Module Code:	COMP40002
Title of Assignment:	Networking Concepts and Cyber Security: Case Study
Assignment Weighting:	50%
Submission Date:	**Assignment 1 (Networks):** **Submission date Tuesday 16th Jan 2024 by 13:00**
Learning outcomes	1. Demonstrate a knowledge of the OSI model, TCP/IP model and IP addressing and network design (subnetting), as well as fundamental introductory concepts of cyber security. 2. Explain and use layer 2 and 3 based technology such as VLANs, the spanning-tree protocol, network management principles, routing protocols and associated tools. 3. Perform pc, router, switch, and WAN installation, configuration and troubleshooting including access control lists in extensive router-based internetworks and do so in a responsible and safe manner.

General Guidelines:

This part of the assignment will assess your ability as a group to:

- Design a LAN and select/justify a WAN connection to another site, installing appropriate services, providing a simulation (in Packet Tracer) to prove the design. This assignment will be scenario driven.

- You will be given a case study (scenario), based upon a company that wants to expand its physical locations, you will need to evaluate and design a network system to manage the internal and site-to-site communication channels.

This assessment will be completed in groups. Marks will be given for engagement in 3 milestone meetings, up to 5% of the available marks will be allocated for engaging in these milestone meetings and demonstrating your engagement. Further details are given in the marking scheme. You will each be asked to grade each of the peers in your group by giving them a mark out of 100%, this will then be used as a weighting for the final grade.

You are expected to demonstrate an insight into the implications of the problem introduced in each task by using clear and concise arguments. The report should be well written (and word-processed), showing good skills in creativity and design. Sentences should be of an appropriate length and the writing style should be brief but informative. If you need any help with this your tutor can give you guidance, also one-to-one support can be arranged via our library services: https://libguides.staffs.ac.uk/study-skills

The report should have a consistent layout and be divided into enumerated sections, sub- sections, sub-sub sections, etc. (eg 2, 2.1, 2.1.1). For references and bibliography, you are expected to use appropriate peer reviewed sources for developing your arguments and Harvard referencing style as per the University regulations, extra guidance can be found here: https://libguides.staffs.ac.uk/refzone

A digital copy of the report as a Microsoft Word document should be submitted using blackboard/Turnitin (email submission **will not** be accepted), more instructions will be given for this by your instructor(s). A link will be provided to upload the Packet Tracer simulation file. **ONLY 1** copy needs to be submitted per team, each team member will need to submit their peer weighting.

1.0 Assignment detail

1.1 Network design

Part 1 is weighted at **50%** of the overall module mark. It is expected that this part of the assignment will be in the region of **3000 words** +/-10% overall.

Please use this link to download the Packet Tracer tool https://www.netacad.com/courses/packet-tracer, if you are using an Arm based mac, you will need to install xcode as well.

Your task is based on the following scenario: An existing small company is looking to expand, currently based in Manchester. Their internal infrastructure is old and slow and therefore needs replacing and expanding to allow recruitment of new staff. They also want to open a new site based in Liverpool. Currently, they have a 20Mbps DSL link to an internet service provider (ISP) which has also become too slow and unreliable. The current topology is shown in Figure 1. Current topology at Manchester.

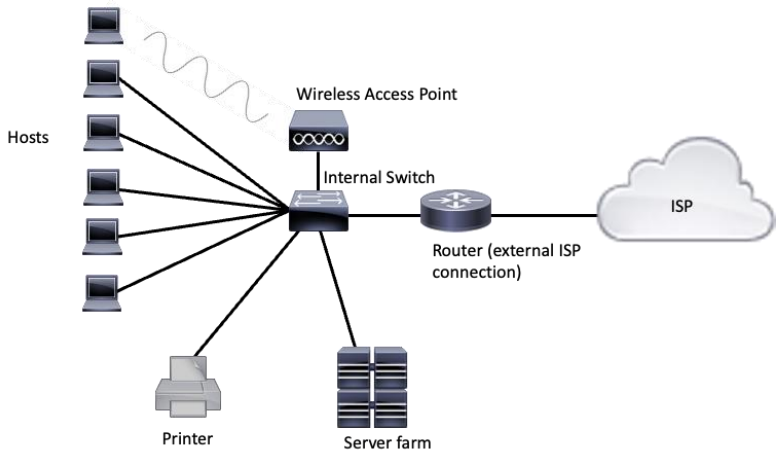

Figure 1. Current topology at Manchester

The Manchester site will need to have a connection to the new site in Liverpool.

Network Requirements

Manchester is the Headquarters and currently has an internal server farm, hosts and a printer. Wireless access is currently permitted for employees only. The requirements for the expansion are:

1. Each site issues its own IP addresses internally (DHCP) and has its own address range.

2. You need to decide how to connect the sites together and provide some redundancy as a back-up. You need to decide which technology to use and justify your approach.
3. Security needs to be improved at Manchester and appropriate measures at Liverpool.

4. The plan is to move all the servers to Liverpool and run as an internal private cloud.

Requirements of each site Table 1:

Manchester	**Liverpool**
20 User machines (wired & Wireless connections)	10 User machines (wired & Wireless connections)
A system administrator PC on a separate address range	A system administrator PC on a separate address range
A guest VLAN on the WiFi	Email server
2 networked Multi-Function Printers	FTP server
A development server	Database server
External access for the sys-admin	Web server
Appropriate security	External access for the sys-admin
	Appropriate security
	1 networked Multi-Function Printers

Table 1

Report requirements

1) An internal IP addressing scheme for both sites (the only difference being the overall network address) as shown in Table 2.
2) Ip addresses for the link between sites as shown in Table 3.
3) A discussion as to the benefits and requirements for the use of VLANs within the network
4) A discussion about the requirements for the WAN connections, in terms of:
    a. Where to connect
    b. What throughput is needed
    c. What WAN technologies are available to connect the infrastructure with the benefits and risks
    d. Approximate cost of this technology
    e. WAN link redundancy
5) You will need to justify the choice of devices, user and network.
6) Discussion of the security you have added

You will need to produce a packet tracer simulation showing your design. The file should include:

1. Router/Switch configurations for Manchester and Liverpool sites showing standard device hardening (naming, console, enable & VTY passwords)
2. Router/Switch configurations for Liverpool and Manchester sites, demonstrating DHCP and NAT/PAT
3. Demonstrate the use of VLANS and MAC address security, with base configuration and management interfaces
4. External connections between both sites, proving connectivity

5. Please note for the host machines, only show one device in your packet tracer simulation

IP Addresses to use:

Internal IP Address range per site:

Site	Internal Ip Address
Manchester	192.168.16.0/24
Liverpool	192.168.17.0/24

Table 2

External IP Address range per site:

Site
Manchester: 172.16.0.0/24
Liverpool: 172.17.0.0/24

Table 3

The following tables (Table 4 Addressing table and Table 5) are as guides as how you could represent the IP addresses, you can use these or develop your own:

Subnet (Department)	Number of Hosts	Subnet Address	Subnet Mask	First Usable Address	Last Usable Address	Broadcast Address	No. Of Unused IP Addresses

Table 4 Addressing table

Host/Device/Interface	IP address Start	Mask /	Default Gateway	DCE/DTE

Table 5

You are expected to use an appropriate referencing style as per the University regulations. The referencing needs to be done using the Harvard method. If you are unsure with this method of referencing then please look on the Internet, ask one of the tutors or talk to the library staff. It is not acceptable to just print out a page from the Internet where you found a piece of hardware and attach that to the back of the report. Submission will be via Blackboard/Turnitin, there will be separate submissions for the report and the packet tracer file.

Here is a link to the university website which discusses the referencing of work
http://libguides.staffs.ac.uk/refzone

Marking Criteria/Feedback sheet Part 1 (Network design)

As this is a group-based assignment, you will be required to produce a signed declaration (within the report) agreeing to the allocation of marks within the group.

	Criteria	Max Mark	Comments
A	**IP address configuration:** IP addressing the breakdown of the IP addresses must be given in a table format showing the IP address, with the range, broadcast and network address for each site.	10	
B	**Router configuration:** Device configuration which demonstrates the configuration with suitable comments to show what is being done (Packet Tracer)	20	
C	**Switch Configuration:** Device Configuration which demonstrates the configuration of the switches within network (Packet Tracer)	20	
D	**Discussion of the WAN technologies**	15	
E	**Discussion of VLANs**	5	
F	**Discussion of Security measures**	5	
G	**Format of the work:** The work must be presented in a suitable word-processed format and Harvard referencing must be used for all standards and diagrams The work must be presented in a suitable word-processed format and Harvard referencing.	10	
	Average peer weighting (sections A-G)		

H	**Engagement in Milestone 1 meeting in week 5**	5	
I	**Engagement in Milestone 1 meeting in week 8**	5	
I	**Engagement in Milestone 1 meeting in week 12**	5	
	Overall Mark	**/100**	**%**