Whitireia NEW ZEALAND

WelTec
Te Whare Wānanga o te Awakairangi

Te Pūkenga

- School of Innovation, Design & Technology -

IT5506 Bachelor of Information Technology
IT5487 Diploma in Information Systems
(Level 5)

Skills Based Assessment

Practical Lab 2

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Score: _____ **/ 100 points**

Details
Due Date: **24 October 2023**
This Lab is worth 30**%** of the over-all course grade

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Describe network protocol models and devices to explain the layers of communications in data networks.
2. Design and calculate IP addresses and subnet masks for both IPv4 and IPv6 for given simple networks, using IPv4 and IPv6.
3. Explain fundamental Ethernet concepts.
4. Describe and build a simple Ethernet network using routers and switches employing basic cabling and network design.
5. Identify and perform basic router and switch configuration and verification.

Assessment Tasks

There are four tasks for this assessment

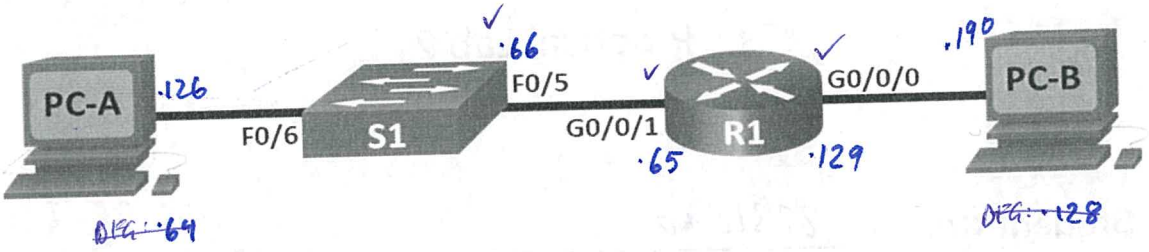
Task 1: Calculate the IP Addressing Scheme

Task 2 Connect and Initialize Network Devices

Task 3 Configure and Document Network Device Settings

Task 4: Connectivity Testing and Configuration Verification

Network Topology Diagram



Scenario

In this Skills-based Assessment (SBA) you will be building a small LAN consisting of a single router, a switch and 2 computers as shown in the network topology diagram. The network IP address will need to be subnetted and the network devices configured with the new addressing scheme.

You have been assigned the IPv6 address of **2023:5506:5487::/64**

Ask your tutor for an IPv4 address

192.168.11.0 /24

Part One: Calculate the IP Addressing Scheme — 29 marks

Based on the IPv4 address given to you by your tutor and the IPv6 address of **2023:5506:5487::/64** create the **4 subnets** and calculate the range of addresses that can be used in each subnet.

Note: When calculating the IPv6 hosts addresses you must match the IPv4 host address portion used and convert to hexadecimal numbers, for example if the IPv4 host portion of the address is **63** then the IPv6 host portion of the address will be **3F**

Step 1: Calculate the new IPv4 subnet mask — 5 marks

Calculate the new subnet mask to allow for **four (4) new equal sized** subnetted networks. (1 mark per correct answer)

a. Complete the subnet mask addressing table.

IPv4 Subnet Mask Calculations	Answer
Number of subnet host bits borrowed to create the new subnet mask	2
New IPv4 subnet mask (binary)	11111111.11111111.11111111.11000000
New IPv4 subnet mask (decimal)	255.255.255.192
Maximum number of subnets	4 subnets
Maximum number of **usable** host IP addresses for each subnet	62 usable addresses

Step 2: Calculate individual subnet range of addresses — 16 marks

Calculate each subnets network address, first and last usable host addresses and the broadcast address. (0.5 marks for each correct address)

a. Complete the subnet addressing table

Subnet addressing ranges	IPv4 address	IPv6 address	
Subnet zero network address	192.168.11.0	2023:5506:5487:0::0	164
Subnet zero first host address	192.168.11.1	2023:5506:5487:0::1	164
Subnet zero last host address	192.168.11.62	2023:5506:5487:0::3E	164
Subnet zero broadcast address	192.168.11.63	2023:5506:5487:0::3F	164
Subnet one network address	192.168.11.64	2023:5506:5487:1::40	164
Subnet one first host address	192.168.11.65	2023:5506:5487:1::41	164
Subnet one last host address	192.168.11.126	2023:5506:5487:1::7E	164
Subnet one broadcast address	192.168.11.127	2023:5506:5487:1::7F	164

Subnet two network address	192.168.11.128	2023:5506:5487:2::80	164
Subnet two first host address	192.168.11.129	2023:5506:5487:2::81	164
Subnet two last host address	192.168.11.190	2023:5506:5487:2::BE	164
Subnet two broadcast address	192.168.11.191	2023:5506:5487:2::BF	164
Subnet three network address	192.168.11.192	2023:5506:5487:3::C0	164
Subnet three first host address	192.168.11.193	2023:5506:5487:3::C1	164
Subnet three last host address	192.168.11.254	2023:5506:5487:3::FE	164
Subnet three broadcast address	192.168.11.255	2023:5506:5487:3::FF	164

Step 3: Allocate addresses to network devices **8 marks**

Note: For this assessment you will be using the addresses of **subnet (1) one** and **subnet (2) two**. Subnets (0) zero and subnet (4) four addresses are reserved for future use

IP addresses should be allocated based on the following criteria.

- Subnet two will be assigned to the router G0/0 interface and connected devices
- Subnet one will be assigned to the router G0/1 interface and connected devices
- Router interfaces must be allocated the first IPv4 address of the appropriate subnet
- Router interface IPv6 GUA addresses must match the IPv4 address in hex.
- Router interfaces IPv6 LLA addresses should use the FE80::1 address
- Switch VLAN 1 interface should be configured with an IPv4 address only and must use the second host address of subnet one
- Computers should be allocated the last IPv4 address of the appropriate subnet
- Computer IPv6 GUA addresses should match the IPv4 host address in hex
- Computer IPv6 LLA addresses are automatically generated
- Computers must be configured with IPv6 and IPv4 dns server address and default gateway addresses

Note: Addresses for computer IPv6 default gateway, the DNS server IPv4 and IPv6 addresses have been supplied.

Complete the device allocation addressing table. (0.5 marks for each correct address)

PC-A	**IP Address**	**Default Gateway**
PC-A ipv4 address	192.168.11.126	192.168.11.65
PC-A ipv6 GUA address	2023:5506:5487:1:7E/64	**FE80::1**
PC-A ipv6 LLA address		
PC-A DNS IPV4 server address	**1.1.1.1**	
PC-A DNS IPV6 server address	**2001:4860:4860::8888**	
PC-B	**IP Address**	**Default Gateway**
PC-B ipv4 address	192.168.11.190	192.168.11.129

PC-B ipv6 GUA address	2023:5506:5487:2::BE/64	FE80::1
PC-B ipv6 LLA address		
PC-B DNS server ipv4 address	1.1.1.1	
PC-B DNS server ipv6 address	2001:4860:4860::8888	
S1 Switch	**IP Address**	
S1 VLAN 1 ipv4 address	192.168.11.66	
S1 IPv4 default gateway address	192.168.11.64	
R1 Router	**IP Address**	
Interface G0/0 ipv4 address	192.168.11.129	
Interface G0/0 ipv6 GUA address	2023:5506:5487:2::81/64	
Interface G0/0 ipv6 LLA address	FE80::2:1	
Interface G0/1 ipv4 address	192.168.11.65	
Interface G0/1 ipv6 GUA address	2023:5506:5487:1::40/64	
Interface G0/1 ipv6 LLA address	FE80::1:1	
Note. Check your routers interface labels to see the type of interfaces it has. Some Routers will have a G0/0 and G0/1 Gigabit Ethernet interfaces, others may have F0/0 and F0/1 Fast Ethernet interfaces.		

Part 2 Connect and Initialize Network Devices — 17 marks

Connect devices together and remove any previous settings by erasing the router and switch startup-config files and the switches vlan.dat file. Document router and switch model, hardware specification and iOS versions, following instructions below

Step 1: Connect the devices together — 10 marks

Based on the topology diagram

a. Using the appropriate network cables connect the network devices together using the ports and interfaces identified in the topology diagram

Step 2: Reset router iOS to default setting — 3 marks

Power on the router, connect the console cable between the router and a computer. (1 mark for each command issued)

a. Start a Putty terminal session
b. Access the Router iOS
c. Issue the command to **erase the startup-config file** #erase startup-config
d. Issue the command to **reload the router iOS file** #reload
e. Issue the command to **show startup-config file** settings #show startup-config

Step 3: Reset switch iOS to default setting — 4 marks

Power on the switch, connect the console cable between the switch and a computer. (1 mark for each command issued)

a. Start a Putty terminal session
b. Access the Switch iOS
c. Issue the command to **erase the startup-config file** # erase startup-config
d. Issue the command to **reload the router iOS file** # reload
e. Issue the command to **delete the vlan.dat file** # delete vlan.dat
f. Issue the command to **show the startup-config file** settings # show startup-config EXEC
g. Issue the **show startup-config** command # show startup-config

Call your tutor over to confirm router and switches settings have been erased.

Tutor verification:

Part 3 Configure and Document Network Device Settings 38 marks

Step 1: Configure Computer address settings — 6 marks

Note: Windows11 will automatically configure an IPv6 LLA address. Insert this address in the tables below (0.5 marks per correct address)

a. Configure PC-A and PC-B IPv4 and IPv6 addresses

Computer Addresses	PC-A	PC-B
IPv4 address	192.168.11.126	192.168.11.190
IPv4 subnet mask	255.255.255.192	255.255.255.192
IPv4 default gateway	2023:5506:5487:1:7E/64	2023:5506:5487:2::BE/64
IPv6 GUA address	192.168.11.65	192.168.11.128
IPv6 LLA address	FE80::7080:3738:2c29:94f%6	FE80::fe80::8083:a92a:6079:d67f%8
IPv6 default gateway	FE80::1	FE80::1

Step 2: Configure Router settings — 16 marks

a. Complete the configuration tasks for the router:

Router Configuration Settings	Marks
Enable IPv6 unicast routing Note: This **MUST BE THE FIRST** command inputted to enable IPv6 routing Router(config) # ipv6 unicast-routing	1
Set Router hostname - **R1** Router(config) # hostname R1	1
Configure encrypted privileged EXEC mode password - **itsasecret** R1(config) # enable secret itsasecret	1
Configure line console local access settings • set password - **letmein** • allow logins R1(config) # line console 0 (config-line) # password letmein (config-line) # login (config-line) # exit	2
Configure line vty remote access settings • set password - **cisco** (config) # line vty 0 15 (config-line) # password cisco # login	2

• allow logins #login	
Encrypt all passwords (config)# service password-encryption	1
Configure login security warning message - **"Authorized Access Only"** #banner motd	1
Configure Interface G0/0. # interface g0/0 (config-if)# • description – "**Subnet 2 LAN**" • ipv4 address 192.168.11.129 • ipv6 gua address 2023:5506:5487:2::81/64 • ipv6 lla address FE80::2:1 link-local • activate the interface No shutdown	3
Configure Interface G0/1 #interface g0/1 • description – "**Subnet 1 LAN**" (config-if)# • ipv4 address 192.168.11.65 • ipv6 gua address 2023:5506:5487:1::40/64 • ipv6 lla address FE80::1:1 link-local • activate the interface No shutdown	3
Save the configuration file to NVRAM. Cop r st	1

Step 3: Configure Switch settings

a. Complete the configuration tasks for the switch: **12 marks**

Switch Configuration Settings	**Marks**
Set Router hostname - S1 Switch (config)#hostname S1	1
Encrypted privileged EXEC mode password - **itsasecret** (config)#enable secret itsasecret	1
Configure line console local access settings (config)#line console 0 • set password - **letmein** (config-line)# password letmein • allow login (config-line)# login # exit	2
Configure line vty remote access settings (config)# line vty 0 15 • set password - **cisco** (config-line)# password cisco • allow login (config-line)# login #exit	2
Encrypt all passwords (config)# service password-encryption	1
Configure login security warning message - **"Authorized Access Only"** (config) #banner motd	1
Configure IPv4 default gateway address (config)# ip default-gateway 192.168.11.65	1
Configure VLAN 1 interface settings S1 (config)# interface vlan 1 • ipv4 address S1 (config-if)# ip address 192.168.11.66 • activate interface # no shutdown # exit	2
Save the configuration file to NVRAM S1 # Cop r st	1

Step 4: Document router specifications **3 marks**

Issue the command to view the router model, the iOS version, and Flash memory hardware specifications. (0.5 marks per correct answer) #show version #show flash

Router Specifications	
Router manufacturer	Cisco IOS Software
Router model	C2900
IOS image file name and version	Version 15.1(4)M5 (C2900 - universal) #flash0:c2900-universal
Total flash memory	25088K bytes
Total RAM memory	450560K/73728K bytes
Total NVRAM memory	255K bytes

Step 5: Document switch specifications **3 marks**

Issue the command to view the switches model, the iOS version, Flash memory hardware specifications. (0.5 marks per correct answer) #show processes memory

Switch Specifications	#show version #show flash
Switch manufacturer	Cisco IOS Software
Switch model	C2960
IOS image file name and version	Version 12.2(55)SE7
Total flash memory	32514046 bytes
Total RAM memory	65536K bytes of memory
Total NVRAM memory	64K bytes

Part 4: Connectivity Testing and Verification **14 marks**

Call your tutor over to verify successful connectivity tests and to review the router, switch and computer configuration settings. **14 marks**

Step 1: Conduct connectivity testing

From each PC test connectivity to all other IP addresses used. (1 mark for each successful connection test result)

From	To	IPv4 results	IPv6 results
PC-A	S1 VLAN 1 .66	✓ ✓	N/A
	Router G0/1 .65	✓ ✓	
	Router G0/0 .129	✓ ✓	

	PC-B .190	✓✓	
PC-B	Router G0/0 .129	✓✓	
	Router G0/1 .65	✓✓	
	S1 VLAN 1 .66	✓✓	N/A
	PC-A .126	✓✓	

Step 2: Tutor verification

Call tutor over to verify router, switch and computer configurations settings and to verify connectivity test results

PC config	Router config	Switch config	Connectivity test

Step 3: Reset configurations to default settings

a. Reset the computer IP address settings to automatic
b. Reset the router IOS to the default settings
c. Reset the switch IOS to the default settings
d. Power off devices and disconnect all cables
e. Plug class network cable back into computer NIC
f. Return cables, router and switch to their shelves

Assessment Complete. Hand this into your tutor.

Marking Schedule

	Task	Marking Criteria	Total
Part One			
Step 1	Calculate the new IPv4 subnet mask	1 mark for each correct answer	5
Step 2	Calculate individual subnet range of addresses	0.5 marks for each correct address	16
Step 3			8
		Total	**29**
Part Two			
Step 1	Connect the devices together	1 mark for correct cable used and for correct port interface	10
Step 2	Reset router iOS to default setting	1 mark for putty, erase, reload	3
Step 3	Reset switch iOS to default setting	1 mark for putty, erase, delete reload	4
		Total	**17**
Part Three			
Step 1	Configure PC settings	0.5 marks per correct setting	6
Step 2	Configure router settings	As shown on configuration table instructions	16
Step 3	Configure switch settings	As shown on configuration table instructions	12
Step 4	Document router specs	0.5 marks per correct answer	3
Step 5	Document switch specs	0.5 marks per correct answer	3
		Total	**40**
Part Four			
Step 1	Connectivity test	1 mark for each successful result	14
Step 2	Reset, power off and pack away		0
		Total	**14**
		Overall Total	**100**