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HTU.
جامعة الحسين التقنية
Al Hussein Technical University

Assignment Brief	
Course Name	Computer Networks

This assignment brief provides the requirement for the capstone project for candidates enrolled in the National ICT Upskilling Programme. The assignment provides learners with the opportunity to present evidence of their learning in the technical, soft skills, and English language components.

The learner's work will be assessed by the instructors according to the criteria specified herein. Successful candidates will be awarded a completion certificate. Learners who do not meet the pass criteria will be awarded an attendance certificate.



Submission Format

Report (produced using MS-Word) that includes relevant diagrams, plots, justification, and discuss results for the decisions you made. The following format shall be considered when submitting the draft report or the final version:

1. The font size should be 12 point and should be in the style of Times New Roman.
2. Set line spacing to 1.5 and justify all paragraphs.
3. The report should be properly cited (using IEEE citation format¹). All sources used in the production of your report should be cited in text and listed at the end of report.
4. Ensure that all headings are consistent in terms of size and font style.
5. Use footer function in MS-Word to insert your name, course, project name, and page number on each page.
6. Use the spell check and grammar check function of MS-Word to review the use of language on your assignment.
7. The caption for a figure appears below the graphic, for a table, above. The caption should be brief and explanatory. All Figures and Tables should be numbered. Capitalize only the first letter of the first word of all headings. Notes are placed below the table.

Important Points:

- a) Carefully check the submission date and the instructions given with the assignment. Late submissions will not be accepted.
- b) Do not wait until the last minute to print or bind the assignment such an excuse will not be accepted for late submissions.
- c) The maximum number of report pages is up to 7 and minimum down to 2.
- d) If you are not able to hand in your assignment on time and have valid reasons such as illness, you may apply (in writing) for an extension subject to the program director's decision based on the tutor approval.
8. Failure to achieve at least a PASS grade will result in a FAIL.
9. Failure of submission without a valid reason will lead to automatic FAIL.

If you use any reference or other people's work or ideas in your assignment, it must be properly referenced. Otherwise, you'll be found guilty of committing plagiarism and your grade will be reduced to FAIL.

¹ <https://ieee-dataport.org/sites/default/files/analysis/27/IEEE%20Citation%20Guidelines.pdf>

Deliverables

You will work at home on this project and using your own machine to provide the following deliverables containing the expected results. You are advised to take notes during the class to help you with the assignment.

Component	Deliverable	Submission format	Deadline
Technical	Build full network between HQ and BO plus full technical report.	Packet Tracer Ver 8.2 and Word file	12 th – Jan 2023
English	Technical Report	Technical Report	
Soft Skills	Presentation	Presentation	

Learning Outcomes

Technical Skills

- Design, Implement and Document a network for HQ and Branch office to meet the company requirements shared by your manager.
- Document all the work done in LO1 as a technical report.
- Present your final solution to a committee to address the technology and the approach you decide to go with.

Language Skills

- Participants show structure and organization
- Participants show coherence and cohesion
- Participants show strong content
- Participants show grammatical accuracy
- Participants use well prepared visual aids written in English
- Participants speak clearly with proper pronunciation
- Participants use range of vocabulary

Presentation Skills



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- Speak clearly and at an understandable pace.
- Maintain good eye contact with the audience.
- Be well-rehearsed, and well prepared
- Demonstrate a limited use of filler words ("umm", "Like", etc.)
- Use body language appropriately.
- Present within time limits.
- Be able to answer questions professionally.
- Be dressed appropriately



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Assignment Brief and Guidance

Scenario:

You are a senior network Engineer at IIS Company, the company is applying new infrastructure deployments, new devices are needed to be brought for Head Quarter (HQ) site and remo site and remote they have three branches (Amman, Istanbul, and Beirut). You are requested to build a topology where you can achieve full connectivity between the clients in HQ and all branches' sites. You also asked to achieve a secure connection between the main site and the branch Amman site using VPN site-to-site connection, it is important that you don't exceed the budget for the company project.

Security measures need to be taken to consideration on your solution (ACL, Telnet, SSH and basic network device security).

Your budget should not exceed 85,000 USD for routers, switches cabling and any required expansion cards such as HWIC.



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Your duty is to:

1. Design an IP addressing scheme that meets the design requirements.
2. Configure all network devices with basic commands.
3. Secure access to the devices
4. Access all routers and switches with only SSH, and use RSA with 2048.
5. Use **(YOURNAME)** as a username and **(YOUR-FAMILY-NAME)** as the password.
6. Configure the access layer with the required VLANs and map the VLAN with the client ports.
7. Configure the trunk between switches.
8. Configure SVI Interface and native VLAN.
9. DTP to be configured from both ports per switch.
10. Use a Router on a Stick as the inter-VLAN routing technique.
11. All unused ports need to be shutdown.
12. Disable BPDU messages on all access ports.
13. Redundancy between all network hierarchical layers needs to be available.
14. EtherChannel between switches needs to be configured.
15. Use PaG-P and just one switch initiates the negotiation.
16. You are required to achieve full redundancy peer client gateway by configuring HSRP.
17. Each VLAN will have a redundant Gateway for their clients.
18. You are required to configure DHCP for each VLAN through 2 DHCP Router (Redundant to each other)
19. Only IT VLAN can access Application VLAN in HQ
20. Only IT VLAN can SSH network devices in Branch Istanbul.
21. Use OSPF as a dynamic routing protocol with Process ID 10.
22. In VPN site-to-site use GRE protocol between HQ and Branch Amman.
23. Apply Port Security on both HQ and Branch switches.
24. In port-security maximum mac address learned is 4 and learned the mac address sticky.
25. If a violation happened send a log message to the Syslog server.
26. You should gather network device traps and messages and save them to a Syslog server on both HQ and BO sites.
27. Configure NTP on your topology.
28. Apply NAT by using PAT.s
29. Deploy a WLC with one LAP for wireless clients in HQ.
30. Configure the WLC username “ADMIN” and password “Admin123”.
31. Configure one SSID and name it HQ-wireless and map it to VLAN 15.
32. User multilayer Switch in HQ for Routing between VLANs.
33. ALL clients in each branch must take IP addresses from the DHCP server.



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34. Use IPv6 as redundant IP with IPv4 in your Address design.



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Mandatory Requirements:

- High availability & redundancy.
- Restrict access using ACL (Security).
- Stick to budget.
- Scalability and easy of management.
- Full technical report including IP schema and logical schema.

Table of equipment's price:

No.	Description	Price (USD)
1	2960 Switch 24 Ports /2 GB	2500
2	3560 Multilayer Switch	3500
5	ISR4331 Router with 2 Port 1GB per port	1500
6	High Wan Interface Card	1000
7	Workstation for service (Syslog, NTP, DHCP, etc.)	600
8	WLC 3504	5000
9	Light weight AP(LAP)	300
10	Wireless adapter	50

Table of VLAN's in HQ

VLAN ID	VLANs Name	Number of Clients
10	Management	None
99	Native	None
20	Sales	5
30	Engineers	4
40	IT	3
50	Application	2
5	Wireless	1



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Table of VLAN in Branch Office (Branch Amman, Istanbul, and Beirut).

VLAN ID	VLAN Name	Number of Client
10	Mgmt.	None
99	Native	None
70	Auditing	3
80	IT	2
90	Admin	2

Technical Component Passing Requirements:

- Build full redundant topology
- Implement your IP addressing scheme.
- Creating VLANs and secure them.
- Creating DHCP and secure the Scope.
- Implement Dynamic Routing Protocol.
- Configuring EtherChannel and Port Security.
- Applying ACL and VPN.
- Gathering Syslog messages.
- Client in HQ can ping clients located in all Branches (Amman, Istanbul, and Beirut).
- Create an SSID with its interface.

Assignment Learning Outcomes and Assessment Criteria (Technical Skills)		
Pass	Merit	Distinction
LO1: Build HQ and Branch network, design IP schema and testing the connectivity.		
Implement a valid network topology and prepare a draft for required devices, understand basic component to achieve hierarchical network, understand IP and Logical schema	Prepare the topology with logical schema and IP schema, choose required devices to build the topology on both Side with full connectivity	Prepare logical schema, IP schema, Design the Topology, prepare the access methods and ensure its secure.
LO2: Apply wireless connectivity for scaling network.		
Prepare documentation for the IP address and select devices for wireless LAN.	Prepare documentation for the IP address and select devices for wireless LAN and create an open SSID.	Prepare documentation for the IP address and select devices for wireless LAN. Implement full Wireless configuration, connectivity and ensure end-device with wireless adapter.
LO3: Design VLANs and implement redundancy		
Prepare proper documentation for the VLAN topology with its name, including IP addressing and port Mapping.	Prepare a proper documentation for the VLAN topology with its name, including IP addressing and port Mapping. Create the VLANs on all HQ, Branches switches and assign VLANs on active ports. Verify connectivity between VLANs.	Prepare proper documentation for the VLAN topology with its name, cover IP addressing and port Mapping. Create the VLANs on all HQ Branches switches and assign VLANs on active ports. Verify connectivity between them. Use EtherChannel for load balancing and fault tolerance.
LO4: implement routing protocols and backup routes using public IP		
Prepare proper documentation for the WAN topology, including IP addressing and port.	Prepare proper documentation for the VLAN topology with its name, including IP addressing and port. Deploy DHCPv4 for each VLAN on all HQ and Branches routers.	Prepare a proper documentation for the VLAN topology with its name, including IP addressing and port. Deploy DHCPv4 for each VLAN on all HQ and Branches routers. Ensure connectivity between all sites by using OSPF. Integrate backup router on HQ and Branches.
LO5: Apply security measures to protect the network.		
Prepare proper documentation for the ACL rules, VLAN snooping solution. VPN tunneling.	Prepare proper documentation for the ACL rules, VLAN snooping solution. VPN tunneling.	Prepare proper documentation for the ACL rules, VLAN snooping solution. VPN tunneling. Apply the ACLs as

	Apply the ACLs as specified. Implement port security on all HQ and Branches switches.	specified. Implement full Layer 2 security and create tunneling between HQ and Branches routers.
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LO6: comprehend scaling network and analyse upcoming issues.

Prepare proper document describing packet changes from an end-device in HQ to an end-device in Istanbul in each stage (every hop).	Prepare a proper document describing packet changes from an end-device in HQ to an end-device in Istanbul in each stage (every hop). Identify the issues can occur to the packet in each stage.	Prepare a proper document describing packet changes from an end-device in HQ to an end-device in Istanbul in each stage (every hop). Identify the issues can occur to the packet in each stage. Describe troubleshooting steps and how to find the issue for each problem.
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Assignment Learning Outcomes and Assessment Criteria (Writing Skills-English)		
Pass	Merit	Distinction
LO1: Participants show structure and organization		
Simple composition with evidence of a beginning and an end. Organizational plan is evident with paragraphing, introduction and conclusion. Contains a weak thesis statement in the introductory paragraph. Contains a conclusion which does not re-state thesis but does not give suggestions. Shows some awareness of audience or purpose. Task fulfillment adequate.	Complete composition with evidence of a beginning and an end. Shows evidence of a clear introductory paragraph and a concluding paragraph. Contains a good thesis statement in the introductory paragraph. Conclusion re-states thesis and gives simple suggestions. Shows good awareness of audience and purpose. Task fulfillment satisfactory.	An effective, well-developed composition with a strong and clear introduction and conclusion. Organizational plan is logical and focused. Contains a strong thesis statement in the introductory paragraph. Conclusion re-states thesis and supplies strong suggestions. Clearly shows a strong awareness of audience and purpose. Task fulfillment exemplary.
LO2: Participants show coherence and cohesion		
Contains a sense of direction but may lack focus. May not progress in a logical order. Some ideas or evidence may be lacking / inappropriate, and more specific supporting ideas may seem desirable. Some transitional devices are used but may not be very effective.	Contains a sense of direction. Progresses in a logical order. Ideas or evidence is appropriate and supporting ideas are suitable. Some transitional devices are used. Task fulfillment satisfactory.	Contains a strong sense of direction and is focused on the topic. Progresses in a logical order. Accurate and effective use of transitional devices / linking words. Task fulfillment exemplary.

Task fulfillment adequate.		
LO3: Participants show strong content		
<p>Attempts to address the topic but gives no relevant supporting details.</p> <p>Message not clearly communicated to the target reader. Point of view not clear or lacks relevance.</p> <p>Uses imprecise language. Uses only basic / limited vocabulary repetitively, or uses vocabulary which may be inappropriate for the task.</p> <p>Task fulfillment adequate.</p>	<p>Addresses the topic but relies on generalities rather than specifics.</p> <p>A point of view may be evident, but arguments may lack clarity, relevance or supporting details.</p> <p>May use imprecise language, but uses an adequate range of vocabulary for the task.</p> <p>Attempts to use less common vocabulary but with some inaccuracy.</p> <p>Task fulfillment satisfactory.</p>	<p>Addresses the topic using specific supporting details, and examples. Clear point of view evident with relevant ideas and supporting details.</p> <p>Uses a wide range of vocabulary fluently and naturally to convey meaning, and to successfully complete the writing task.</p> <p>Task fulfillment exemplary.</p>

LO4: Participants show grammatical range and accuracy		
<p>Contains sentences that are generally clear but may lack variety and complexity.</p> <p>Contains errors in grammar / usage / punctuation / capitalization, and/or spelling that may be distracting to the reader but does not interfere with meaning.</p> <p>Task fulfillment adequate.</p>	<p>Contains sentences that are generally clear but may lack variety and complexity.</p> <p>Contains errors in grammar / usage / punctuation / capitalization, and/or spelling that are adequate but do not interfere with meaning.</p> <p>Task fulfillment satisfactory.</p>	<p>Contains sentences that are clear and show variety in structure, both simple and complex.</p> <p>Contains few or no errors in grammar/usage / punctuation / capitalization, and/or spelling.</p> <p>Task fulfillment exemplary.</p>

Assignment Learning Outcomes and Assessment Criteria (Presentation-English)		
Pass	Merit	Distinction
LO1: Use well prepared visual aids written in English		
Visual aids are adequately prepared, informative, effective but distracting. Some grammatical or spelling errors that hamper meaning.	Visual aids are well prepared, informative, effective. Minor grammatical and spelling errors are a little distracting.	Visual aids are well prepared, informative, effective, and not distracting. No grammatical or spelling errors.
LO2: Participants use good language skills		
Good language skills and pronunciation are used with some hesitation that may interfere slightly with communication. Speaker uses a low or monotonous voice tone.	Good language skills and pronunciation are used with little hesitation. It does not interfere greatly with communication. Speaker uses an adequately animated voice tone.	Excellent language skills and pronunciation are used with no hesitation and clear communication. Speaker uses a clear, audible voice.
LO3: Participants use suitable variety of content		

Speaker uses limited vocabulary and expressions with some grammatical errors.	Speaker uses adequate vocabulary and expressions with only occasional grammatical errors.	Speaker uses a variety of vocabulary and expressions with minimal errors.
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Assignment Learning Outcomes and Assessment Criteria (Presentation-Soft skills)		
Pass	Merit	Distinction
Overall Image (10%)		
The participant did not finish the presentation on-time, showed minimum confidence and dressed adequately	The participant slightly exceeded the time, has shown adequate confidence and has dressed neatly	The participant finishes the presentation on time, has shown high level of confidence and is smartly dressed
Visual Aides (15%)		
The visual aid has some spelling & formatting mistakes; however, it is still legible and understandable. An acceptable level of visual elements is used	The presentation has very few spelling and formatting mistakes. The participants use a multiple visual element to support his/her talk.	The presentation has no spelling or formatting mistakes, is neatly prepared and contains sufficient level of visual elements
Presenting Skills (15%)		
Participant's tone of voice is on an acceptable level. The pace of the presentation is adequate. Acceptable level of eye contact is maintained with the audience with acceptable level of hands and body movement & posture. The participant should show an adequate level of preparedness	Participant's tone of voice is on an average level. The pace of the presentation is acceptable. Good level of eye contact is maintained with the audience with good level of hands and body movement & posture. The participant should show a good level of preparedness	Participant's tone of voice is on very good. The pace of the presentation is very good. Excellent level of eye contact is maintained with the audience with an excellent level of hands and body movement & posture. The participant should be very well prepared for the presentation