Networks and Switching

Case Study Handout

As per the Unit Outline - the Case Study makes up 15% of your final mark (10% report and 5% presentation for this Unit). This is a group assignment, and must be completed by:

- Groups of **three** or **four** students only
- Groups assembled from students within the same allocated Lab Class

Groups **MUST** be formed by Week 6. You are required to form your groups within the ESP (https://esp.swin.edu.au. The ESP web site is also used to lodge your assignment report, Blackboard will be used to lodge your video presentation. Submission details for the assignment are outlined below.

I. Outline

This Case Study will require you to

1) Build a small network using three switches and one router
2) One switch will run as a distribution layer switch, the other two will run as access layer switches
3) A router will be connected to the distribution layer switch using 802.1Q trunking to route between subnets
4) The switches will be connected with two Ethernet links using Ether-channel bonding
5) The distribution layer switch will be configured as the STP root bridge

II. Case Study Details

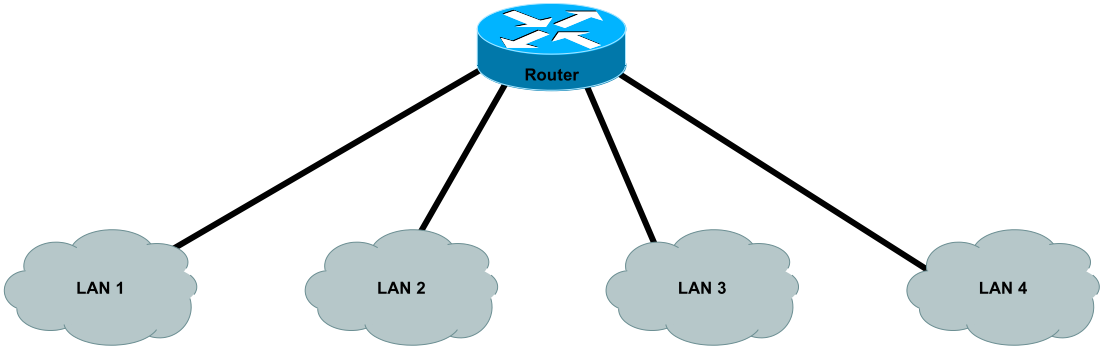
Your Lab Supervisor will provide your group with your:

- Company/orgnaisation name
- Allocated network address information
- Subnetting requirements for four LANs to operate within your organisation
- VLAN numbers and VLAN names for each of the four LANs
- Network Management VLAN to use in your network

These details will be provided once you have registered your group within ESP and provided those details to your supervisor.

III. Logical Network Topology

The logical topology for the organisations network is depicted in the figure below. Your organisation consists of four LANs which will each be connected to a single router to route traffic between subnets.



IV. Network Addressing

Your Lab Supervisor has provided you with a network address (and subnet mask) and subnetting requirements for each of your four LANs. When subnetting your network to accomodate the required hosts for each of your four LANs, you must:

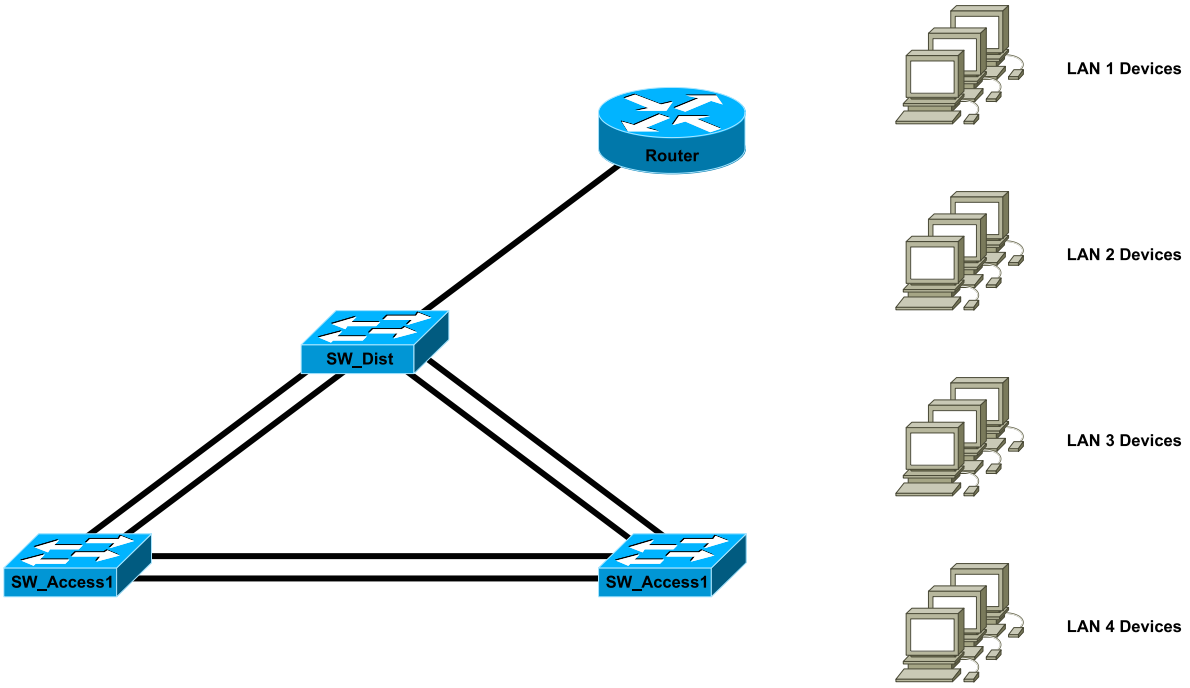
- Ensure that you have enough subnets to address the entire network
- Allocate a subnet for the management network (switches and routers) large enough to cover network growth of double the current ammount of infrastructure
- Subnet optimally such that the largest number of IP addresses within your allocated network remain for future expansion

In your final report, you must explain your subnetting process and show your calculations.

V. Switch Port Allocation

You have been provided with five VLAN identifiers for your network, one for each of your four LANs and one for your management VLAN. You have been provided with appropriate names for the VLANs covering the subnets.

The physical topology of your network must match the network diagram below.



For each port on the four network devices, you must nominate:

- Whether it will operate in access or trunking mode
- Which VLANs are allocated to which ports, and on which switches
- Which ports will be disabled

In your final report, you must explain your decision process for switch port allocation.

VI. Basic Device Configuration

You are required to configure all switches and routers with the following information:

- Device names
- Message of the Day
- Interface descriptions
- Console and Enable passwords
- ssh Access
- All router interfaces are to have the lowest usable IP address of their allocated subnet

Further, all switches should be configured such that:

- Unallocated ports are disabled
- Appropriate switch-port security is configured

In your report you will need to justify your switchport security decisions and configurations.

VII. Advanced Network Configuration

You will be required to configure 802.1Q trunking connections between the switches. Each switch will be connected to another switch via two trunking connections where the second connection is used for redundancy purposes.

You will be required to configure your network Spanning Tree Protocol to PVST+ and to ensure that the distribution layer switch is the **Root Bridge**.

VIII. EtherChannel Bundling

Network traffic has grown since you first built your network. The Ethernet trunking channels are no longer capable of carrying the offered load on their own. A decision has been made to change the redundant trunking connections between each switch into a bundled EtherChannel to double the maximumum throughput.

You must reconfigure your network such that the two links connecting the switches now form an EtherChannel. You must ensure that the distribution layer switch remains the **Root Bridge** for the Spanning Tree Protocol.

A. Testing

As part of the Case Study, you need to devise and document an appropriate testing regime to ensure that all the following conditions are met:

1) The nominate level of switchport security is functional
2) Full interconnectivity exists between all hosts in all LANs and the management VLAN
3) The redundant trunking links are functional in the event of failure of the primary links
4) The correct switch is configured as the PVST+ **Root Bridge**
5) EtherChannel bundling is correctly configured, the channel bandwidth is indeed doubled, and that the root bridge remains properly configured
6) ssh access to all network devices is functional

IX. Assessment Items

The Case Study submission will consist of two components:

1) A report, assessed out of a total of 40 marks and worth 10% of your final mark. All group members will receive the same mark for the report
2) A video presentation, assessed out of a total of 20 marks and worth 5% of your final mark. Group members will receive individual marks for their part of the video presentation

Details of the two submission items and the assessment procedure are outlined below.

A. Report Contents

You are required to produce a report that contains the following information.

Subnetting Discussion
: A discussion of your subnetting approach, your calculations for each subnet, why particular subnet masks were chosen and how you allocated the subnets to individual networks

Network Drawing
: A complete network drawing detailing allocation of addressing information for all relevant hosts and devices. This documentation must include port and VLAN allocation for all devices

Device Configuration Summary
: Tables containing the device information that is not included within the network drawing, including:
  - Hostname information
  - Console, enable and ssh passwords
  - Assigned interface descriptions and the MOTD
  - Port security summary

Design Discussion
: Discussion of your design and decision making processes and reasoning. These discussions must include:
  - Swithport allocation reasoning
  - Port security reasoning and design
  - Spanning Tree implementation details to define the root bridge
  - Planning for redundancy and EtherChannel considerations and deployment

Simulated Network
: A packet tracer file containing your simulated network build

Testing Procedure
: An outline of how you built your network and an overview of your testing to verify the complete functionality of your network

1) Marking Details: Alss students in the group will receive a combined armk out of 40 for the Report. Marks will be allocated as per the following table:

Component	Score
Subnetting	
Description of subnetting procedure	3
Properly Subnetted	2
Design Discussions	
Switchport allocation reasoning	3
Port Security design	1
Spanning Tree design and implementation details	2
Redundancy planning and implementation	2
EtherChannel Bundling design details	2
Testing	
Testing plan for overall network functionality	2
Testing plan for redundant links	4
Testing plan for Spanning Tree	2
Testing plan for EtherChannel	2
Best Practice	
Subnet, address, VLAN and port allocations	3
Sub-interface naming schemes	2
Technical Documentation	
Network Diagram with all allocated information provided and correct	2
Device Configuration tables	2
Requested device output	2
Clarity, completeness and quality	4
Penalties	
Late submission – per working day late	**-2**
Total	**40**

2) Submission Requirements: This assignment is due at 5:00pm on Wednesday during Week 11. The requirements you must adhere to are:

- Submission of your PDF report must be completed via the Faculty ESP submission system at http://esp.swin.edu.au
- The report must be submitted as a PDF document
- The online submission system timestamps your report, a late submission will result in the penalty of loss of 10% of the possible assignment mark per day for a maximum of five days. Later submissions will result in a score of 0
- Only one member of the group need submit, the last submitted copy by any group member will be assessed

NOTE: When submitting your report, PacketTracer file, and video presentation you MUST:

- Report **MUST** be in PDF format
- Video must be under 100MB in size
- All three documents, report, video and PacketTracer file **MUST** be zipped in a single file for submission

B. Video Presentation

You are required to prepare a (no longer than) five minute group video. Each group member must speak for a minimum of 1 minute (four person group) or $1\frac{1}{2}$ minutes (three person group) on the video and clearly identify themselves. The assessment crtieria for the presentation will be individual.

The content of the video presentation will change from semester-to-semester and be provided on Blackboard.

1) Marking Details: Each group member will receive an individual mark out of 20 for the video presentation. Marks will be allocated as per the following table:

Component	Score
Organisation – group Overall organisation of the presentation for all group members. This will be assessed based on the structure of the presentation	6
Presentation Skills – individual How well is the individual able to clearly articulate their part of the presentation and how well is the individual able to talk to the camera and engage the viewer	8
Content – individual How well does the presentation cover the required content	6
Penalties Late submission – per working day late Length – per each portion of one minute over the five minute maximum Length – student contribution under minimum length	 **-4** **-4** **-4**
Total	**20**

2) Submission Requirements: This video presentation is due at 5:00pm on Wednesday during Week 11. The requirements you must adhere to are:

- See instructions for the report submission for submission of your video presentation
- The video must be submitted in a standard video playback format such as AVI, MP4, WMV or MKV
- Keep the file small (under 100MB) the network can struggle with larger uploads and this will not be considered an excuse for late submission
- The online submission system timestamps your report, a late submission will result in the penalty of loss of 10% of the possible presentation mark per day for a maximum of five days. Later submissions will result in a score of 0

X. Plagiarism

Please be aware of Swinburne's plagiarism policies and procedures:

- http://www.it.swin.edu.au/students/plagiarism_guide.pdf

Part of this may involve citation of work, a guide is available at:

- http://www.swin.edu.au/lib/guides/harvard_system.pdf