



Faculty of Computer Science and Information Technology

## **BIC21303: COMPUTER NETWORKING**

### **FINAL REPORT Group 13**

### **The Implementation of Local Area Network & Campus Network**

LECTURER'S NAME: Prof. Madya Dr. Sapi'ee Bin Jamel

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## TABLE OF CONTENT

<b>PART 1.....</b>	<b>1</b>
PROJECT TITLE.....	1
COMPANY PROFILE.....	1
PROJECT SCOPE.....	5
NETWORK REQUIREMENT.....	5
NETWORK PLANNING.....	7
IP NETWORK DESIGN TABLE.....	8
PHYSICAL NETWORK DESIGN.....	9
LOGICAL NETWORK DESIGN.....	10
NETWORK CONFIGURATION.....	10
NETWORK TESTING.....	14
PROJECT DELIVERABLE.....	15
PROJECT COSTING.....	16
PAYMENT TERM AND CONDITION.....	17
WARRANTY PERIOD.....	18
 <b>PART 2.....</b>	 <b>20</b>
PROJECT TITLE.....	20
COMPANY PROFILE.....	20
PROJECT SCOPE.....	24
CAMPUS DIAGRAM.....	25
NETWORK REQUIREMENT.....	26
NETWORK PLANNING.....	28
IP NETWORK DESIGN TABLE.....	29
PHYSICAL NETWORK DESIGN.....	30
LOGICAL NETWORK DESIGN.....	31
NETWORK CONFIGURATION.....	31
NETWORK TESTING.....	37
PROJECT DELIVERABLE.....	39
PROJECT COSTING.....	40
PAYMENT TERM AND CONDITION.....	41
WARRANTY PERIOD.....	42

# **PART 1**

## **IMPLEMENTATION OF LOCAL AREA NETWORK (LAN)**

### **SMALL BUSINESS NETWORK**

#### **1. COMPANY PROFILE**

ANAA Sdn Bhd is built on 18 March 2011 and it is located in Johor Bahru, Malaysia. This company has involved actively in many major projects. The scope for the project involved is usually related to the work of communication system, transmission system and electrical system. ANAA Sdn Bhd can also provide the fiber optic cabling and data cabling for the projects as this company has gained valuable technical expertise since it was established.

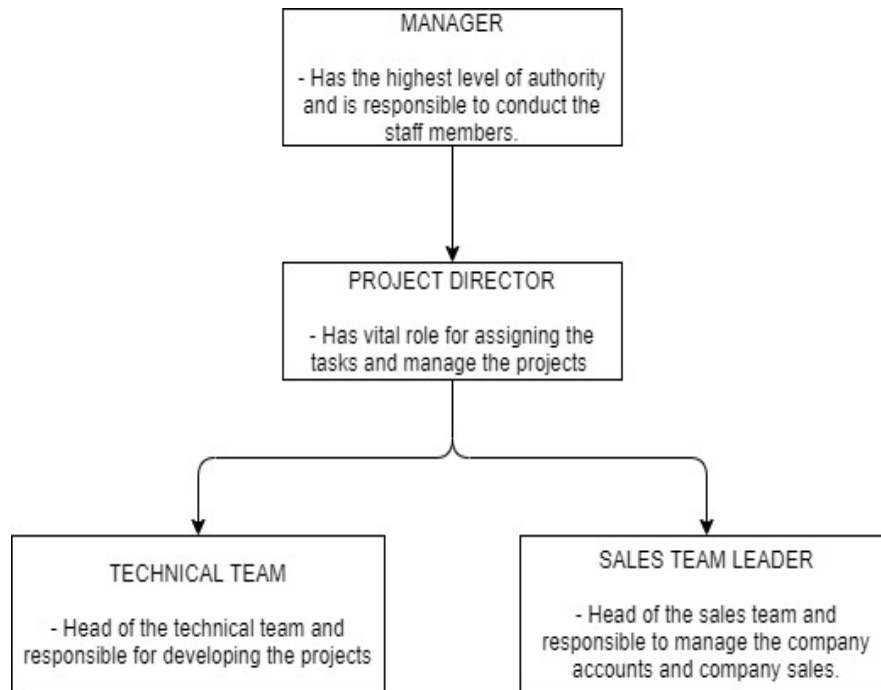
For any inquiries or further information about our company, please visit our website: <https://www.anaacompany.com.my/> or easily contact ANAA Sdn Bhd at 03-777878976.

#### **COMPANY MISSION**

- Always deliver good service and have good relationship with our clients in order to fulfill their requirements.
- The company can be well-known in communication, transmission and electrical problems to the crowd.
- Always present well trained team for the guidelines to the project from the initial phase to the end.
- Provide the best quality and offer affordable price for clients.

## TEAM ORGANIZATION

The team is composed into a specialized areas which are software, communication, cabling and technical services. All of the team is represented by a highly skilled employee in the company to solve all the clients' problem.

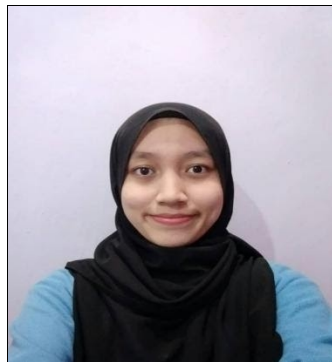


### Team Member 1



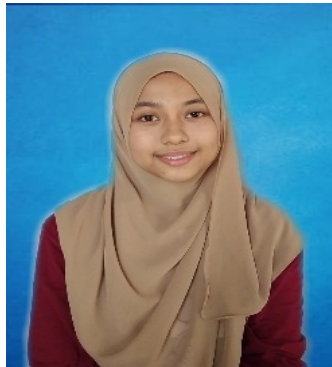
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## **2. PROJECT SCOPE**

A small business network has to be designed for an organization. The organization has occasional guest users (Max 10) visiting the office. There are a total of 50 users in the organization. The estimated size of the small business is 150-250 square feet. A FTP server is also available for sharing files. Access control list are being used for restricting access between the guest and LAN network. Router proposed for the guest and LAN network. Setting up a network for small business can be tricky work -- there are a lot of parts involved, and every computer on the network has to have the correct equipment in order to transfer files and access the server. The firewall filters the traffic transmitted through the cable, which then connects to a switch. All your network devices then gain access to the internet by connecting to that switch.

## **3. NETWORK REQUIREMENT**

### **● LAN**

The LAN components consist of LAN structure and network foundation technologies providing baseline routing and switching guidelines. The LAN design interconnects several other components such as the endpoints, data center, WAN and other infrastructure to support a foundation on which the mobility, security and data integrity of the networks. Single LAN with one or two servers, using off-the-shelf components. A small office LAN usually can be managed by one person with only moderate technical knowledge and experience.

### **● Star Topology**

There is a central node, treated as a server that all nodes are connected to and communicate through it. Not Secure but fast. Star topology is the most popular network topology in today's business. It consists of nodes connected to a central switch or a hub. The network for the small office must allow members of the organization to share information, as well as printers and other peripherals.

## ● **Hardware**

Many of the vendors have product lines that specifically focus on small business customers, such as the OfficeConnect series from 3Com, most of the Netgear products from Bay Networks and Intel's InBusiness products. Prices for network equipment vary greatly. Here are approximate street prices for some of the items that need to build a small office network:

1. Use switched Ethernet to segment the network or deliver faster performance to the desktop.
2. Use 40 Dell Optiplex 980 Desktop PC with New 30 inch LED Monitor as end device.
3. Switch 48port - 1000Mbps
4. Switch 16port -1000Mbps
5. DSL Router with firewall features
6. LAN cables- UTP CAT6 for 40 connected end user
7. RJ45 CAT6 Wall Flat Faceplate Ethernet Network Socket
8. Lenovo ThinkServer TS150
9. Patch Panel
10. Straight-through cable for connection between switch and router.
11. D-link N300 Wireless Access Point
12. Yellow Ethernet cable

## ● **Software**

1. Microsoft Windows NT Server .
2. Windows Operating System built-in the desktop computers.



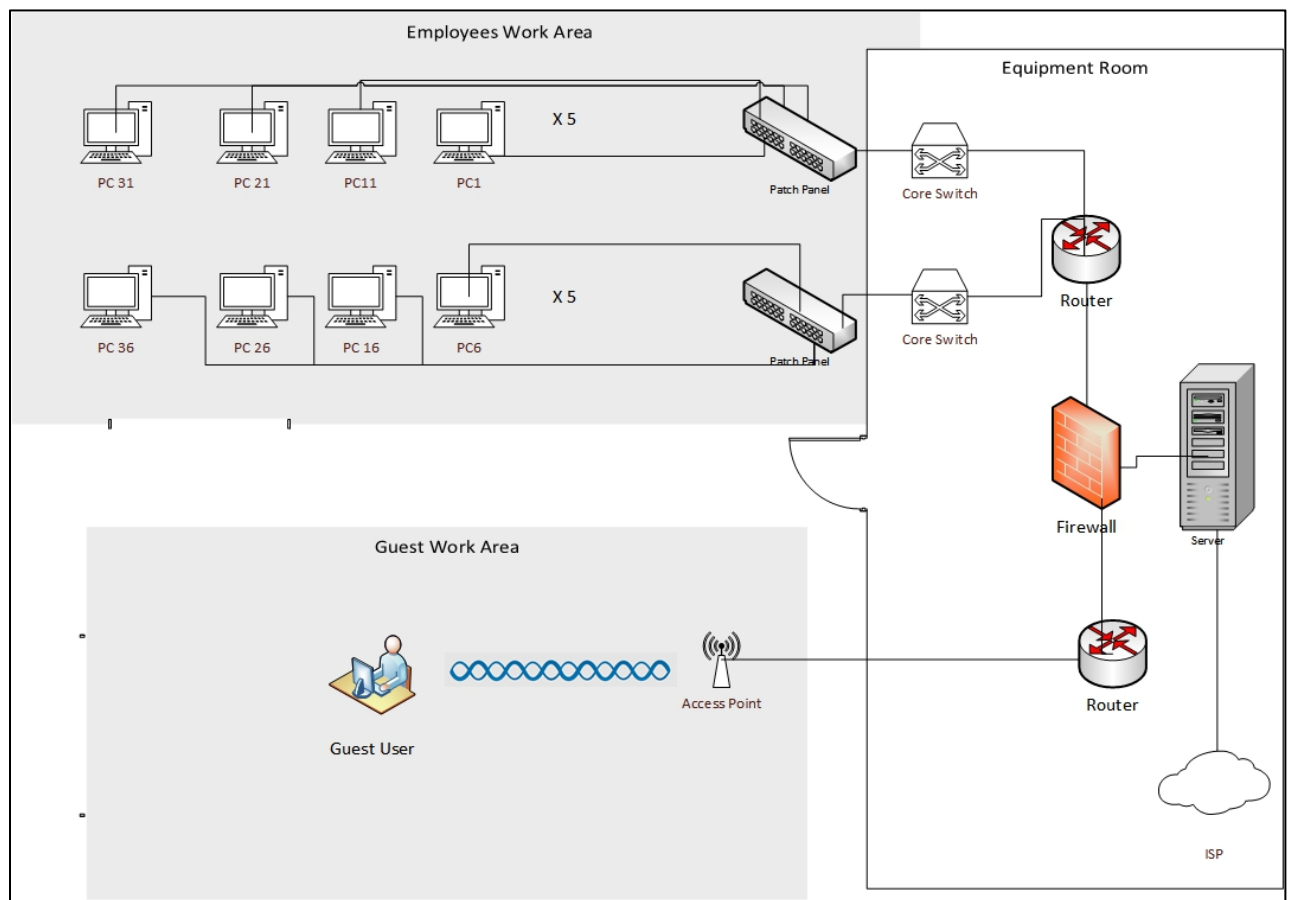
#### 4. NETWORK PLANNING

TASK	NAME
- Logical Network Design	Nafsiah Binti Ahmad
- Network configuration - Network Testing and verification procedure	Nurulain Farhana Binti Yasin
- Network requirement - Physical Network Design	Nuraini Izzati Binti Ghazali
- IP Network design table - Bill of material	Nur Amelia Binti Ahmad Zakaria

## 5. IP NETWORK DESIGN TABLE

GIVEN IP ADDRESS	SUBNET ADDRESS	SUBNET MASK	NO. OF HOST SUPPORT ED	NO. OF HOST NEEDED	IP RANGE		BROADCAST ADDRESS	GATEWAY ADDRESS	DEPARTMENT
					FIRST IP	LAST IP			
200.130.130.0	200.130.130.0	255.255.255.224 /27	30	20	200.130.130.1	200.130.130.30	200.130.130.31	200.130.130.1	LAN(STAFF) 1
	200.130.130.32	255.255.255.224 /27	30	20	200.130.130.33	200.130.130.62	200.130.130.63	200.130.130.33	LAN(STAFF) 2
	200.130.130.64	255.255.255.240 /28	14	10	200.130.130.65	200.130.130.78	200.130.130.79	200.130.130.65	GUEST
	200.130.130.80	255.255.255.252 /30	2	1	200.130.130.81	200.130.130.82	200.130.130.83	200.130.130.81	FTP SERVER

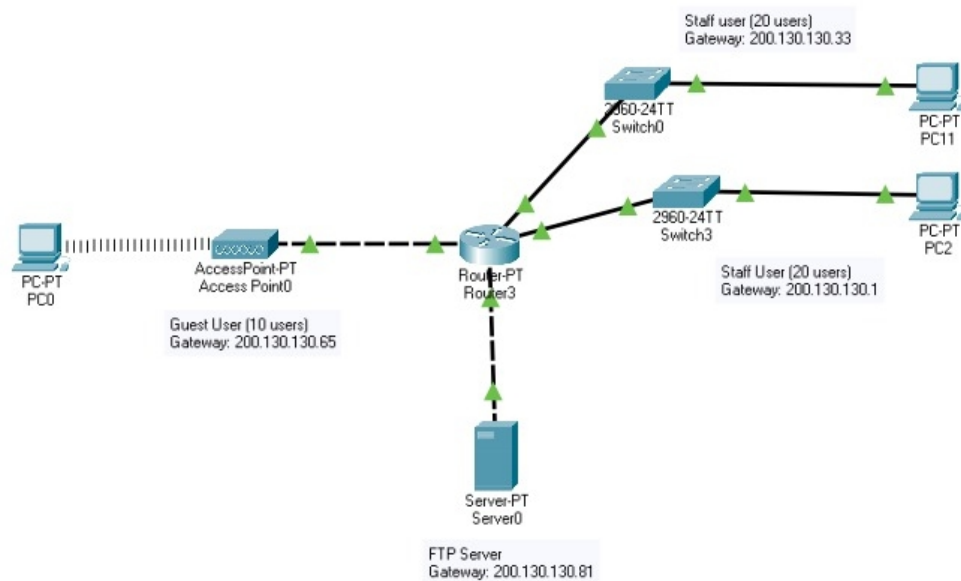
## 6. PHYSICAL NETWORK DESIGN



Small Business Floor Plan

## 7. LOGICAL NETWORK DESIGN

---



## 8. NETWORK CONFIGURATION

### NETWORK CONFIGURATION (User / Staff, 20 users)

```
Switch1>enable
Switch1#configure terminal
Switch1(config)#interface vlan1
Switch1(config-if)#ip address 200.130.130.1
255.255.255.224
Switch1(config-if)#no shutdown
Switch1(config-if)#exit
Switch1(config)#exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the switch.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for VLAN1 interface on the switch.
- Step 4 is to set up the IP address and subnet mask for the VLAN1 interface.
- Step 5 is to enable the VLAN1 interface change its state from administratively down to administratively up.

```

Router> enable
Router# configure terminal
Router(config)# interface FastEthernet 0/0
Router(config-if)# ip address 200.130.130.1
255.255.255.224
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# exit

```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for a FastEthernet interface on the router that connect with the switch port.
- Step 4 is to set up the IP address and subnet mask for the FastEthernet interface.
- Step 5 is to enable the FastEthernet 0/0 interface change its state from administratively down to administratively up.

#### **NETWORK CONFIGURATION (User / Staff, 20 users)**

```

Switch2>enable
Switch2#configure terminal
Switch2 (config)#interface vlan1
Switch2 (config-if)#ip address 200.130.130.33
255.255.255.224
Switch2 (config-if)#no shutdown
Switch2 (config-if)#exit
Switch2 (config)#exit

```

- In step 1, it will allow us to enter the Privileged EXEC in the switch.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for VLAN1 interface on the switch.
- Step 4 is to set up the IP address and subnet mask for the VLAN1 interface.
- Step 5 is to enable the VLAN1 interface change its state from administratively down to administratively up.

```

Router> enable
Router# configure terminal
Router(config)# interface FastEthernet 6/0
Router(config-if)# ip address 200.130.130.33
255.255.255.224
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# exit

```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for a FastEthernet interface on the router that connect with the switch port.
- Step 4 is to set up the IP address and subnet mask for the FastEthernet interface.
- Step 5 is to enable the FastEthernet 6/0 interface change its state from administratively down to administratively up.

#### **NETWORK CONFIGURATION (Guest Users, 10 users)**

```
Router> enable
Router# configure terminal
Router(config)# interface FastEthernet 5/0
Router(config-if)# ip address 200.130.130.65
255.255.255.240
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for a FastEthernet interface on the router that connect with access point.
- Step 4 is to set up the IP address and subnet mask for the FastEthernet interface.
- Step 5 is to enable the FastEthernet 5/0 interface change its state from administratively down to administratively up.

#### **NETWORK CONFIGURATION (FTP Server)**

```
Router> enable
Router# configure terminal
Router(config)# interface FastEthernet 1/0
Router(config-if)# ip address 200.130.130.81
255.255.255.252
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for a FastEthernet interface on the router that connect with the server port
- Step 4 is to set up the IP address and subnet mask for the FastEthernet interface.

- Step 5 is to enable the FastEthernet 1/0 interface change its state from administratively down to administratively up.

## ACL CONFIGURATION

```
Router> enable
Router# configure terminal
Router(config)#access-list 1 deny host 200.130.130.66
Router(config)#exit
Router#configure terminal
Router(config)#int FastEthernet6/0
Router(config-if)#ip access-group 1 out
Router(config-if)#exit
Router(config)#int FastEthernet0/0
Router(config-if)#ip access-group 1 out
Router(config-if)#
```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to deny all IP traffic from the 200.130.130.65/28 (Guest network) to the 200.130.130.1/26 network (LAN network).
- On the 4<sup>th</sup> line, the command will enter the Privileged EXEC in the router.
- Line 5 will allow us to enter the global configuration mode back.
- On the 6<sup>th</sup> line, we will enter the configuration mode for a FastEthernet interface on the router
- The 7<sup>th</sup> line applies the ACL as outbound on the LAN interface IP address of the router which is 200.130.130.1
- The 8<sup>th</sup> line will enter the configuration mode for a FastEthernet 0/0 interface on the router.
- The 9<sup>th</sup> line applies the ACL as outbound on the LAN interface IP address of the router which is 200.130.130.33

## 9. NETWORK TESTING AND VERIFICATION PROCEDURE

### i) Ping FTP connection from the guest PC

- Open the guest PC. Click on the Desktop tab and go to the command prompt.
- Ping with the FTP IP address.
- The connection should be successful

```
C:\>ping 200.130.130.82

Pinging 200.130.130.82 with 32 bytes of data:

Reply from 200.130.130.82: bytes=32 time=38ms TTL=127
Reply from 200.130.130.82: bytes=32 time=39ms TTL=127
Reply from 200.130.130.82: bytes=32 time=30ms TTL=127
Reply from 200.130.130.82: bytes=32 time=27ms TTL=127

Ping statistics for 200.130.130.82:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 27ms, Maximum = 39ms, Average = 33ms

C:\>
```

### ii) Ping a system on one of the LAN network from the guest PC

- Click one of the PC on the guest network.
- Open the desktop tab and click on the command prompt.
- Ping with IP address from the system on the LAN network
- The ping should not be successful.

```
C:\>ping 200.130.130.34

Pinging 200.130.130.34 with 32 bytes of data:

Reply from 200.130.130.65: Destination host unreachable.
Reply from 200.130.130.65: Destination host unreachable.
Reply from 200.130.130.65: Destination host unreachable.
Reply from 200.130.130.65: Destination host unreachable.

Ping statistics for 200.130.130.34:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```



## 10. PROJECT DELIVERABLE

ANAA Contract Sdn Bhd  
12, Jalan University ,  
Taman University,  
Johor.

## INVOICE

XYZ Organization Sdn Bhd,  
No. 99 Jalan Raja Chulan,  
50200 Kuala Lumpur.

**Invoice** #00000001  
**Invoice Date** 05/05/2021  
**Due Date** 05/05/2021

ITEM	DESCRIPTION	UNIT PRICE	QUANTITY	AMOUNT
Product	Dell Optiplex 980 Desktop PC with New 30 inch LED Monitor	RM4,600	40	RM 184,000
Product	Switch TP-link TL-SG1048 48-Port Gigabit Cat6 - 1000Mbps	RM 1,100	1	RM 1,100
Product	Switch TP-LINK TL-SG1016D 16 PORT GIGABIT-1000Mbps	RM 349	1	RM 349
Product	Router with firewall features D-link DSR-250N	RM 1,150	1	RM 1,150
Product	Cable UTP Cat6-PROLINK CAT6 UTP LAN	RM250	40	RM 10,000
Product	Hellerman Tyton P108-48-MOD Modular Patch Panel 48 Port	RM 1,940	1	RM 1,940
Product	D-link N300 Wireless Access Point	RM 450	1	RM450
Product	Lenovo ThinkServer TS150	RM800	1	RM800
Product	StarTech (3m) Straight Through DB9 RS232 Serial Cable	RM 100	4	RM400
Product	RJ45 CAT6 Wall Flat Faceplate Ethernet Network Socket	RM42	40	RM1,680
Software	Microsoft Windows NT Server	RM3,000	-	RM3,000
Software	Windows Operating System	RM340	-	RM340
Service	Installation charge	RM4,000	-	RM4,000
			<b>SUBTOTAL</b>	<b>RM209,209</b>
			<b>AMOUNT PAID</b>	<b>RM 0.00</b>
			<b>BALANCE</b>	<b>RM209,209</b>

## 11. PROJECT COSTING

EQUIPMENT	MODEL	PRICE	QUANTITY	TOTAL
Personal computer	Dell Optiplex 980 Desktop PC with New 30 inch LED Monitor	RM4,600	40	RM 184,000
Switch 48-port	TP-link TL-SG1048 48-Port Gigabit Cat6	RM 1,100	1	RM 1,100
Switch 16-port	TP-LINK TL-SG1016D 16 PORT GIGABIT	RM 349	1	RM349
Router	Router with firewall features D-link DSR-250N	RM 1,150	1	RM 1,150
Cable UTP Cat6	PROLINK CAT6 UTP LAN	RM250	40	RM 10,000
Patch panel 48-port	Hellerman Tyton P108-48-MOD Modular Patch Panel 48 Port	RM 1,940	1	RM1,940
Access point	D-link N300 Wireless Access Point	RM 450	1	RM450
Server	Lenovo ThinkServer TS150	RM800	1	RM800
Straight Through Cable	StarTech (3m) Straight Through DB9 RS232 Serial Cable	RM 100	4	RM400
Face Plate	RJ45 CAT6 Wall Flat Faceplate Ethernet Network Socket	RM42	40	RM1,680
Software	Microsoft Windows NT Server	RM3,000	-	RM3,000
Software	Windows Operating System	RM340	-	RM340
Installation charge	-	RM4,000	-	RM4,000
			<b>TOTAL</b>	<b>RM209,209</b>

## **12. PAYMENT TERM AND CONDITION**

### **TERMS OF PAYMENT**

This agreement is made on the 5<sup>th</sup> day of May in the year 2021.

### **BY AND BETWEEN**

XYZ Organization Sdn Bhd

---

**Hereinafter called the "Owner"**

### **AND**

NAAA Contract Sdn Bhd

---

**Hereinafter called the "Contractor"**

### **CONDITION THAT THE BOTH PARTIES AGREE AS FOLLOWS**

The contractor shall :

1. Perform all the work required by the Contract Documents to implement the Local Area Network which have been agreed by both the parties
2. Do and fulfil everything indicated by this Agreement, and
3. Finish the entire network implementation within 30 days, starting from the 16<sup>th</sup> of May, until the 16<sup>th</sup> of June, in 2021.

The owner shall :

1. Deposit 30% of total price of the project before the project started.
2. Upon Total Performance of the Work, pay to the contractor any unpaid balance of the Contract Price.
3. If the Owner fails to make payments to the Contractor as they become due under the terms of this Contract, the contractor may take legal action.

**SIGNED, SEALED AND DELIVERED**

in the presence of:

**OWNER:***Aliana Sofea*

05/05/2021

**CONTRACTOR:***ANAA SdnBhd*

05/05/2021

**13. WARRANTY PERIOD**

Product	Product Model	Warranty Duration	Hardware Replacement	Technical Support	Product Management Portal	Software OS Release
Monitor	Dell Optiplex 980 Desktop PC with New 30 inch LED Monitor	2 years	N/A	1 year	Lifetime	Lifetime Updates
Router	MikroTik hEX S (RB760iGS) - Gigabit VPN Router	3 years	Return and replace	2 years	Lifetime	Lifetime Updates
Switch	Switch TP-LINK TL-SG1016D 16 PORT GIGABIT-1000Mbps	3 years	Return and replace	2 years	Lifetime	Lifetime Updates
Router	Router with firewall features D-link DSR-250N	3 years	Return and replace	2 years	Lifetime	Lifetime Updates

Cable	StarTech (3m) Straight Through DB9 RS232 Serial Cable	1 year	Return and replace	N/A	N/A	N/A
Server	Lenovo Think Server TS150	3 years	Return and replace	2 years	Lifetime	Lifetime Updates
Access Point	D-link N300 Wireless Access Point	3 years	Return and replace	2 years	Lifetime	Lifetime Updates
Patch Panel	Hellerman Tyton P108-48- MOD Modular Patch Panel 48 Port	3 years	Return and replace	2 years	Lifetime	Lifetime Updates
Cable	Cable UTP Cat6- PROLINK CAT6 UTP LAN	1 year	Return and replace	N/A	N/A	N/A

## **PART 2**

### **IMPLEMENTATION OF CAMPUS NETWORK**

#### **1. COMPANY PROFILE**

ANAA Sdn Bhd is built on 18 March 2011 and it is located in Johor Bahru, Malaysia. This company has involved actively in many major projects. The scope for the project involved is usually related to the work of communication system, transmission system and electrical system. ANAA Sdn Bhd can also provide the fiber optic cabling and data cabling for the projects as this company has gained valuable technical expertise since it was established.

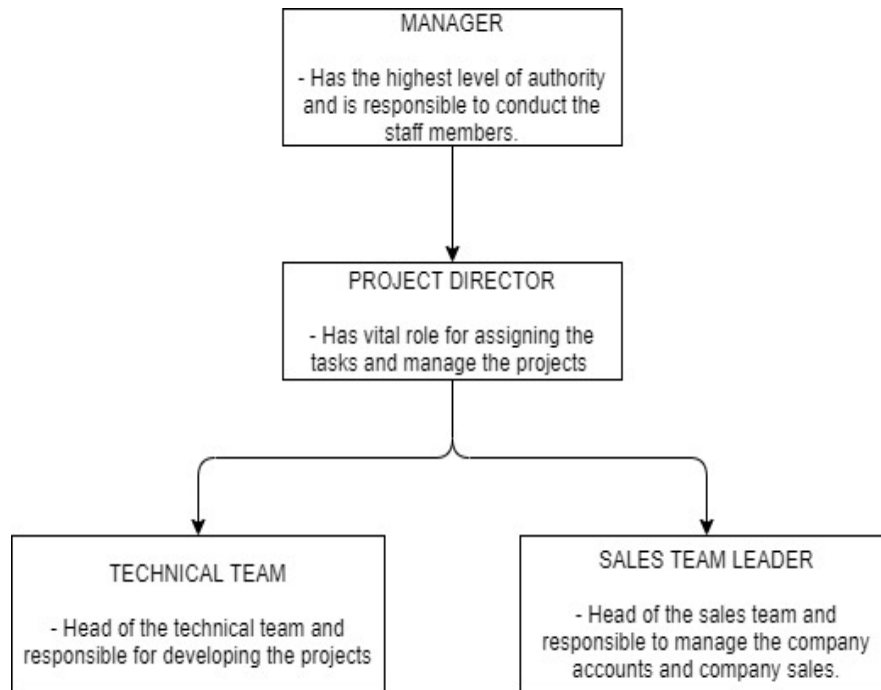
For any inquiries or further information about our company, please visit our website: <https://www.anaacompany.com.my/> or easily contact ANAA Sdn Bhd at 03-777878976.

#### **COMPANY MISSION**

- Always deliver good service and have good relationship with our clients in order to fulfill their requirements.
- The company can be well-known in communication, transmission and electrical problems to the crowd.
- Always present well trained team for the guidelines to the project from the initial phase to the end.
- Provide the best quality and offer affordable price for clients.

## TEAM ORGANIZATION

The team is composed into a specialized areas which are software, communication, cabling and technical services. All of the team is represented by a highly skilled employee in the company to solve all the clients' problem.



### Team Member 1



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<b>NO. TELEFON</b>	017-7746039

## **2. PROJECT SCOPE**

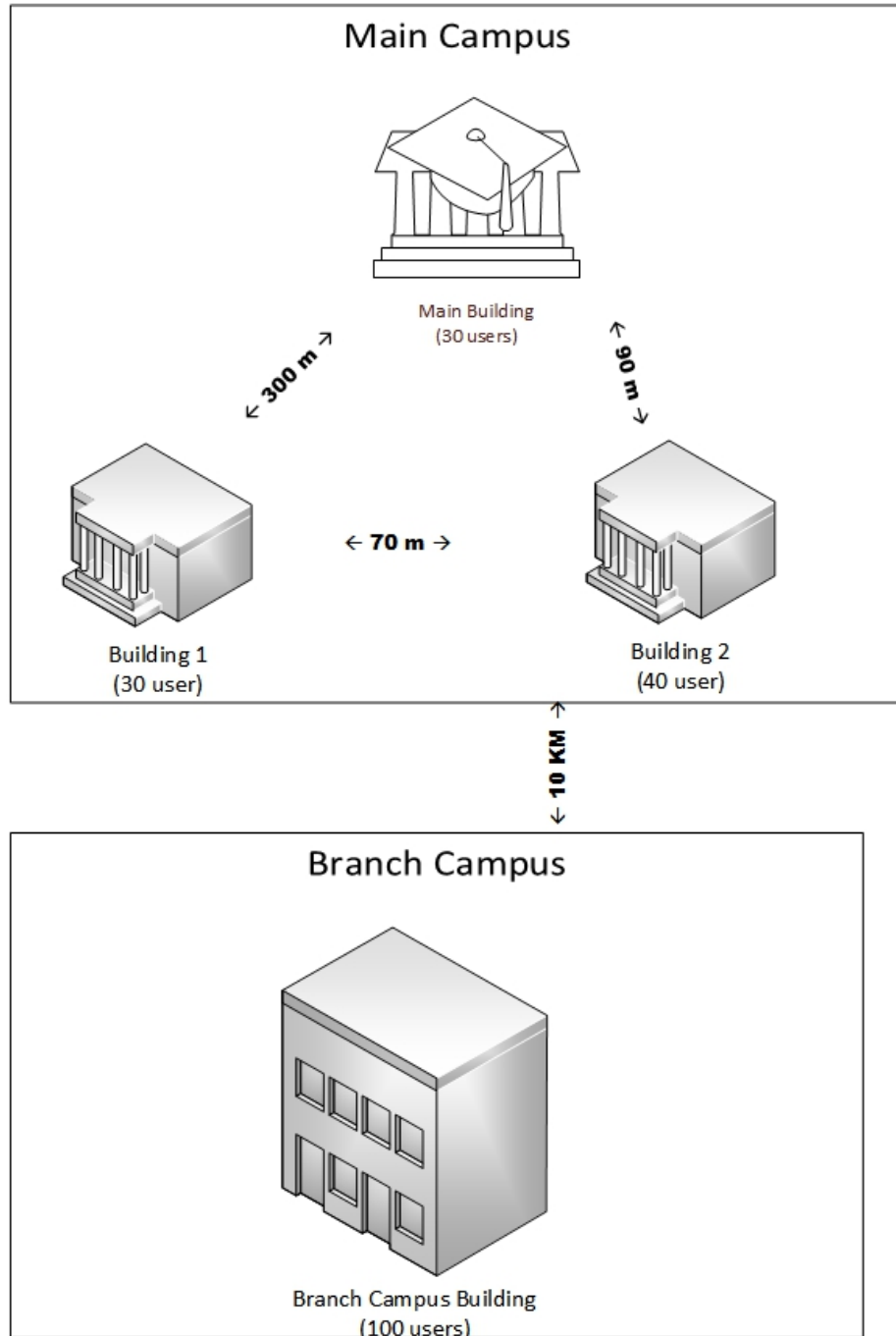
There are 100 users in the college. 30 users in the Main building, 30 users in Building 1, and 40 users in Building 2. Every building has a lobby which is 200 square feet open space, where wireless access to the network is required. Only authorized personal should have access to the wireless network.

The distance between Building 1 and the main building is 300 meter.(FIBER OPTIC) The distance between Building 2 and the main building is 90 meter.(UTP CABLING) The distance between Building 1 and Building 2 is 70 meter(UTP CABLE). A high speed cable internet connection is available in the main building which needs to be shared among the users.

A branch campus is located about 10 km from the main campus network. It also has 100 users, all in the same building. There's a lobby where wifi access is available. Only registered students can access the wireless network.

The necessary equipment and appropriate topology required for the campus network design along with the IP address schema, IP address management, secure wireless access, internet sharing, features and services should be worked out. A bill of material should be included with products from Microsoft, Cisco, D-LINK or Netgear with appropriate quantity which can be used for setting up of the campus infrastructure. Use at least 2 routers.

### 3. CAMPUS DIAGRAM



#### **4. NETWORK REQUIREMENT**

- **WLAN & LAN**

The campus design incorporates both LAN and wireless LAN connectivity for a complete network access solution. There is a standard for wireless LANs, called IEEE 802.11, which most systems implement and which is becoming very widespread. Can operate at rates up to about 50 Mbps over distances of tens of meters. Then on the other hand, so many 802.11 wireless LAN access points are being set up all over the place, A common configuration for a wireless LAN is an office building with base stations (also called access points) strategically placed. All the base stations are wired together using copper or fiber.

- **Hierarchical Network**

Design based on industry's best practice and wellknown three hierarchical layers (Core, Distribution and Access Layer), A Hierarchical design avoids the the need for a fully meshed network in which all network nodes are interconnected. goal for availability and performance by featuring small bandwidth domains, small broadcast domains, redundancy, mirrored server and multiple ways for workstations to reach a router for off-net communication. Server Placement Within a campus network, servers may be placed locally in the Building Access or Building Distribution layer, or attached directly to the Campus Core. Centralized servers are typically grouped into a server farm located in the Enterprise Campus or in a separate data center.

- **Hybrid topology**

A hybrid topology is a combination of two or more topologies. For this case, star topology and bus topology. New topologies and nodes can be added and removed from the network easily. The characteristics of each topology are combined in the hybrid network and weakness of different topologies are eliminated

## ● **Star Topology**

There is a central node, treated as a server that all nodes are connected to and communicate through it. Not Secure but fast. Star topology is the most popular network topology in today's business. It consists of nodes connected to a central switch or a hub. The network for the small office must allow members of the organization to share information, as well as printers and other peripherals.

## ● **Hardware**

1. Use 40 Dell Optiplex 980 Desktop PC with New 30 inch LED Monitor as end device.
2. Cisco Catalyst 9115AX or 9117AX Series
3. MikroTik hEX S (RB760iGS) - Gigabit VPN Router
4. LAN cables- UTP CAT6 for wired connected end user .
5. PowerEdge T40 Tower Server
6. Patch Panel 48 Port Cat6 1RU Rack Mount
7. Straight-through cable for connection between switch and router.
8. Catalyst Wireless Access Point Cisco C9130AXI-B 9130AX
9. Yellow Ethernet cable.
10. Twisted-pair cables
11. S3900-48T4S, 48-Port Gigabit Ethernet L2+ Fully Managed Switch, 48 x Gigabit RJ45, with 4 x 10Gb SFP+ Uplinks, Stackable Switch, Broadcom Chip.
12. Ethernet cable to connect access point to router.
13. RJ45 CAT6 Wall Flat Faceplate Ethernet Network Socket
14. Fiber Optic Cable LC/LC Single Mode Duplex - 25 Meter (9/125 TYPE) - Yellow

## ● **Software**

1. Microsoft Windows NT Server .
2. Windows Operating System built-in the desktop computers.
3. Google Cloud Platform (GCP)

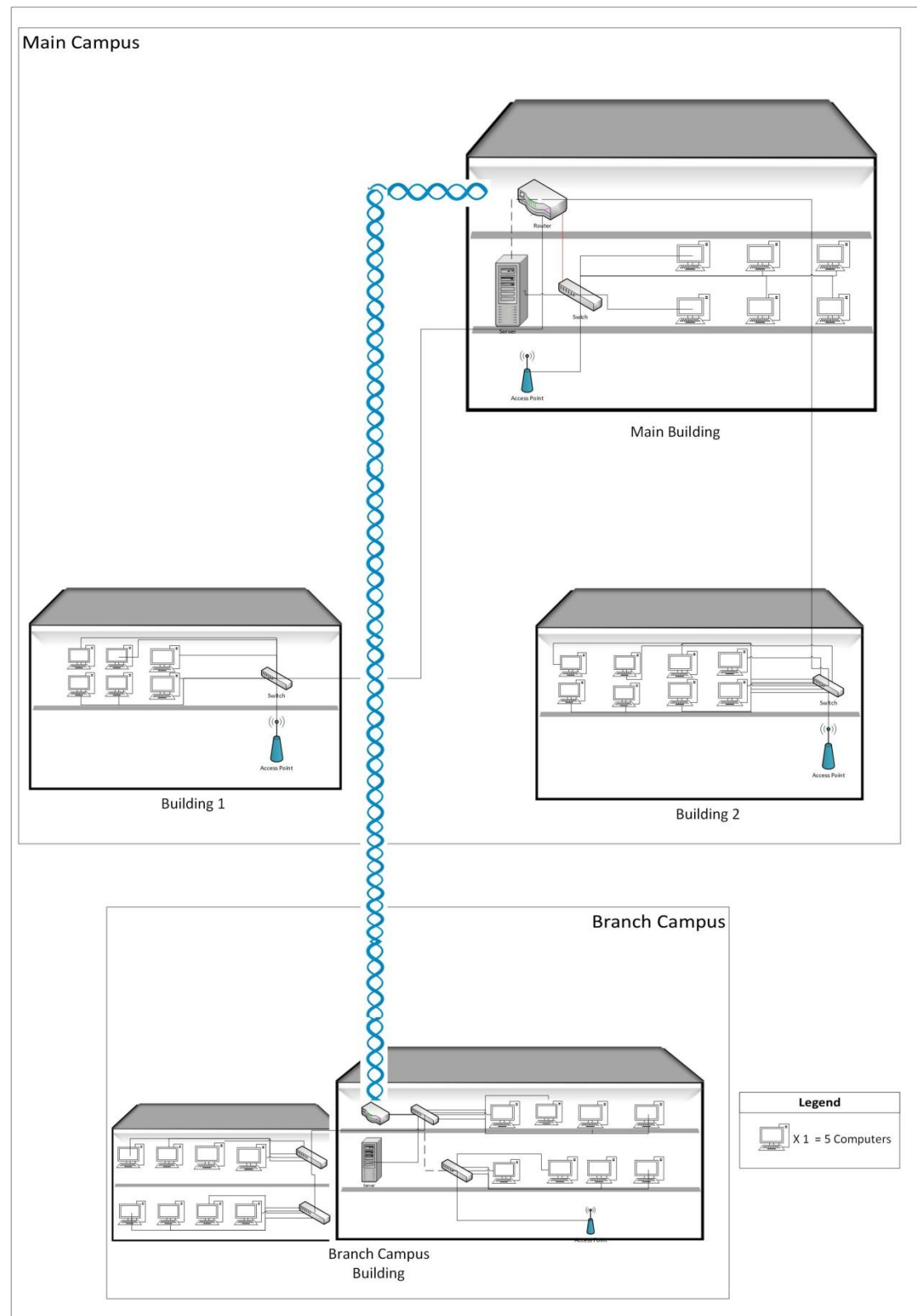
## 5. NETWORK PLANNING

TASK	NAME
- Logical Network Design - Campus diagram	Nafsiah Binti Ahmad
- Network configuration - Network Testing and verification procedure	Nurulain Farhana Binti Yasin
- Network requirement - Physical Network Design	Nuraini Izzati Binti Ghazali
- IP Network design table - Bill of material	Nur Amelia Binti Ahmad Zakaria

## 6. IP NETWORK DESIGN TABLE

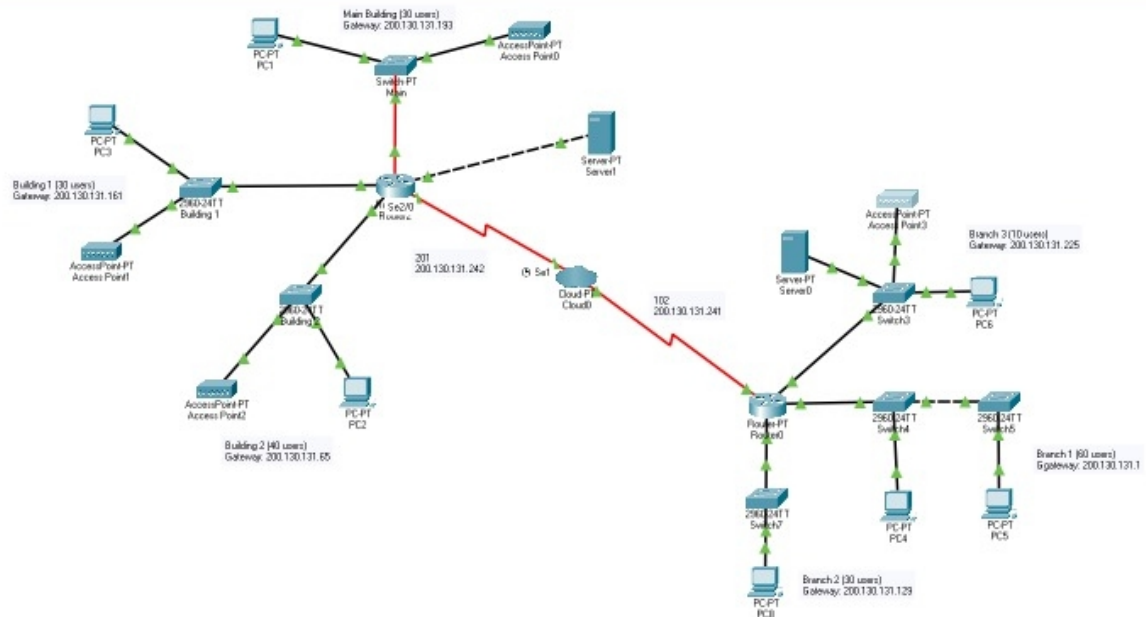
GIVEN IP ADDRESS	SUBNET ADDRESS	SUBNET MASK	NO. OF HOST SUPPORTED	NO. OF HOST NEEDED	IP RANGE		BROADCAST ADDRESS	GATEWAY ADDRESS	DEPARTMENT
					FIRST IP	LAST IP			
200.130.131.0	200.130.131.0	255.255.255.192 /26	62	60	200.130.131.1	200.130.131.62	200.130.131.63	200.130.131.1	Branch 1
	200.130.131.64	255.255.255.192 /26	62	40	200.130.131.65	200.130.131.126	200.130.131.127	200.130.131.65	Building 2
	200.130.131.128	255.255.255.224 /27	30	30	200.130.131.129	200.130.131.158	200.130.131.159	200.130.131.129	Branch 2
	200.130.131.160	255.255.255.224 /27	30	30	200.130.131.161	200.130.131.190	200.130.131.191	200.130.131.161	Building 1
	200.130.131.192	255.255.255.224 /27	30	30	200.130.131.193	200.130.131.222	200.130.131.223	200.130.131.193	Main Building
	200.130.131.224	255.255.255.240 /28	14	10	200.130.131.225	200.130.131.238	200.130.131.239	200.130.131.225	Branch 3
	200.130.131.240	255.255.255.252 /30	2	1	200.130.131.241	200.130.131.242	200.130.131.243	200.130.131.241	Link A
	200.130.131.244	255.255.255.252 /30	2	1	200.130.131.245	200.130.131.246	200.130.131.247	200.130.131.245	Link B
	200.130.131.248	255.255.255.252 /30	2	1	200.130.131.249	200.130.131.250	200.130.131.251	200.130.131.249	Link C
	200.130.131.252	255.255.255.252 /30	2	1	200.130.131.253	200.130.131.254	200.130.131.255	200.130.131.253	Link D

## 7. PHYSICAL NETWORK DESIGN





## 8. LOGICAL NETWORK DESIGN



## 9. NETWORK CONFIGURATION

### NETWORK CONFIGURATION (Main Building, 30 users)

```
Router2> enable
Router2# configure terminal
Router2(config)# interface GigabitEthernet 5/0
Router2(config-if)# ip address 200.130.131.193
255.255.255.224
Router2(config-if)# no shutdown
Router2(config-if)# exit
Router2(config)# exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for a GigabitEthernet interface on the router that connect with the switch port.
- Step 4 is to set up the IP address and subnet mask for the GigabitEthernet interface.
- Step 5 is to enable the GigabitEthernet 5/0 interface change its state from administratively down to administratively up.

```
Switch1>enable
Switch1#configure terminal
Switch1(config)#interface vlan1
Switch1(config-if)#ip address 200.130.131.193
255.255.255.224
Switch1(config-if)#no shutdown
Switch1(config-if)#exit
Switch1(config)#exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the switch.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for VLAN1 interface on the switch.
- Step 4 is to set up the IP address and subnet mask for the VLAN1 interface.
- Step 5 is to enable the VLAN1 interface change its state from administratively down to administratively up.

#### **NETWORK CONFIGURATION (Building 1, 30 users)**

```
Router2> enable
Router2# configure terminal
Router2(config)# interface FastEthernet 7/0
Router2(config-if)# ip address 200.130.131.161
255.255.255.224
Router2(config-if)# no shutdown
Router2(config-if)# exit
Router2(config)# exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for a FastEthernet interface on the router that connect with the switch port.
- Step 4 is to set up the IP address and subnet mask for the FastEthernet interface.
- Step 5 is to enable the FastEthernet 7/0 interface change its state from administratively down to administratively up.

```
Switch2>enable
Switch2#configure terminal
Switch2(config)#interface vlan1
Switch2(config-if)#ip address 200.130.131.161
255.255.255.224
Switch2(config-if)#no shutdown
Switch2(config-if)#exit
Switch2(config)#exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the switch.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for VLAN1 interface on the switch.
- Step 4 is to set up the IP address and subnet mask for the VLAN1 interface.
- Step 5 is to enable the VLAN1 interface change its state from administratively down to administratively up.

## **NETWORK CONFIGURATION (Building 2, 40 users)**

```
Router2> enable
Router2# configure terminal
Router2(config)# interface FastEthernet 6/0
Router2(config-if)# ip address 200.130.131.65
255.255.255.192
Router2(config-if)# no shutdown
Router2(config-if)# exit
Router2(config)# exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for a FastEthernet interface on the router that connect with the switch port.
- Step 4 is to set up the IP address and subnet mask for the FastEthernet interface.
- Step 5 is to enable the FastEthernet 6/0 interface change its state from administratively down to administratively up.

```
Switch3>enable
Switch3#configure terminal
Switch3(config)#interface vlan1
Switch3(config-if)#ip address 200.130.131.65
255.255.255.192
Switch3(config-if)#no shutdown
Switch3(config-if)#exit
Switch3(config)#exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the switch.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for VLAN1 interface on the switch.
- Step 4 is to set up the IP address and subnet mask for the VLAN1 interface.
- Step 5 is to enable the VLAN1 interface change its state from administratively down to administratively up.

### **CONFIGURATION NETWORK (Server)**

```
Router2> enable
Router2# configure terminal
Router2(config)# interface FastEthernet 1/0
Router2(config-if)# ip address 200.130.131.249
255.255.255.252
Router2(config-if)# no shutdown
Router2(config-if)# exit
Router2(config)# exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for a FastEthernet interface on the router that connect with the switch port.
- Step 4 is to set up the IP address and subnet mask for the FastEthernet interface.
- Step 5 is to enable the FastEthernet 1/0 interface change its state from administratively down to administratively up.

### **NETWORK CONFIGURATION (Branch Campus, 60 users)**

```
Router0> enable
Router0# configure terminal
Router0(config)# interface FastEthernet 0/0
Router0(config-if)# ip address 200.130.131.1
255.255.255.192
Router0(config-if)# no shutdown
Router0(config-if)# exit
Router0(config)# exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for a FastEthernet interface on the router that connect with the switch port.
- Step 4 is to set up the IP address and subnet mask for the FastEthernet interface.
- Step 5 is to enable the FastEthernet 0/0 interface change its state from administratively down to administratively up.

### **NETWORK CONFIGURATION (Branch Campus, 30 users)**

```
Router0> enable
Router0# configure terminal
Router0(config)# interface GigabitEthernet 6/0
Router0(config-if)# ip address 200.130.131.129
255.255.255.224
Router0(config-if)# no shutdown
Router0(config-if)# exit
Router0(config)# exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for a GigabitEthernet interface on the router that connect with the switch port.
- Step 4 is to set up the IP address and subnet mask for the GigabitEthernet interface.
- Step 5 is to enable the GigabitEthernet 6/0 interface change its state from administratively down to administratively up.

### **CONFIGURATION NETWORK (Branch Campus, 10 users)**

```
Router0> enable
Router0# configure terminal
Router0(config)# interface FastEthernet 1/0
Router0(config-if)# ip address 200.130.131.225
255.255.255.240
Router0(config-if)# no shutdown
Router0(config-if)# exit
Router0(config)# exit
```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- Step 3 is to enter the configuration mode for a FastEthernet interface on the router that connect with the switch port.
- Step 4 is to set up the IP address and subnet mask for the FastEthernet interface.
- Step 5 is to enable the FastEthernet 1/0 interface change its state from administratively down to administratively up.

## ACL CONFIGURATION

```
Router> enable
Router# configure terminal
Router(config)#access-list 1 deny host 200.130.131.2
Router(config)#access-list 1 deny host 200.130.131.3
Router(config)#access-list 1 permit any
Router(config)#exit
Router#configure terminal
Router(config)#int FastEthernet7/0
Router(config-if)#ip access-group 1 out
Router(config)#int FastEthernet6/0
Router(config-if)#ip access-group 1 out
Router(config)#int FastEthernet1/0
Router(config-if)#ip access-group 1 out
Router(config)#int GigabitEthernet5/0
Router(config-if)#ip access-group 1 out
Router(config-if)#
```

- In step 1, it will allow us to enter the Privileged EXEC in the router.
- Step 2 will allow us to enter the global configuration mode
- On the 3<sup>rd</sup> and 4<sup>th</sup> line, we assume that the IP address 200.130.131.2 and 200.130.131.3 is from unauthorized user. This command will deny all IP traffic from that addresses to access the wireless network.
- On the 5<sup>th</sup> line, the command will allow all other traffic.
- On the 6<sup>th</sup> line, we will enter the Privileged EXEC.
- Line 7<sup>th</sup> will allow us to enter the global configuration mode back.
- On the 8<sup>th</sup> until line 15, we will enter several configuration mode for a FastEthernet and GigabitEthernet interface on the router. This command will apply the ACL as outbound to ensure that the traffic from the authorized user is restricted to the wireless network while all the unauthorized user is denied.

## 10. NETWORK TESTING AND VERIFICATION PROCEDURE

### i) Ping the main building, building 1 and building 2 with each other

- Click on one of the PC in one of the building.
- Go to the Desktop tab and click the command prompt.
- Use 'ping' command with the IP address from system in another building.

```
C:\>ping 200.130.131.162

Pinging 200.130.131.162 with 32 bytes of data:

Reply from 200.130.131.162: bytes=32 time<1ms TTL=127
Reply from 200.130.131.162: bytes=32 time=1ms TTL=127
Reply from 200.130.131.162: bytes=32 time=40ms TTL=127
Reply from 200.130.131.162: bytes=32 time=29ms TTL=127

Ping statistics for 200.130.131.162:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 40ms, Average = 17ms

C:\>
```

```
C:\>ping 200.130.131.66

Pinging 200.130.131.66 with 32 bytes of data:

Reply from 200.130.131.66: bytes=32 time<1ms TTL=127
Reply from 200.130.131.66: bytes=32 time<1ms TTL=127
Reply from 200.130.131.66: bytes=32 time=2ms TTL=127
Reply from 200.130.131.66: bytes=32 time=2ms TTL=127

Ping statistics for 200.130.131.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 1ms

C:\>
```

```
Packet Tracer PC Command Line 1.0
C:\>ping 200.130.131.194

Pinging 200.130.131.194 with 32 bytes of data:

Reply from 200.130.131.194: bytes=32 time=9ms TTL=127
Reply from 200.130.131.194: bytes=32 time<1ms TTL=127
Reply from 200.130.131.194: bytes=32 time<1ms TTL=127
Reply from 200.130.131.194: bytes=32 time<1ms TTL=127

Ping statistics for 200.130.131.194:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 9ms, Average = 2ms

C:\>|
```

**ii) Ping from an unauthorized user from the branch campus to the main campus**

```
C:\>ping 200.130.131.162

Pinging 200.130.131.162 with 32 bytes of data:

Reply from 200.130.131.1: Destination host unreachable.
Reply from 200.130.131.1: Destination host unreachable.
Reply from 200.130.131.1: Destination host unreachable.
Reply from 200.130.131.1: Destination host unreachable.

Ping statistics for 200.130.131.162:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```



## 11. PROJECT DELIVERABLE

ANAA Contract Sdn Bhd  
12, Jalan University ,  
Taman University,  
Johor.

## INVOICE

UAA Campus,  
Jalan Bukit Bintang,  
50200 Kuala Lumpur.

**Invoice** #0000002  
**Invoice Date** 05/05/2021  
**Due Date** 05/05/2021

ITEM	DESCRIPTION	UNIT PRICE	QUANTITY	AMOUNT
Product	Dell Optiplex 980 Desktop PC with New 30 inch LED Monitor	RM4,600	200	RM920,000
Product	MikroTik hEX S (RB760iGS) - Gigabit VPN Router	RM320	2	RM640
Product	Cable UTP Cat6-PROLINK CAT6 UTP LAN	RM250	200	RM50,000
Product	PowerEdge T40 Tower Server	RM2,800	2	RM2,800
Product	Patch Panel 48 Port Cat6 1RU Rack Mount	RM 1,940	5	RM9,700
Product	StarTech (3m) Straight Through DB9 RS232 Serial Cable	RM 100	7	RM700
Product	Catalyst Wireless Access Point Cisco C9130AXI-B 9130AX	RM4,800	4	RM19,200
Product	Yellow Ethernet cable	RM275	5	RM1375
Product	Belden 8760 Twisted Pair Cable Ldpe Sh Pvc Chrome 1000 Ft 2C 18Awg, 305M	RM1,182	1	RM1,182
Product	S3900-48T4S, 48-Port Gigabit Ethernet L2+ Fully Managed Switch, 48 x Gigabit RJ45, with 4 x 10Gb SFP+ Uplinks, Stackable Switch, Broadcom Chip	RM2,100	5	RM10,500
Product	RJ45 CAT6 Wall Flat Faceplate Ethernet Network socket	RM42	200	RM8,400
Product	Fiber Optic Cable LC/LC Single Mode Duplex-25 Meter (9/125 TYPE)	RM333	1	RM333
Software	Microsoft Windows NT Server	RM3,000	-	RM3,000
Software	Windows Operating System	RM340	-	RM340
Software	Google Cloud Platform (GCP)	RM3,000	-	RM3,000
Service	Installation charge	RM10,000	-	RM10,000
			<b>SUBTOTAL</b>	<b>RM1,041,170</b>
			<b>AMOUNT PAID</b>	<b>RM 0.00</b>
			<b>BALANCE</b>	<b>RM1,041,170</b>

## 12. PROJECT COSTING

EQUIPMENT	MODEL	PRICE	QUANTITY	TOTAL
Personal computer	Dell Optiplex 980 Desktop PC with New 30 inch LED Monitor	RM4,600	200	RM920,000
Router	MikroTik hEX S (RB760iGS) - Gigabit VPN Router	RM320	2	RM640
UTP Cat6 Cable	Cable UTP Cat6-PROLINK CAT6 UTP LAN	RM250	200	RM50,000
Server	PowerEdge T40 Tower Server	RM2,800	2	RM2,800
Patch Panel	Patch Panel 48 Port Cat6 1RU Rack Mount	RM 1,940	5	RM9,700
Straight Through Cable	StarTech (3m) Straight Through DB9 RS232 Serial Cable	RM 100	7	RM700
Access Point	Catalyst Wireless Access Point Cisco C9130AXI-B 9130AX	RM4,800	4	RM19,200
Ethernet cable	Yellow Ethernet cable	RM275	5	RM1375
Twisted Pair Cable	Belden 8760 Twisted Pair Cable Ldpe Sh Pvc Chrome 1000 Ft 2C 18Awg, 305M	RM1,182	1	RM1,182
Switch	S3900-48T4S, 48-Port Gigabit Ethernet L2+ Fully Managed Switch, 48 x Gigabit RJ45, with 4 x 10Gb SFP+ Uplinks, Stackable Switch, Broadcom Chip	RM2,100	5	RM10,500
Face plate	RJ45 CAT6 Wall Flat Faceplate Ethernet Network socket	RM42	200	RM8,400
Optic cable	Fiber Optic Cable LC/LC Single Mode Duplex-25 Meter (9/125 TYPE)	RM333	1	RM333
Software	Microsoft Windows NT Server	RM3,000	-	RM3,000
Software	Windows Operating System	RM340	-	RM340
Software	Google Cloud Platform (GCP)	RM3,000	-	RM3,000
Service	Installation charge	RM10,000	-	RM10,000
			<b>TOTAL</b>	<b>RM1,041,170</b>

### **13. PAYMENT TERM AND CONDITION**

#### **TERMS OF PAYMENT**

This agreement is made on the 5<sup>th</sup> day of May in the year 2021.

#### **BY AND BETWEEN**

UAA Campus Organization

---

**Hereinafter called the "Owner"**

**AND**

NAAA Contract Sdn Bhd

---

**Hereinafter called the "Contractor"**

#### **CONDITION THAT THE BOTH PARTIES AGREE AS FOLLOWS**

The contractor shall :

1. Perform all the work required by the Contract Documents to implement the Local Area Network which have been agreed by both the parties
2. Do and fulfil everything indicated by this Agreement, and
3. Finish the entire network implementation within 60 days, starting from the 16<sup>th</sup> of May, until the 16<sup>th</sup> of July, in 2021.

The owner shall :

1. Deposit 30% of total price of the project before the project started.
2. Upon Total Performance of the Work, pay to the contractor any unpaid balance of the Contract Price.
3. If the Owner fails to make payments to the Contractor as they become due under the terms of this Contract, the contractor may take legal action.

**SIGNED, SEALED AND DELIVERED**

in the presence of:

**OWNER:***Lugman Rasyid*

05/05/2021

**CONTRACTOR:***ANAA SdnBhd*

05/05/2021

**14. WARRANTY PERIOD**

Product	Product Model	Warranty Duration	Hardware Replacement	Technical Support	Product Management Portal	Software OS Release
Monitor	Dell Optiplex 980 Desktop PC with New 30 inch LED Monitor	2 years	N/A	1 year	Lifetime	Lifetime Updates
Access Point	Cisco Catalyst 9115AX or 9117AX Series	3 years	Return and replace	2 years	Lifetime	Lifetime Updates
Router	DSL Router with firewall features	3 years	Return and replace	2 years	Lifetime	Lifetime Updates
Cable	Cable UTP Cat6- PROLINK CAT6 UTP LAN	1 year	Return and replace	N/A	N/A	N/A
Server	PowerEdge T40 Tower Server	3 years	Return and replace	2 years	Lifetime	Lifetime Updates
Patch Panel	Patch Panel 48	3 years	Return and replace	2 years	Lifetime	Lifetime Updates

	Port Cat6 1RU Rack Mount					
Cable	StarTech (3m) Straight Through DB9 RS232 Serial Cable	1 year	Return and replace	N/A	N/A	N/A
Access Point	Catalyst Wireless Access Point Cisco C9130AXI- B 9130AX	3 years	Return and replace	2 years	Lifetime	Lifetime Updates
Cable	Yellow Ethernet cable	1 year	Return and replace	N/A	N/A	N/A
Cable	Belden 8760 Twisted Pair Cable Ldpe Sh Pvc Chrome 1000 Ft 2C 18Awg, 305M	1 year	Return and replace	N/A	N/A	N/A
Cable	Ethernet cable	1 year	Return and replace	N/A	N/A	N/A
Switch	S3900- 48T4S, 48- Port Gigabit Ethernet L2+ Fully Managed Switch, 48 x Gigabit RJ45, with 4 x 10Gb SFP+ Uplinks, Stackable Switch, Broadcom	3 years	Return and replace	2 years	Lifetime	Lifetime Updates

	Chip					
Socket	RJ45 CAT6 Wall Flat Faceplate Ethernet Network socket	1 year	Return and replace	N/A	N/A	N/A
Optic cable	Fiber Optic Cable LC/LC Single Mode Duplex - 25 Meter (9/125 TYPE) - Yellow	1 year	Return and replace	N/A	N/A	N/A