

Routing, Switching and Virtual LANs

Assignment 1: VLAN Case Study

Deadline: Week of 16/01/06 (5 weeks)

Student Name _____

Date handed in: _____

Grading Criteria

It is possible to achieve credits for the following from this assignment.

BTEC Grading Criteria	Tick	Date	KS
M1. design an addressing scheme based on classless addressing			PS3 LP3
D1. design and evaluate an efficient classless addressing scheme using VLSMs			PS3 LP3
M2. compare distance vector and link state routing protocols			PS3 LP3
M3. demonstrate an understanding of the technical workings and security advantages of VLANs			PS3 LP3
D2. design, document and evaluate a network involving classless routing, switching and security based on VLANs for a given scenario or case study			PS3 LP3

Assignment Feedback (with smart targets)

Student Feedback

Internal Verifier Comments:

Signed: _____

Date: _____

Assignment Brief

Routing, Switching and Virtual LANs

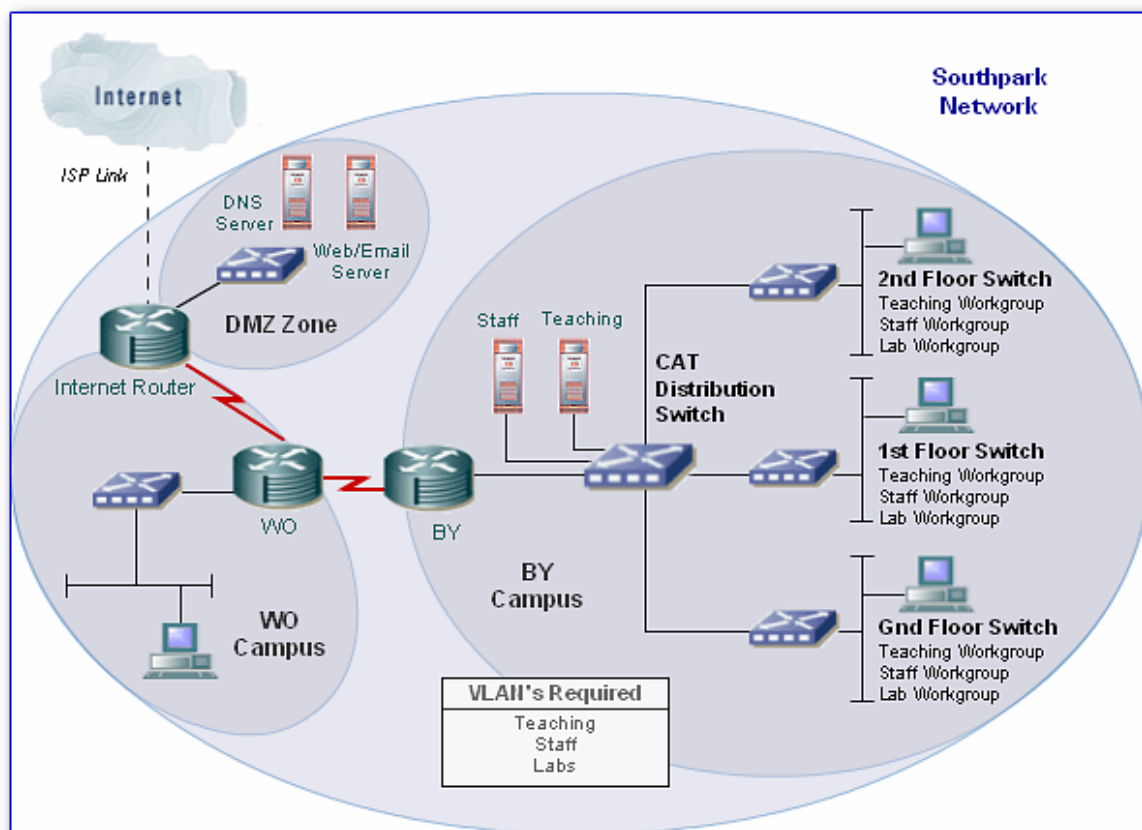
Assignment 1: VLAN Case Study

Scenario:

Southpark College network extends over two geographically separated campuses, called WO and BY. The existing network has been up and running tolerably well for a considerable number of years. Recently however, problems with the existing network seem to have become worse. One of the concerns is with the large amount of broadcast traffic generated at the larger BY campus. This traffic slows down the network considerably at times. The other problem concerns security; it is thought that the teaching and lab computers should be logically separated from the staff computers through the introduction of **VLAN's**.

The network is currently structured as follows. The main part of the WO network services all the staff located there. A separate demilitarized (DMZ) zone contains the DNS Server and Web/Email Server so people from the outside can look at the college website and employees can check their email 24 hours a day. The Internet connection is also based at this site. The BY network services staff, lecturers and students and is linked to the WO site through a dedicated WAN connection.

Your task is to design and fully document this organisations network and so provide a solution that meets their needs and solves their current problems.



Network Diagram

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Network Design Requirements:

You should take the following requirements into account when designing the network

General Requirements

- Use the public class C network 200.0.0.0 for internal addressing.
- Use VLSM for IP addressing.
- All networking devices must have IP addresses

At the WO campus

- 50 employees and students in the WO campus.
- The DMZ on a separate subnet with room for 100% expansion.
- Use subnet 100.100.2.0/30 for connection to the Internet router.

At the BY campus

There is one classroom and a one lab per floor.

On each floor...

- There are 15 PC's per classroom for students to use.
- There are 10 PC's per lab for students to use.
- There is an extra PC in each classroom and lab reserved for staff to use.

Network Devices Information

Information about the existing network devices on the network is given below.

Device Name	Type	Model	Qty
Routers	2610	CISCO2610XM	3
Distribution Switch	4006	Catalyst WS-C4006	2
48 Port Access Switch	2950	WS-C2950G-48-EI	3

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Assignment Tasks

Task 1 (M1) Design the Addressing Scheme

- 1.1 The company expects you to design the addressing scheme using VLSM to maximize the use of IP addresses. A table is to be produced showing how you propose to subnet using a VLSM design. Subnets that will not be used are to be clearly identified in the table. *A sample table is given in the appendix.*

Task 2 (D1) Justify your Addressing Scheme

- 2.1 Justify your addressing scheme as follows:-
- ◇ Explain in detail why your addressing scheme meets the college's requirements
 - ◇ Explain the need for classless addressing and VLSM.

Task 3 (M2) Distance Vector vs. Link-State Routing Protocols

- 3.1 The company wants a recommendation for a routing protocol for the network. Create a table similar to the one in the appendix. Evaluate each of the common interior routing protocols by assigning various properties such as **simplicity, scalability** etc. a value. On completion of your table, state the protocol you think would be most suitable for this organization.
- 3.2 Choose a **pure** distance vector routing protocol and a **pure** link-state routing protocol from your table.
- ◇ Explain how the WO and BY routing tables would be updated if a distance-vector routing protocol were used. How would they be updated if a link-state routing protocol were used? Explain how a router running a link-state routing protocol stores various different tables.
 - ◇ Compare the two routing protocols and explain why you gave the values you did for each property in the table.

Task 4 (M3) Explain the Advantages of VLAN's

- 4.1 Explain what a VLAN is.
- 4.2 Explain how the introduction of VLAN's could benefit **this organizations** network with respect to the following:-
- ◇ Broadcast traffic and network performance
 - ◇ Logical division of users
 - ◇ Increased security
- 4.3 Explain how this particular network be logically divided into VLAN's.

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Task 5 (D2) Design, Document and Evaluate the Network

5.1 Produce a **logical** network diagram that includes the following.

- ◇ Router and switch names
- ◇ Router interface details
- ◇ Network addresses
- ◇ Number of hosts per network
- ◇ DCE Serial interfaces are to be clearly indicated
- ◇ Link Speeds

Note: You may produce a separate diagram per site if you wish.

5.2 Design and document information about the router on the BY network only.
A sample table is given in the appendix – Table 5.1.

5.3 Design and document information about the switches on the BY network only.
A sample table is given in the appendix – Table 5.2.

5.4 Design and document information about the switch VLAN port assignments on the BY network. *A sample table is given in the appendix – Table 5.3.*

5.5 Conclude your report by providing an evaluation of your network design, taking into account network traffic, security, ease of administration and future expansion.

It is crucial to read and understand the scenario, complete each task carefully and provide full documentation as evidence that you have fulfilled all the requirements.

What you will need to hand in:

<input type="checkbox"/> Task 1: Table detailing IP addressing scheme
<input type="checkbox"/> Task 2: Justification of your IP addressing scheme
<input type="checkbox"/> Task 3: Table assigning good/bad/indifferent values to routing protocol properties
<input type="checkbox"/> Task 3: Written comparison of a distance-vector and link-state routing protocol
<input type="checkbox"/> Task 4: Written explanation of the working and benefits of VLAN's
<input type="checkbox"/> Task 5: Logical network diagram
<input type="checkbox"/> Task 5: Table detailing router design information
<input type="checkbox"/> Task 5: Table detailing switch design information
<input type="checkbox"/> Task 5: Table detailing switch VLAN design information
<input type="checkbox"/> Task 5: Evaluation

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Appendix

Task 1 Documentation Sample

A sample table layout for recording the VLSM design is given below.

Number of host addresses required	Network Address	CIDR Subnet Mask	Max Number of Host Possible	In Use (Yes/No)	Network Name

Table 1.1

Task 3 Documentation Sample

A sample table layout for evaluating routing protocols is given below.

Assign +, -, or **neutral** to each property to indicate good, bad or indifferent. Add all the pluses and minuses to reach a total.

Routing Protocol	Property 1 Simplicity	Property 2 Scalability	Property 3 Convergence	Property 4 Robustness	Property 4 Addressing Flexibility	Total
RIP	+	-	-	-	-	-3
IGRP						
EIGRP						
OSPF						

Table 3.1

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Task 5 Documentation Samples

Sample table layouts for recording network design information are given below.

Router Information

Complete a separate table similar to the one below for **each** router on the BY network,

Router Name:

Interface or Sub Interface Type/Number	Description and Purpose	DCE/DTE if applicable	Link speed or clock rate	Network or VLAN name	Network Address	Interface IP Address	CIDR Subnet Mask

Table 5.1

Switch Information

Use a table like below to document information about the switches on the **BY** network.

Switch Name	Model	# of Ports	VLAN IP Address	Gateway Address	VTP Mode	VTP Domain	STP Root

Table 5.2

VLAN Information

Complete a separate table similar to the one below for **each** switch on the BY network,

Switch Name:

Interface or Sub Interface Port/Number	Description and Purpose	Speed	Network or VLAN name	VLAN No.	Network Address	CIDR Subnet Mask	Encapsulation

Table 5.3