DLS1 the primary gateway for VLAN **x**0 and **x**1 and DLS2 the primary gateway for VLAN **x**2, **x**3, and **x**9. Enable preemption on both switches. **6 points**
7. Using the table provided, assign ALS1 and ALS2 ports G1/0/5, G1/0/6, and G1/0/12-24 as access ports in the Data VLAN. **4 points**
8. Enable PortFast and BPDU guard on all access ports. Shutdown any unused ports at the Distribution layer. **4 points**
9. Configure ALS1 and ALS2 ports G1/0/5, G1/0/6, and G1/0/12-24 for use with Cisco IP phones using the corresponding voice VLANs. **2 points**
10. Configure ALS2 G1/0/5 and G1/0/6 for port security. Allow only up to three MAC addresses to be learned on each port and then drop any traffic from other MAC addresses and set the violate mode to **protect**. **4 points**
11. Configure ALS1 G1/0/5 and G1/0/6 to only allow the MAC addresses of the two supervisor laptops (aka the two team members completing this case study). Assign only one MAC address per port and **shutdown** if a violation occurs. **4 points**
12. Create routed ports on DLS1 and DLS2 ports G1/0/23 and G1/0/24 that lead to CORE1 and CORE2. Configure addresses using the subnets specified in the table above. **4 points**
13. Enable EIGRP routing on DLS1, DLS2, and advertise all connected networks. Ensure that neighbor relationships form with both CORE1 and CORE2 on both DLS switches. **4 points**
14. Implement <u>one</u> additional upgrade that you have learned in this course. Suggestions include monitoring (IP SLAs), private VLANs, security, etc. **4 points**

Additional Deliverables

Once all tasks have been completed, demonstrate the following (note that these steps may require access to your network through the host PCs in the lab):

1. A ping issued from any host in any VLAN will reach the CORE switches (1.1.1.1). **3 points**
2. A trace issued from any host in any VLAN will reach the CORE switches (1.1.1.1) using the active HSRP active router. **3 points**
3. When the active HSRP router fails, the passive router will switchover. Further, when the active HSRP router comes back up, preemption takes place and the desired active router regains the active role. **4 points**
4. Port security violations will act as anticipated. i.e. The ports will shut down or transition to protect when a violation occurs as described above. **3 points**

Total Marks for the implementation section: 75 points

Enterprise Network Design

The network topology above represents the design in a single building of the UOIT Student Help Desk network. For this section, you must design the rest of the enterprise network. Your network design must include, at a minimum, the following pieces:

1. A topology diagram, which must include the following functional areas of an Enterprise Campus Network (refer to Lecture 2 slides 9 & 10 for sample models):
    a. At least three campus modules (building access and building distribution), one of which is already defined in the topology above
    b. A core module (expand the existing one as needed)
    c. A data center module
    d. An Internet edge distribution module
2. For each module in the diagram, show each device, each connection between the devices, and VLAN and subnet information. Be sure to specify which links are Layer 2 and which are Layer 3. Refer to the "Enterprise Campus 3.0 Architecture" document posted on Blackboard for guidance on proper design.
3. Using the best practices in the textbook and the "Campus Network for High Availability Design Guide" posted on Blackboard, explain exactly where in your network design you would include the following features and why:
    a. Layer 3 Routing Protocols
        i. Which ones would you implement and where
        ii. Any special design notes regarding the implementation of the routing protocols
    b. Layer 2 Redundancy
        i. What type(s) of spanning tree would you use? Where? Why?
        ii. What enhancements would you implement? Where? Why?
    c. FHRPs
        i. Which one(s) would you implement? Where? Why?
        ii. Where would the active switch(es) be in the topology? Why?

d. Link Aggregation and Oversubscription

   i. Describe the oversubscription ratios present in your network (based on the link bandwidths). Present this as a ratio reduced as much as possible (e.g. 8:1 rather than 16:2). Explain why this oversubscription exists in your network design and whether it will be problematic for your users.

   ii. Where would you implement link aggregation (Etherchannel) to help reduce oversubscription? How many links would you need to include in each bundle to meet your target ration, and what would be the total bandwidth?

e. Security

   i. What Layer 2 security measures would you implement? Where? Why?

Report Requirements

1. The Case Study must be submitted on-line via Blackboard for each group. There will be an assignment dropbox which utilizes the turnitin.com originality checker to validate assignment content. You will submit your completed PDF copy to this dropbox before it will be graded by the instructor. For maximum effectiveness, please ensure all screen output in your report is from **screenshots and not copy/pasted text from the terminal windows**.

2. Due date: March 25th, 2018 at 11:59 pm. No late submissions will be accepted.

3. As per the Course Outline, the case study is a mandatory completion component of this course. Failure to submit a case study results in disqualification from the final Skills-based exam.

4. The Case Study must be done in groups of no more than two students. Only one report is required per group. Include the name of the students and student numbers on the title page.

5. The Case Study must contain:

   - IEEE standard formatting and citation: http://www.ieee.org/documents/ieeecitationref.pdf.
   - Title page
   - Table of contents
   - Topology diagram(s)
   - Abstract explaining the case study
   - For each configuration step you must provide a relevant output of *show* or *debug* commands to demonstrate the outcome of the configurations and support the answers. A blanket show run is not acceptable documentation. Remember to include these as screenshots, not copied text.
   - Discussion section explaining the upgrade that was implemented in task 14, which includes relevant screenshots
   - The Enterprise Network Design section, including all of the required documentation. Be sure to thoroughly explain your design decisions citing best practices from the design guides posted on Blackboard whenever possible
   - Conclusion section outlining final observations of the report
   - Final show running-configuration output on all devices, formatted to remove extraneous info
   - The Case Study and the results must be combined in one single document. Providing outputs and configurations in separate files will be marked as missing and won't be calculated toward the final mark
   - Marks will be deducted for spelling and grammar mistakes, so make sure the report is written professionally and that it has been proofread.

BE SURE TO PROPERLY CITE ALL REFERENCES, INCLUDING LECTURE NOTES, TEXTBOOKS, WEBSITES, IMAGES, AND THE PDFs POSTED ON BLACKBOARD