

## Faculty of Science and Technology - Department of Computing and Informatics

<b>Unit Title: Networks and Cyber Security</b>	
<b>Assessment Title:</b> Network design and security	
<b>Unit Level:</b> 4	<b>Assessment Number:</b> 2 of 2
<b>Credit Value of Unit:</b> 20	<b>Date Issued:</b>
<b>Marker(s):</b> Reza Sahandi/Abir Awad	<b>Submission Due Date:</b> 4 May 2021 <b>Time:</b> 12:30pm
<b>Quality Assessor:</b> Wei Koong Chai	<b>Submission Location:</b> Turnitin (& large file submission)
<b>Feedback method:</b> Brightspace	

**This is an individual assignment which carries 50% of the final unit mark**

### ASSESSMENT TASK

The Smart car manufacturing company has recently purchased two buildings, which are located 0.5 Km away from each other. Each building has two floors, each floor measuring 200mx200m. Every floor contains five individual offices and an open plan environment. The open plan on each floor measures 120mx120m. The open plan in each building is located above the other on one side of the building.

The Buildings are named Rose and Tulip. The offices in the Rose building are used by senior managers and administrator staff. However, the offices in the Tulip building are used by the research/development staff.

Each open plan part of the buildings will have 15 computers supporting the staff involved in manufacturing cars. The desks in the open plan areas are equally spaced. Each floor contains a designated communication room, which is located between the open plan and the individual offices adjacent to the open plan wall. Each office will be equipped with one computer. The communication rooms will be equipped by the necessary networking kits.

Two departments will be housed in each building. Each department will occupy one of the floors. Due to the network traffic that they will be producing and to avoid congestion, each department will have its own data server.

A network consisting of two segments should be designed for each building. Each segment which supports one of the departments should include 20 computers connected to the network by suitable cables.

Each segment should have its own wireless access point to support the staff who may wish to connect their laptops or their mobile phones to the network. The network of each Department must have its own network id, a data server (to facilitate local storage) and a DHCP server. A shared webserver should also be attached to one of the segments which will be used for internal access only. To avoid interference, each access point should use a different communication channel. The network should have sufficient capacity for future expansion. All the segments should be connected to each other using suitable network devices and appropriate topology.

The buildings have already been wired with twisted pair cable using structured cabling. However, fibre optic cables may be used, if required. The buildings should be linked by two pairs of fibre optic cables, but only one of the pairs will be active. The second pair of fibre optic cable will be used if the first pair fails.

The network is expected to be connected to the Internet through a NAT for security. This is achieved by connecting the network to the router of an Internet Service Provider (ISP). The company has already signed a contract with the ISP and received four Public IP addresses 200.2.3.1/24, 200.2.3.2/24, 199.4.5.1/24 and 199.4.5.2/24 for this connection and testing.

A single PC connected to the ISP's network (public zone) can be used for testing the operation and effectiveness of the NAT. You should ensure that your settings reflect both the public and private zones of the NAT.

Eight Class C private IP address ranges (192.168.1.0/24, 192.168.2.0/24, 192.168.3.0/24, 192.168.4.0/24, 192.168.5.0/24, 192.168.6.0/24, 192.168.7.0/24 and 192.168.8.0/24) have been provided which can be allocated to the devices on this network. Depending on the configuration, you may not require all these IP addresses.

To make the design simpler and easier to demonstrate the functionality of the network, you will be asked to use 5 desktop PCs only in each segment.

Design and implement the network following the steps below:

1. Using Packet Tracer, design the network consisting of a switch, 5 desktop PCs, a wireless access point, a data server, a DHCP server and a wireless access point per segment. A webserver should be attached to one of the segments. A laptop must be connected to the wireless access point. Each wireless access point should have a separate SSID.

**Note:** To make the design simpler and easier to demonstrate the functionality of the network, you are asked to use 5 desktop PCs only in each segment of the network.

**You must use the version of the Packet Tracer software made available to you on Brightspace. You must NOT use any newer version of the software which may be available on the CISCO's website.**

2. Sufficient number of routers may be used for the network.
3. Select suitable devices and appropriate transmission media for connecting network devices and computers to the network. All the network devices must be housed in the communication rooms. *If twisted pair cables are used, you must clearly explain what approaches you have used to avoid the cable exceeding its maximum permissible length.*
4. Allocate appropriate IP addresses manually (not using DHCP) to all the wired devices. IP address allocation using DHCP may be used for laptops or mobile phones only.
5. Connect the network to the Internet through the NAT.
6. Simulate the operation of the network ensuring operability.
7. Label **all the devices** and identify the **type of transmission media** used on your packet tracer diagram.
8. Provide step by step discussions on the action taken in the design of the network, justifying the decisions taken, the devices selected and contingency for future expansion. Also discuss the floor dimension and explain the approaches taken to avoid twisted pair cables exceeding their maximum permissible length.
9. After finishing steps 1-8 above, you are required to analyse the security level for the design of your proposed network. Therefore, you are asked to provide a table identifying 3 security flaws in the design and suggest a security countermeasure for each (in a Word document).
10. Based on your finding in step 9, draw the diagram of the redesigned network (as a Word document, not in Packet Tracer), discuss the changes made and provide reasons.

## SUBMISSION FORMAT

Create a **zipped** folder to include: the packet tracer file and a Word document. The Word document should include two parts with a maximum of 1200 words. The first part must contain responses to point 8 above. The second part should contain responses to points 9 and 10 above. The folder must be submitted via Brightspace via "Large File" submission route before Monday 4th May, 12:30pm.

## MARKING CRITERIA

The following criteria will be used to assess the assignment:

	Weighting (%)
1. Selection of appropriate network devices and IP address allocation including default routers	12
2. Appropriate design using Packet Tracer, supported by labels	12
3. Setup and configuration of the NAT and access points	12
4. Step by step discussions on the action taken in the design (400 words max)	15
5. Three security flaws and countermeasures are identified and discussed (400 words max)	21
6. A diagram for the redesigned network, discussing the changes made for improving security and providing reasons (400 words max)	28
	-----
<b>Total</b>	<b>100</b>

The above weighting is merely to indicate the importance of the topics to be covered in this assignment. Please also refer to the generic assessment criteria at the end of this document.

Learning outcome 1, 2, 3 and 4 are assessed by this assignment.

## INTENDED LEARNING OUTCOMES (ILOs)

This assignment tests your ability to:

1. Understand basic and essential network and cyber security concepts and definitions;
2. Understand the fundamental concepts and requirements for networks, their main components, functions and characteristics including the Cloud;
3. Describe network and cyber security architectures;
4. Distinguish system and application security threats, vulnerabilities and define types of security incidents.

## QUESTIONS ABOUT THE BRIEF

Any question about the assignment brief can be asked during the lecture slots.

**Signature Marker: M R Sahandi/A Awad**

## HELP AND SUPPORT

- If a piece of coursework is not submitted by the required deadline, the following will apply:
  1. If coursework is submitted within 72 hours after the deadline, the maximum mark that can be awarded is 40%. If the assessment achieves a pass mark and subject to the overall performance of the unit and the student's profile for the level, it will be accepted by the Assessment Board as the reassessment piece. The unit will count towards the reassessment allowance for the level; This ruling will apply to written coursework and artefacts only; This ruling will apply to the first attempt only (including any subsequent attempt taken as a first attempt due to exceptional circumstances).
  2. If a first attempt coursework is submitted more than 72 hours after the deadline, a mark of zero (0%) will be awarded.
  3. Failure to submit/complete any other types of coursework (which includes resubmission coursework without exceptional circumstances) by the required deadline will result in a mark of zero (0%) being awarded.

The Standard Assessment Regulations can be found on **Brightspace**.

- If you have any valid **exceptional circumstances** which mean that you cannot meet an assignment submission deadline and you wish to request an extension, you will need to complete and submit the Exceptional Circumstances Form for consideration to your Programme Support Officer (based in C114) together with appropriate supporting evidence (e.g, GP note) normally **before the coursework deadline**. Further details on the procedure and the exceptional circumstances form can be found on **Brightspace**. Please make sure that you read these documents carefully before submitting anything for consideration. For further guidance on exceptional circumstances please see your Programme Leader.
- You must acknowledge your source every time you refer to others' work, using the **BU Harvard Referencing** system (Author Date Method). Failure to do so amounts to plagiarism which is against University regulations. Please refer to <http://libguides.bournemouth.ac.uk/bu-referencing-harvard-style> for the University's guide to citation in the Harvard style. Also be aware of Self-plagiarism, this primarily occurs when a student submits a piece of work to fulfill the assessment requirement for a particular unit and all or part of the content has been previously submitted by that student for formal assessment on the same/a different unit. Further information on academic offences can be found on **Brightspace** and from <https://www1.bournemouth.ac.uk/discover/library/using-library/how-guides/how-avoid-academic-offences>
- Students with **Additional Learning Needs** may contact Learning Support on [www.bournemouth.ac.uk/als](http://www.bournemouth.ac.uk/als)
- You should not be conducting any primary research (i.e. carrying out an investigation to acquire data first-hand, for example, where it involves approaching participants to ask questions or to participate in surveys, questionnaires, interviews, observations, focus groups, etc.) unless otherwise specified in the brief. However, if there is a genuine requirement to collect primary research data you will require ethical approval before doing so. In the first instance, please discuss with the Unit Leader. The collection of primary data without appropriate ethical approval is a serious breach of Bournemouth University's Research Ethics Code of Practice and will be treated as Research Misconduct.

**Disclaimer:** The information provided in this assignment brief is correct at time of publication. In the unlikely event that any changes are deemed necessary, they will be communicated clearly via e-mail and Brightspace and a new version of this assignment brief will be circulated.

Level 4 Grade Range		Subject knowledge and understanding	Intellectual skills - including analysis, evaluation, and critical judgement	Subject-specific skills - including applications and problem solving	Transferable skills - including communication and presentation
<b>High First</b>  <b>80% +</b>  Exceptional work overall	Feedback	The work demonstrates an exceptionally broad factual and conceptual understanding of the subject informed by extensive reading.	The work demonstrates exceptional analysis and evaluation of information. Ideas and information are fluently, insightfully and critically selected and collated in support of analysis, evaluation and a sustained coherent argument.	The work demonstrates a range of very effective responses to given problems, some of which may demonstrate innovation and considerable insight	Exceptionally well-organised work in which the argument is well-structured and communicated very well. Sentence structure and grammar indicate a high level of skill.
	Feedforward	Future work could offer even broader and deeper understanding.	Future work could offer an even deeper and more extensive critical approach with deeper analysis and evaluation.	Future work could demonstrate even further innovation and insights.	Future work could offer even greater flow with the argument.
<b>First</b>  <b>70 - 79%</b>  Excellent work overall	Feedback	The work demonstrates excellent factual and conceptual understanding informed by extensive reading.	There is clear evidence of analysis and evaluation using defined techniques and principles. Ideas and information are selected and collated in support of analysis, evaluation and argument. The work demonstrates an early critical approach to information.	The work demonstrates the generation of a very effective range of appropriate responses to given problems, some of which may be innovative.	Excellent well-organised work in which the argument is structured and communicated well. Sentence structure and grammar are well developed.
	Feedforward	Deeper reading and research would help develop knowledge and understanding further.	Future work could offer a fluent and critical stance in relation to information and its evaluation and analysis.	Future work could demonstrate deeper insight and innovation.	Future work could offer flow and progression across well-structured arguments.
<b>Upper Second</b>  <b>60 - 69%</b>  Very good work overall	Feedback	The work demonstrates very good understanding of the subject. There is evidence of wider reading which goes beyond unit contact and draws on independent research.	The work demonstrates very good analysis and evaluation of information. Well argued with appropriate amount of evidence, substantiated opinions are given.	The work demonstrates the application of knowledge to different contexts and generates a range of responses.	The structure is clear and logical showing progression of the argument. There may be some minor mistakes in presentation or referencing.
	Feedforward	Future work should demonstrate wider reading and more developed understanding.	Future work should offer more detailed analysis and criticality.	Future work should demonstrate deeper insight along with innovative responses.	Future work should demonstrate additional flow and progression, well developed sentence structure and accurate referencing.
<b>Lower Second</b>  <b>50 - 59%</b>  Good work overall	Feedback	The work demonstrates some good evidence that understanding has been enhanced through wider reading, but is still limited to basic texts.	The work demonstrates some good understanding of the subject and some analysis of the information using simple reasoning. On balance the work is descriptive.	The work demonstrates a reasonable, if limited, attempt to apply understanding to other contexts.	Structure would benefit from more accurate communication and presentation.
	Feedforward	Future work should demonstrate wide reading and more developed understanding.	Future work should contain more clearly developed arguments, backed up with appropriate references from the literature.	Future work should demonstrate a more detailed application of knowledge to other contexts.	Future work should offer a clearer structure and/or more accurate references and language use.
<b>Third Class</b>  <b>40 - 49%</b>  A basic level of work overall	Feedback	The work demonstrates a basic level of factual and conceptual understanding of the subject. Reading/research appears limited to that gained through unit materials.	The work is mainly descriptive with opinions rather than academic argument. Logical development of an argument is lacking.	The work demonstrates only a limited attempt to apply knowledge across situations and/ or limited understanding of how to do so.	The structure of the work is weak. There are mistakes in grammar or sentence structure. References are not presented in the BU referencing style.
	Feedforward	In future work further reading and research beyond the material covered in the unit materials is needed to develop knowledge and understanding.	In future work more clearly developed arguments, backed up with appropriate references from the literature are required.	In future work clearer links between theory and practice are required beyond the limited range presented here.	A clearer structure is needed, along with a more appropriate use of English. Developing skills in referencing is strongly recommended.

<b>Fail</b> <b>30-39%</b> Insufficient level of work overall	Feedback	The work shows an insufficient level of factual and conceptual understanding of the subject. There is little or no evidence of reading and research beyond unit contact.	The work is almost entirely descriptive, showing little or no evidence of analysis and unsubstantiated opinions are present.	The link between theory and practice is limited or absent.	The structure is very weak or lacking. There are many mistakes in grammar or sentence structure and the academic style is undeveloped. The references are not presented in the BU referencing style.
	Feedforward	In future work the level of factual and conceptual understanding needs to be strengthened. Further reading and research beyond unit contact is needed.	Future work needs to demonstrate less description and a greater level of analysis, backed up with the use of appropriate literature.	Future work needs to demonstrate clearer links between theory and practice.	A much clearer structure is needed, along with a more appropriate use of English. Developing skills in referencing is strongly recommended.
<b>Poor Fail</b> <b>0-29%</b> A very insufficient level of work overall	Feedback	The work is largely inaccurate and/or contains much irrelevant material. There is little or no evidence of knowledge or understanding of the subject, or of reading/research.	The work shows little or no evidence of analysis and contains unsubstantiated opinions.	The work demonstrates little or no evidence of relating theory to practice.	The work is unstructured and is written in inappropriate English. The references are presented incorrectly or are missing. The work may be incomplete or too brief.
	Feedforward	In future work, reading introductory texts will help to develop basic understanding which can then be built on.	Future work should demonstrate understanding through appropriate use of references.	Future work needs to demonstrate links between theory and practice.	A much clearer structure is needed, along with a more appropriate use of English. Developing skills in referencing is strongly recommended.