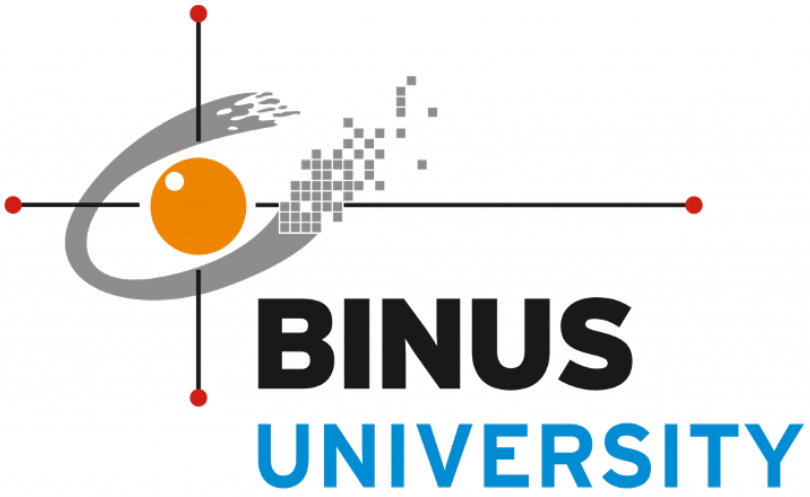
ASSURANCE OF LEARNING PROJECT

COMPUTER NETWORKS



ATIQAH ZAHRA PRAMUDYA 2802520210

BINUS UNIVERSITY ODD SEMESTER

2024/2025

CHAPTER I
INTRODUCTION

I. Background

The rapid advancement of information technology has made computer networks an essential aspect in supporting various activities, particularly academic, operational, and administrative activities within higher education institutions such as Bina Nusantara University. As one of the leading private universities in Indonesia, BINUS University is committed to providing technological facilities that support its operational processes, which are fundamentally based on a reliable, efficient, stable computer network capable of meeting all user needs within the BINUS University environment.

The BINUS University Alam Sutera building, specifically floors 4, 5, and 6, serves as a center for operational, academic, and administrative activities involving various devices such as smartphones, laptops, computers, and Internet of Things (IoT) devices. This condition presents specific challenges in designing an optimal computer network for these areas.

The Computer Networks course enables students to understand the fundamental concepts of computer network design and their practical implementation. Through this report, our group aims to propose a network infrastructure design specifically for floors 4, 5, and 6 of the BINUS Alam Sutera building, covering the selection of network devices, physical network design, transmission media, total cost estimation, IP addressing, routing, and application layer configuration. This design is based on analyses of network capacity, performance, security, and scalability.

II. Research Objectives

1. To design an efficient computer network infrastructure for floors 4, 5, and 6 of the BINUS Alam Sutera building.
2. To determine the physical devices to be used, including the most optimal transmission media to meet user requirements.
3. To analyze and calculate subnetting and structured IP address allocation (IP Addressing).
4. To implement routing mechanisms to effectively interconnect networks across multiple floors.
5. To conduct network connectivity testing through Cisco Packet Tracer simulations to ensure system reliability.
6. To provide configurations that support the application layer (Application Layer).

CHAPTER II
ANALYSIS AND DISCUSSION

I. Methodology

A. Media Devices

- Router is a network device that functions to connect a local area network (LAN) to other networks.
- Switch is used to connect multiple computers or network devices within a single local area network (LAN).
- PC is used by users as a means to access the network and process data.
- Server functions to provide services, applications, and data that can be accessed by other computers within the network.

B. Media Transmission

Fiber optic is selected as the transmission medium for a campus-scale network because it is capable of providing very high data transfer speeds and large bandwidth, enabling it to serve internet access needs and data exchange for many users simultaneously. In addition, fiber optic offers high stability and is resistant to electromagnetic interference, ensuring consistent connection quality even over long-term use. Its long transmission range and higher level of data security also make fiber optic highly suitable for implementation.

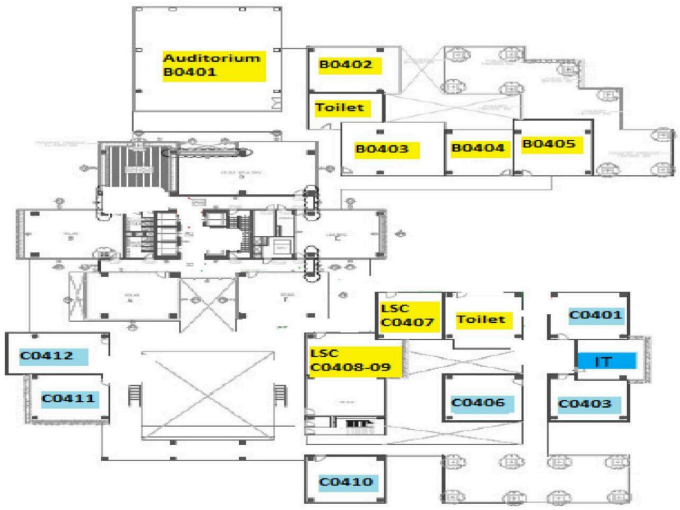
C. Topology

The topology used is Star Topology, for the following reasons:

- Easy maintenance and troubleshooting. If one computer encounters a problem, it will not affect other computers because all devices are connected to a central point (switch).
- More stable network performance, as each device has its own dedicated connection path to the central point, resulting in fewer data collisions compared to other topologies.
- Easily scalable, as adding or removing devices can be done without shutting down the entire network.

II. Devices and Transmission Media

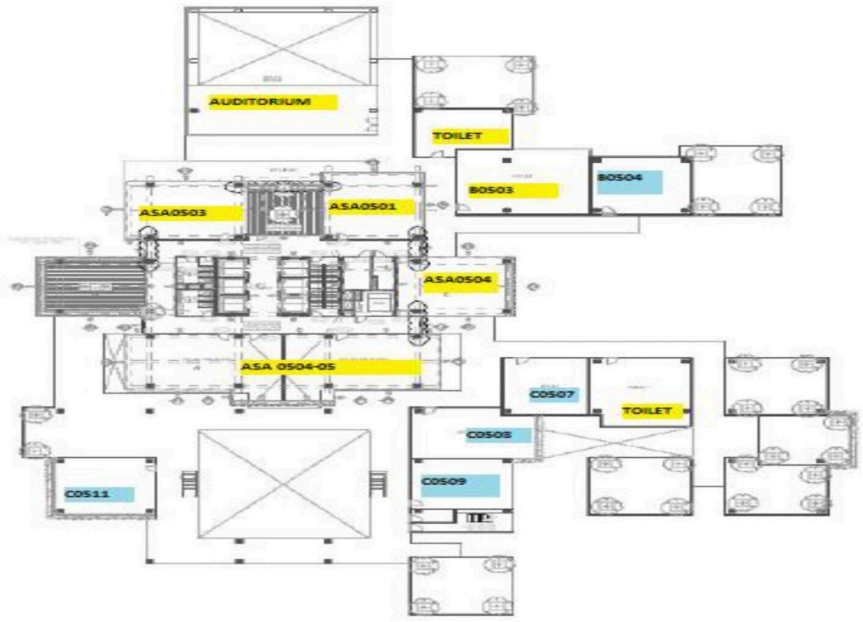
4th Floor (14 Rooms)



Room	PC	Device & Media
Auditorium - B0401	29	Switch 48 Port
B0402	20	Switch 24 Port
B0403	20	Switch 24 Port
B0404	20	Switch 24 Port
B0405	20	Switch 24 Port
C0412	20	Switch 24 Port
C0411	20	Switch 24 Port
LSC C0407	29	Switch 48 Port
LSC C0408-09	40	Switch 48 Port
C0410	20	Switch 24 Port
C0406	20	Switch 24 Port
C0401	20	Switch 24 Port
IT	40	Switch 48 Port
C0403	20	Switch 24 Port

Total PC = 338
Switch = 14
Router = 4

5th Floor (11 Rooms)



Room	PC	Device & Media
Auditorium	29	Switch 48 Port
ASA0503	20	Switch 24 Port
ASA0501	20	Switch 24 Port
B0503	20	Switch 24 Port
B0504	20	Switch 24 Port
ASA0504	20	Switch 24 Port
ASA 0504-05	29	Switch 48 Port
C0511	20	Switch 24 Port
C0507	20	Switch 24 Port
C0508	20	Switch 24 Port
C0509	20	Switch 24 Port

Total PC = 268
Switch = 11
Router = 4

6th Floor (4 Rooms)

Room	PC	Device & Media
A0601	29	Switch 48 Port
A0603	29	Switch 48 Port
A0608	29	Switch 48 Port
A0605-06	40	Switch 48 Port

Total PC = 127
Switch = 4
Router = 3

III. Cost Estimation

Length of Media Used & Cost

Destination	Cable Needed	Device	Total Cable Length
PC -> Switch	20 meter	733	14660
Switch -> Router	60 meter	29	1740
Router-> Router	80 meter	11	880
Total Straight-Through (PC->Switch, Switch->Router)			**16.400 meter**
Total Crossover (Router->Router)			**880 meter**

Cost

Component	Unit	Price per Unit (Rp)	Total Price (Rp)
Router	11	2.000.000	22.000.000
Switch	29	3.500.000	101.500.000
Server	3	25.000.000	75.000.000
Straight-Through Cable	16.400 meter	10,000	164.000.000
Crossover Cable	880 meter	20,000	17.600.000
Total Cost			**380.100.000**

IV. IP Addressing & Subnetting

Variable Length Subnet Mask (VLSM)
Start Point
4th Floor = 192.168.10.0
5th Floor = 192.168.20.0
6th Floor = 192.168.30.0

4th Floor

Lantai 4					
Ruangan	**Jumlah Host**	**Subnet Mask**	**Network Address**	**Broadcast Address**	**Usable IP**
LSC C0408-09	40	255.255.255.192/26	192.168.10.0	192.168.10.63	192.168.10.1 - 192.168.10.62
IT	40	255.255.255.192/26	192.168.10.64	192.168.10.127	192.168.10.65 - 192.168.10.126
B0401	29	255.255.255.224/27	192.168.10.128	192.168.10.159	192.168.10.129 - 192.168.10.158
LSC C0407	29	255.255.255.224/27	192.168.10.160	192.168.10.191	192.168.10.161 - 192.168.10.190
B0402	20	255.255.255.224/27	192.168.10.192	192.168.10.223	192.168.10.193 - 192.168.10.222
B0403	20	255.255.255.224/27	192.168.10.224	192.168.10.255	192.168.10.225 - 192.168.10.254
B0404	20	255.255.255.224/27	192.168.11.0	192.168.11.31	192.168.11.1 - 192.168.11.30
B0405	20	255.255.255.224/27	192.168.11.32	192.168.11.63	192.168.11.33 - 192.168.11.62
C0411	20	255.255.255.224/27	192.168.11.64	192.168.11.95	192.168.11.65 - 192.168.11.94
C0412	20	255.255.255.224/27	192.168.11.96	192.168.11.127	192.168.11.97 - 192.168.11.126
C0410	20	255.255.255.224/27	192.168.11.128	192.168.11.159	192.168.11.129 - 192.168.11.158
C0406	20	255.255.255.224/27	192.168.11.160	192.168.11.191	192.168.11.161 - 192.168.11.190
C0403	20	255.255.255.224/27	192.168.11.192	192.168.11.223	192.168.11.193 - 192.168.11.222
C0401	20	255.255.255.224/27	192.168.11.224	192.168.11.255	192.168.11.225 - 192.168.11.254

LSC C0408-09 (40 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 40$ $2^h \geq 42$ $2^6 = 64,\ h = 6$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 6 = 26 CIDR (new subnet mask) = /26 New Subnet Mask in Bits = 11111111.11111111.11111111.11000000 = 128 + 64 = 192 New Subnet Mask in Decimal = 255.255.255.192	Jumlah Host Address = 2^6 = 64 Network Address (NA) = 192.168.10.0 IP = 192.168.10.1 - 192.168.10.62 Broadcast Address (BA) = 192.168.10.63 Default Gateway = 192.168.10.1

IT (40 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP

$2^h - 2 \geq 40$ $2^h \geq 42$ $2^6 = 64, h = 6$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 6 = 26 CIDR (new subnet mask) = /26 New Subnet Mask in Bits = 11111111.11111111.11111111.11000000 = 128 + 64 = 192 New Subnet Mask in Decimal = 255.255.255.192	Jumlah Host Address = 2^6 = 64 Network Address (NA) = 192.168.10.64 IP = 192.168.10.65 - 192.168.10.126 Broadcast Address (BA) = 192.168.10.127 Default Gateway = 192.168.10.65

Auditorium - B0401 (29 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 29$ $2^h \geq 31$ $2^5 = 31, h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.10.128 IP = 192.168.10.129 - 192.168.10.158 Broadcast Address (BA) = 192.168.10.159 Default Gateway = 192.168.10.129

LSC C0407 (29 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 29$ $2^h \geq 31$ $2^5 = 31, h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.10.160 IP = 192.168.10.161 - 192.168.10.190 Broadcast Address (BA) = 192.168.10.191 Default Gateway = 192.168.10.161

B0402 (20 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.10.192 IP = 192.168.10.193 - 192.168.10.222 Broadcast Address (BA) = 192.168.10.223 Default Gateway = 192.168.10.193

B0403 (20 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.10.224 IP = 192.168.10.225 - 192.168.10.254 Broadcast Address (BA) = 192.168.10.255 Default Gateway = 192.168.10.225

B0404 (20 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.11.0 IP = 192.168.11.1 - 192.168.11.30 Broadcast Address (BA) = 192.168.11.31 Default Gateway = 192.168.11.1

	= 255.255.255.224	

B0405 (20 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.11.32 IP = 192.168.11.33 - 192.168.11.62 Broadcast Address (BA) = 192.168.11.63 Default Gateway = 192.168.11.33

C0411 (20 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.11.64 IP = 192.168.11.65 - 192.168.11.94 Broadcast Address (BA) = 192.168.11.95 Default Gateway = 192.168.11.65

C0412 (20 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.11.96 IP = 192.168.11.97 - 192.168.11.126 Broadcast Address (BA) = 192.168.11.127

	= 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Default Gateway = 192.168.11.97

C0410 (20 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.11.128 IP = 192.168.11.129 - 192.168.11.158 Broadcast Address (BA) = 192.168.11.159 Default Gateway = 192.168.11.129

C0406 (20 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.11.160 IP = 192.168.11.161 - 192.168.11.190 Broadcast Address (BA) = 192.168.11.191 Default Gateway = 192.168.11.161

C0403 (20 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$	Subnet Mask Class C (192) = 255.255.255.0	Jumlah Host Address = 2^5 = 32

$2^h \geq 22$ $2^5 = 32, h = 5$	Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Network Address (NA) = 192.168.11.192 IP = 192.168.11.193 - 192.168.11.222 Broadcast Address (BA) = 192.168.11.223 Default Gateway = 192.168.11.193

C0401 (20 PC)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32, h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.11.224 IP = 192.168.11.225 - 192.168.11.254 Broadcast Address (BA) = 192.168.11.255 Default Gateway = 192.168.11.225

5th Floor

Lantai 5

Ruangan	Jumlah Host	Subnet Mask	Network Address	Broadcast Address	Usable IP
Auditorium	29	255.255.255.224/27	192.168.20.0	192.168.20.31	192.168.20.1 - 192.168.20.30
ASA 0504-05	29	255.255.255.224/27	192.168.20.32	192.168.20.63	192.168.20.33 - 192.168.20.62
ASA0503	20	255.255.255.224/27	192.168.20.64	192.168.20.95	192.168.20.65 - 192.168.20.94
ASA0501	20	255.255.255.224/27	192.168.20.96	192.168.20.127	192.168.20.97 - 192.168.20.126
B0503	20	255.255.255.224/27	192.168.20.128	192.168.20.159	192.168.20.129 - 192.168.20.158
B0504	20	255.255.255.224/27	192.168.20.160	192.168.20.191	192.168.20.161 - 192.168.20.190
ASA0504	20	255.255.255.224/27	192.168.20.192	192.168.20.223	192.168.20.193 - 192.168.20.222
C0511	20	255.255.255.224/27	192.168.20.224	192.168.20.255	192.168.20.225 - 192.168.20.254
C0507	20	255.255.255.224/27	192.168.21.0	192.168.21.31	192.168.21.1 - 192.168.21.30
C0508	20	255.255.255.224/27	192.168.21.32	192.168.21.63	192.168.21.33 - 192.168.21.62
C0509	20	255.255.255.224/27	192.168.21.64	192.168.21.95	192.168.21.65 - 192.168.21.94

Auditorium (29 pc)

Find Host Bits	Find New Subnetmask	Find NA, BA, usable IP

(h)		
$2^h - 2 \geq 29$ $2^h \geq 31$ $2^5 = 31,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.20.0 IP = 192.168.20.1 - 192.168.20.30 Broadcast Address (BA) = 192.168.20.31 Default Gateway = 192.168.20.1

ASA 0504-05 (30 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 29$ $2^h \geq 31$ $2^5 = 31,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.20.32 IP = 192.168.20.33 - 192.168.20.62 Broadcast Address (BA) = 192.168.20.63 Default Gateway = 192.168.20.33

ASA0503 (20 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.20.64 IP = 192.168.20.65 - 192.168.20.94 Broadcast Address (BA) = 192.168.20.95 Default Gateway = 192.168.20.65

ASA0501 (20 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.20.96 IP = 192.168.20.97 - 192.168.20.126 Broadcast Address (BA) = 192.168.20.127 Default Gateway = 192.168.20.97

B0503 (20 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.20.128 IP = 192.168.20.129 - 192.168.20.158 Broadcast Address (BA) = 192.168.20.159 Default Gateway = 192.168.20.129

B0504 (20 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.20.160 IP = 192.168.20.161 - 192.168.20.190 Broadcast Address (BA) = 192.168.20.191 Default Gateway = 192.168.20.161

	New Subnet Mask in Decimal = 255.255.255.224	

ASA0504 (20 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.20.192 IP = 192.168.20.193 - 192.168.20.222 Broadcast Address (BA) = 192.168.20.223 Default Gateway = 192.168.20.193

C0511 (20 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.20.224 IP = 192.168.20.225 - 192.168.20.254 Broadcast Address (BA) = 192.168.20.255 Default Gateway = 192.168.20.225

C0507 (20 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.21.0 IP = 192.168.21.1 - 192.168.21.30

	= 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Broadcast Address (BA) = 192.168.21.31 Default Gateway = 192.168.21.1

C0508 (20 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.21.32 IP = 192.168.21.33 - 192.168.21.62 Broadcast Address (BA) = 192.168.21.63 Default Gateway = 192.168.21.33

C0509 (20 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 20$ $2^h \geq 22$ $2^5 = 32,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.21.64 IP = 192.168.21.65 - 192.168.21.94 Broadcast Address (BA) = 192.168.21.95 Default Gateway = 192.168.21.65

6th Floor

Lantai 6					
Ruangan	**Jumlah Host**	**Subnet Mask**	**Network Address**	**Broadcast Address**	**Usable IP**
A0605-06	40	255.255.255.192/26	192.168.30.0	192.168.30.63	192.168.30.1 - 192.168.30.62
A0601	29	255.255.255.224/27	192.168.30.64	192.168.30.95	192.168.30.65 - 192.168.30.94
A0603	29	255.255.255.224/27	192.168.30.96	192.168.30.127	192.168.30.97 - 192.168.30.126
A0608	29	255.255.255.224/27	192.168.30.128	192.168.30.159	192.168.30.129 - 192.168.30.158

A0605-06 (40 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 40$ $2^h \geq 42$ $2^6 = 64,\ h = 6$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 6 = 26 CIDR (new subnet mask) = /26 New Subnet Mask in Bits = 11111111.11111111.11111111.11000000 = 128 + 64 = 192 New Subnet Mask in Decimal = 255.255.255.192	Jumlah Host Address = 2^6 = 64 Network Address (NA) = 192.168.30.0 IP = 192.168.30.1 - 192.168.30.62 Broadcast Address (BA) = 192.168.30.63 Default Gateway = 192.168.30.1

A0601 (29 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 29$ $2^h \geq 31$ $2^5 = 31,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.30.64 IP = 192.168.30.65 - 192.168.30.94 Broadcast Address (BA) = 192.168.30.95 Default Gateway = 192.168.30.65

A0603 (29 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP

$2^h - 2 \geq 29$ $2^h \geq 31$ $2^5 = 31,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.30.96 IP = 192.168.30.97 - 192.168.30.126 Broadcast Address (BA) = 192.168.30.127 Default Gateway = 192.168.30.97

A0608 (29 pc)

Find Host Bits (h)	Find New Subnetmask	Find NA, BA, usable IP
$2^h - 2 \geq 29$ $2^h \geq 31$ $2^5 = 31,\ h = 5$	Subnet Mask Class C (192) = 255.255.255.0 Total bits = 32 - h = 32 - 5 = 27 CIDR (new subnet mask) = /27 New Subnet Mask in Bits = 11111111.11111111.11111111.11100000 = 128 + 64 + 32 = 224 New Subnet Mask in Decimal = 255.255.255.224	Jumlah Host Address = 2^5 = 32 Network Address (NA) = 192.168.30.128 IP = 192.168.30.129 - 192.168.30.158 Broadcast Address (BA) = 192.168.30.159 Default Gateway = 192.168.30.129

V. Physical Network Design

I. Static Routing

Static routing is selected because the campus network has a relatively stable topology, allowing communication paths between networks to be defined in a fixed and controlled manner by the administrator. In addition, static routing has a low processing overhead since it does not require continuous exchange of routing information, resulting in more optimal router performance and more efficient bandwidth usage. From a security perspective, this method is also more secure because routes cannot be changed automatically by other devices. Therefore, it is well suited for small- to medium-scale campus networks with clear and fixed communication paths.

4th Floor

Router (4.1)

Network Destination	Interface	Next Hop	Status
192.168.10.128/27	Fa0/0	-	DC
192.168.10.192/27	Fa1/0	-	DC
192.168.10.224/27	Fa5/0	-	DC
192.168.11.0/27	Fa7/0	-	DC
192.168.11.32/27	Fa6/0	-	DC
192.168.100.192/30	Se2/0		DC
192.168.11.64/27	Se2/0	192.168.100.194/30	RN
192.168.11.96/27	Se2/0	192.168.100.194/30	RN
192.168.10.160/27	Se2/0	192.168.100.194/30	RN
192.168.10.0/26	Se2/0	192.168.100.194/30	RN
192.168.11.128/27	Se2/0	192.168.100.194/30	RN
192.168.11.192/27	Se2/0	192.168.100.194/30	RN
192.168.11.160/27	Se2/0	192.168.100.194/30	RN
192.168.10.64/26	Se2/0	192.168.100.194/30	RN
192.168.11.224/27	Se2/0	192.168.100.194/30	RN
192.168.30.0/26	Se2/0	192.168.100.194/30	RN
192.168.30.128/27	Se2/0	192.168.100.194/30	RN
192.168.30.64/27	Se2/0	192.168.100.194/30	RN
192.168.30.96/27	Se2/0	192.168.100.194/30	RN
192.168.20.0/27	Se2/0	192.168.100.194/30	RN
192.168.20.32/27	Se2/0	192.168.100.194/30	RN
192.168.20.64/27	Se2/0	192.168.100.194/30	RN
192.168.20.96/27	Se2/0	192.168.100.194/30	RN
192.168.20.128/27	Se2/0	192.168.100.194/30	RN
192.168.20.160/27	Se2/0	192.168.100.194/30	RN
192.168.20.192/27	Se2/0	192.168.100.194/30	RN
192.168.20.224/27	Se2/0	192.168.100.194/30	RN
192.168.21.0/27	Se2/0	192.168.100.194/30	RN
192.168.21.32/27	Se2/0	192.168.100.194/30	RN
192.168.21.64/27	Se2/0	192.168.100.194/30	RN

Router (4.2)

Network Destination	Interface	Next Hop	Status
192.168.100.196/30	Se2/0	-	DC
192.168.11.64/27	Fa1/0	-	DC
192.168.11.96/27	Fa0/0	-	DC
192.168.10.0/26	Se2/0	192.168.100.198/30	RN
192.168.10.64/26	Se2/0	192.168.100.198/30	RN
192.168.10.128/27	Se2/0	192.168.100.198/30	RN
192.168.10.160/27	Se2/0	192.168.100.198/30	RN
192.168.10.192/27	Se2/0	192.168.100.198/30	RN
192.168.10.224/27	Se2/0	192.168.100.198/30	RN
192.168.11.0/27	Se2/0	192.168.100.198/30	RN
192.168.11.32/27	Se2/0	192.168.100.198/30	RN
192.168.11.128/27	Se2/0	192.168.100.198/30	RN
192.168.11.160/27	Se2/0	192.168.100.198/30	RN
192.168.11.192/27	Se2/0	192.168.100.198/30	RN
192.168.11.224/27	Se2/0	192.168.100.198/30	RN
192.168.20.0/27	Se2/0	192.168.100.198/30	RN
192.168.20.32/27	Se2/0	192.168.100.198/30	RN
192.168.20.64/27	Se2/0	192.168.100.198/30	RN
192.168.20.96/27	Se2/0	192.168.100.198/30	RN
192.168.20.128/27	Se2/0	192.168.100.198/30	RN
192.168.20.160/27	Se2/0	192.168.100.198/30	RN
192.168.20.192/27	Se2/0	192.168.100.198/30	RN
192.168.20.224/27	Se2/0	192.168.100.198/30	RN
192.168.21.0/27	Se2/0	192.168.100.198/30	RN
192.168.21.32/27	Se2/0	192.168.100.198/30	RN
192.168.21.64/27	Se2/0	192.168.100.198/30	RN
192.168.30.0/26	Se2/0	192.168.100.198/30	RN
192.168.30.128/27	Se2/0	192.168.100.198/30	RN
192.168.30.64/27	Se2/0	192.168.100.198/30	RN
192.168.30.96/27	Se2/0	192.168.100.198/30	RN

Router (4.3)

Network Destination	Interface	Next Hop	Status
192.168.10.160/27	Fa0/0	-	DC
192.168.10.0/26	Fa1/0	-	DC
192.168.11.128/27	Fa4/0	-	DC
192.168.11.192/27	Fa5/0	-	DC
192.168.11.160/27	Fa6/0	-	DC
192.168.10.64/26	Fa7/0	-	DC
192.168.11.224/27	Fa8/0	-	DC
192.168.100.200/30	Se2/0	-	DC
192.168.10.64/26	Se2/0	192.168.100.201/30	RN
192.168.10.128/27	Se2/0	192.168.100.201/30	RN
192.168.10.192/27	Se2/0	192.168.100.201/30	RN
192.168.10.224/27	Se2/0	192.168.100.201/30	RN
192.168.11.0/27	Se2/0	192.168.100.201/30	RN
192.168.11.32/27	Se2/0	192.168.100.201/30	RN
192.168.11.64/27	Se2/0	192.168.100.201/30	RN
192.168.11.96/27	Se2/0	192.168.100.201/30	RN
192.168.20.0/27	Se2/0	192.168.100.201/30	RN
192.168.20.32/27	Se2/0	192.168.100.201/30	RN
192.168.20.64/27	Se2/0	192.168.100.201/30	RN
192.168.20.96/27	Se2/0	192.168.100.201/30	RN
192.168.20.128/27	Se2/0	192.168.100.201/30	RN
192.168.20.160/27	Se2/0	192.168.100.201/30	RN
192.168.20.192/27	Se2/0	192.168.100.201/30	RN
192.168.20.224/27	Se2/0	192.168.100.201/30	RN
192.168.21.0/27	Se2/0	192.168.100.201/30	RN
192.168.21.32/27	Se2/0	192.168.100.201/30	RN
192.168.21.64/27	Se2/0	192.168.100.201/30	RN
192.168.30.0/26	Se2/0	192.168.100.201/30	RN
192.168.30.128/27	Se2/0	192.168.100.201/30	RN
192.168.30.64/27	Se2/0	192.168.100.201/30	RN
192.168.30.96/27	Se2/0	192.168.100.201/30	RN

Router (4)

Network Destination	Interface	Next Hop	Status
192.168.100.192/30	Se4/0	-	DC
192.168.100.196/30	Se3/0	-	DC
192.168.100.200/30	Se2/0	-	DC
192.168.150.196/30	Se5/0	-	DC
192.168.150.200/30	Se6/0	-	DC
192.168.10.0/26	Se2/0	192.168.100.202/30	RN
192.168.10.64/26	Se2/0	192.168.100.202/30	RN
192.168.10.128/27	Se4/0	192.168.100.193/30	RN
192.168.10.160/27	Se2/0	192.168.100.202/30	RN
192.168.10.192/27	Se4/0	192.168.100.193/30	RN
192.168.10.224/27	Se4/0	192.168.100.193/30	RN
192.168.11.0/27	Se3/0	192.168.100.197/30	RN
192.168.11.32/27	Se4/0	192.168.100.193/30	RN
192.168.11.64/27	Se3/0	192.168.100.197/30	RN
192.168.11.96/27	Se4/0	192.168.100.193/30	RN
192.168.11.128/27	Se2/0	192.168.100.202/30	RN
192.168.11.160/27	Se2/0	192.168.100.202/30	RN
192.168.11.192/27	Se2/0	192.168.100.202/30	RN
192.168.11.224/27	Se2/0	192.168.100.202/30	RN
192.168.20.0/27	Se6/0	192.168.150.201/30	RN
192.168.20.32/27	Se6/0	192.168.150.201/30	RN
192.168.20.64/27	Se6/0	192.168.150.201/30	RN
192.168.20.96/27	Se6/0	192.168.150.201/30	RN
192.168.20.128/27	Se6/0	192.168.150.201/30	RN
192.168.20.160/27	Se6/0	192.168.150.201/30	RN
192.168.20.192/27	Se6/0	192.168.150.201/30	RN
192.168.20.224/27	Se6/0	192.168.150.201/30	RN
192.168.21.0/27	Se6/0	192.168.150.201/30	RN
192.168.21.32/27	Se6/0	192.168.150.201/30	RN
192.168.21.64/27	Se6/0	192.168.150.201/30	RN
192.168.30.0/26	Se5/0	192.168.150.197/30	RN
192.168.30.128/27	Se5/0	192.168.150.197/30	RN
192.168.30.64/27	Se5/0	192.168.150.197/30	RN
192.168.30.96/27	Se5/0	192.168.150.197/30	RN

5th Floor

Router (5.1)

Network Destination	Interface	Next Hop	Status
192.168.20.0/27	Fa0/0	-	DC
192.168.20.64/27	Fa1/0	-	DC
192.168.20.96/27	Fa2/0	-	DC
192.168.20.128/27	Fa3/0	-	DC
192.168.20.160/27	Fa4/0	-	DC
192.168.200.192/30	Se9/0	-	DC
192.168.20.224/27	Se9/0	192.168.200.194/30	RN
192.168.20.32/27	Se9/0	192.168.200.194/30	RN
192.168.20.192/27	Se9/0	192.168.200.194/30	RN
192.168.21.0/27	Se9/0	192.168.200.194/30	RN
192.168.21.32/27	Se9/0	192.168.200.194/30	RN
192.168.21.64/27	Se9/0	192.168.200.194/30	RN
192.168.10.0/26	Se9/0	192.168.200.194/30	RN
192.168.10.64/26	Se9/0	192.168.200.194/30	RN
192.168.10.128/27	Se9/0	192.168.200.194/30	RN
192.168.10.160/27	Se9/0	192.168.200.194/30	RN
192.168.10.192/27	Se9/0	192.168.200.194/30	RN
192.168.10.224/27	Se9/0	192.168.200.194/30	RN
192.168.11.0/27	Se9/0	192.168.200.194/30	RN
192.168.11.32/27	Se9/0	192.168.200.194/30	RN
192.168.11.64/27	Se9/0	192.168.200.194/30	RN
192.168.11.96/27	Se9/0	192.168.200.194/30	RN
192.168.11.128/27	Se9/0	192.168.200.194/30	RN
192.168.11.160/27	Se9/0	192.168.200.194/30	RN
192.168.11.192/27	Se9/0	192.168.200.194/30	RN
192.168.11.224/27	Se9/0	192.168.200.194/30	RN
192.168.30.0/26	Se9/0	192.168.200.194/30	RN
192.168.30.128/27	Se9/0	192.168.200.194/30	RN
192.168.30.64/27	Se9/0	192.168.200.194/30	RN
192.168.30.96/27	Se9/0	192.168.200.194/30	RN

Router(5.2)

Network Destination	Interface	Next Hop	Status
192.168.20.224/27	Fa0/0	-	DC
192.168.20.32/27	Fa1/0	-	DC
192.168.20.192/27	Fa2/0	-	DC
192.168.200.196/30	Se9/0	-	DC
192.168.20.0/27	Se9/0	192.168.200.198/30	RN
192.168.20.64/27	Se9/0	192.168.200.198/30	RN
192.168.20.96/27	Se9/0	192.168.200.198/30	RN
192.168.20.128/27	Se9/0	192.168.200.198/30	RN
192.168.20.160/27	Se9/0	192.168.200.198/30	RN
192.168.21.0/27	Se9/0	192.168.200.198/30	RN
192.168.21.32/27	Se9/0	192.168.200.198/30	RN
192.168.21.64/27	Se9/0	192.168.200.198/30	RN
192.168.10.0/26	Se9/0	192.168.200.198/30	RN
192.168.10.64/26	Se9/0	192.168.200.198/30	RN
192.168.10.128/27	Se9/0	192.168.200.198/30	RN
192.168.10.160/27	Se9/0	192.168.200.198/30	RN
192.168.10.192/27	Se9/0	192.168.200.198/30	RN
192.168.10.224/27	Se9/0	192.168.200.198/30	RN
192.168.11.0/27	Se9/0	192.168.200.198/30	RN
192.168.11.32/27	Se9/0	192.168.200.198/30	RN
192.168.11.64/27	Se9/0	192.168.200.198/30	RN
192.168.11.96/27	Se9/0	192.168.200.198/30	RN
192.168.11.128/27	Se9/0	192.168.200.198/30	RN
192.168.11.160/27	Se9/0	192.168.200.198/30	RN
192.168.11.192/27	Se9/0	192.168.200.198/30	RN
192.168.11.224/27	Se9/0	192.168.200.198/30	RN
192.168.30.0/26	Se9/0	192.168.200.198/30	RN
192.168.30.128/27	Se9/0	192.168.200.198/30	RN
192.168.30.64/27	Se9/0	192.168.200.198/30	RN
192.168.30.96/27	Se9/0	192.168.200.198/30	RN

Router(5.3)

Network Destination	Interface	Next Hop	Status
192.168.21.0/27	Fa0/0	-	DC
192.168.21.32/27	Fa1/0	-	DC
192.168.21.64/27	Fa2/0	-	DC
192.168.200.200/30	Se9/0	-	DC
192.168.20.0/27	Se9/0	192.168.200.202/30	RN
192.168.20.64/27	Se9/0	192.168.200.202/30	RN
192.168.20.96/27	Se9/0	192.168.200.202/30	RN
192.168.20.128/27	Se9/0	192.168.200.202/30	RN
192.168.20.160/27	Se9/0	192.168.200.202/30	RN
192.168.20.224/27	Se9/0	192.168.200.202/30	RN
192.168.20.32/27	Se9/0	192.168.200.202/30	RN
192.168.20.192/27	Se9/0	192.168.200.202/30	RN
192.168.200.196/30	Se9/0	192.168.200.202/30	RN
192.168.10.0/26	Se9/0	192.168.200.202/30	RN
192.168.10.64/26	Se9/0	192.168.200.202/30	RN
192.168.10.128/27	Se9/0	192.168.200.202/30	RN
192.168.10.160/27	Se9/0	192.168.200.202/30	RN
192.168.10.192/27	Se9/0	192.168.200.202/30	RN
192.168.10.224/27	Se9/0	192.168.200.202/30	RN
192.168.11.0/27	Se9/0	192.168.200.202/30	RN
192.168.11.32/27	Se9/0	192.168.200.202/30	RN
192.168.11.64/27	Se9/0	192.168.200.202/30	RN
192.168.11.96/27	Se9/0	192.168.200.202/30	RN
192.168.11.128/27	Se9/0	192.168.200.202/30	RN
192.168.11.160/27	Se9/0	192.168.200.202/30	RN
192.168.11.192/27	Se9/0	192.168.200.202/30	RN
192.168.11.224/27	Se9/0	192.168.200.202/30	RN
192.168.30.0/26	Se9/0	192.168.200.202/30	RN
192.168.30.128/27	Se9/0	192.168.200.202/30	RN
192.168.30.64/27	Se9/0	192.168.200.202/30	RN
192.168.30.96/27	Se9/0	192.168.200.202/30	RN

Router (5)

Network Destination	Interface	Next Hop	Status
192.168.150.192/30	Se3/0	-	DC
192.168.150.200/30	Se4/0	-	DC
192.168.200.192/30	Se7/0	-	DC
192.168.200.200/30	Se8/0	-	DC
192.168.200.196/30	Se9/0	-	DC
192.168.20.0/27	Se7/0	192.168.200.193/30	RN
192.168.20.64/27	Se7/0	192.168.200.193/30	RN
192.168.20.96/27	Se7/0	192.168.200.193/30	RN
192.168.20.128/27	Se7/0	192.168.200.193/30	RN
192.168.20.160/27	Se7/0	192.168.200.193/30	RN
192.168.20.224/27	Se9/0	192.168.200.197/30	RN
192.168.20.32/27	Se9/0	192.168.200.197/30	RN
192.168.20.192/27	Se9/0	192.168.200.197/30	RN
192.168.21.0/27	Se8/0	192.168.200.201/30	RN
192.168.21.32/27	Se8/0	192.168.200.201/30	RN
192.168.21.64/27	Se8/0	192.168.200.201/30	RN
192.168.10.0/26	Se4/0	192.168.150.202/30	RN
192.168.10.64/26	Se4/0	192.168.150.202/30	RN
192.168.10.128/27	Se4/0	192.168.150.202/30	RN
192.168.10.160/27	Se4/0	192.168.150.202/30	RN
192.168.10.192/27	Se4/0	192.168.150.202/30	RN
192.168.10.224/27	Se4/0	192.168.150.202/30	RN
192.168.11.0/27	Se4/0	192.168.150.202/30	RN
192.168.11.32/27	Se4/0	192.168.150.202/30	RN
192.168.11.64/27	Se4/0	192.168.150.202/30	RN
192.168.11.96/27	Se4/0	192.168.150.202/30	RN
192.168.11.128/27	Se4/0	192.168.150.202/30	RN
192.168.11.160/27	Se4/0	192.168.150.202/30	RN
192.168.11.192/27	Se4/0	192.168.150.202/30	RN
192.168.11.224/27	Se4/0	192.168.150.202/30	RN
192.168.30.0/26	Se3/0	192.168.150.193/30	RN
192.168.30.128/27	Se3/0	192.168.150.193/30	RN
192.168.30.64/27	Se3/0	192.168.150.193/30	RN
192.168.30.96/27	Se3/0	192.168.150.193/30	RN

\

6th Floor

Router (6.1)

Network Destination	Interface	Next Hop	Status
192.168.30.96/27	Fa1/0	-	DC
192.168.30.64/27	Fa0/0	-	DC
192.168.33.192/30	Se5/0	-	DC
192.168.30.128/27	Se5/0	192.168.33.194/30	RN
192.168.30.0/26	Se5/0	192.168.33.194/30	RN
192.168.10.0/26	Se5/0	192.168.33.194/30	RN
192.168.10.64/26	Se5/0	192.168.33.194/30	RN
192.168.10.128/27	Se5/0	192.168.33.194/30	RN
192.168.10.160/27	Se5/0	192.168.33.194/30	RN
192.168.10.192/27	Se5/0	192.168.33.194/30	RN
192.168.10.224/27	Se5/0	192.168.33.194/30	RN
192.168.11.0/27	Se5/0	192.168.33.194/30	RN
192.168.11.32/27	Se5/0	192.168.33.194/30	RN
192.168.11.64/27	Se5/0	192.168.33.194/30	RN
192.168.11.96/27	Se5/0	192.168.33.194/30	RN
192.168.11.128/27	Se5/0	192.168.33.194/30	RN
192.168.11.160/27	Se5/0	192.168.33.194/30	RN
192.168.11.192/27	Se5/0	192.168.33.194/30	RN
192.168.11.224/27	Se5/0	192.168.33.194/30	RN
192.168.20.0/27	Se5/0	192.168.33.194/30	RN
192.168.20.32/27	Se5/0	192.168.33.194/30	RN
192.168.20.64/27	Se5/0	192.168.33.194/30	RN
192.168.20.96/27	Se5/0	192.168.33.194/30	RN
192.168.20.128/27	Se5/0	192.168.33.194/30	RN
192.168.20.160/27	Se5/0	192.168.33.194/30	RN
192.168.20.192/27	Se5/0	192.168.33.194/30	RN
192.168.20.224/27	Se5/0	192.168.33.194/30	RN
192.168.21.0/27	Se5/0	192.168.33.194/30	RN
192.168.21.32/27	Se5/0	192.168.33.194/30	RN
192.168.21.64/27	Se5/0	192.168.33.194/30	RN

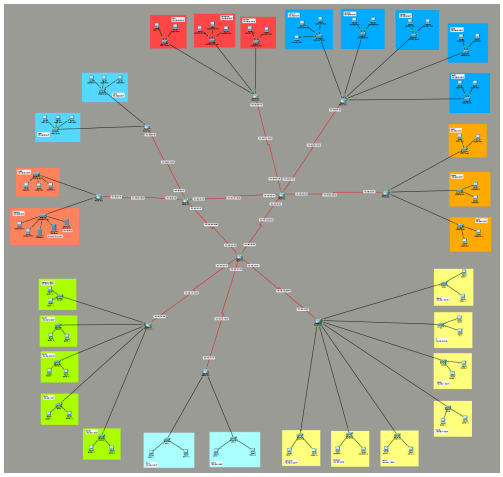
Router (6.2)

Network Destination	Interface	Next Hop	Status
192.168.30.0/26	Fa0/0	-	DC
192.168.30.128/27	Fa1/0	-	DC
192.168.33.196/30	Se9/0	-	DC
192.168.30.64/27	Se9/0	192.168.33.198/30	RN
192.168.30.96/27	Se9/0	192.168.33.198/30	RN
192.168.10.0/26	Se9/0	192.168.33.198/30	RN
192.168.10.64/26	Se9/0	192.168.33.198/30	RN
192.168.10.128/27	Se9/0	192.168.33.198/30	RN
192.168.10.160/27	Se9/0	192.168.33.198/30	RN
192.168.10.192/27	Se9/0	192.168.33.198/30	RN
192.168.10.224/27	Se9/0	192.168.33.198/30	RN
192.168.11.0/27	Se9/0	192.168.33.198/30	RN
192.168.11.32/27	Se9/0	192.168.33.198/30	RN
192.168.11.64/27	Se9/0	192.168.33.198/30	RN
192.168.11.96/27	Se9/0	192.168.33.198/30	RN
192.168.11.128/27	Se9/0	192.168.33.198/30	RN
192.168.11.160/27	Se9/0	192.168.33.198/30	RN
192.168.11.192/27	Se9/0	192.168.33.198/30	RN
192.168.11.224/27	Se9/0	192.168.33.198/30	RN
192.168.20.0/27	Se9/0	192.168.33.198/30	RN
192.168.20.32/27	Se9/0	192.168.33.198/30	RN
192.168.20.64/27	Se9/0	192.168.33.198/30	RN
192.168.20.96/27	Se9/0	192.168.33.198/30	RN
192.168.20.128/27	Se9/0	192.168.33.198/30	RN
192.168.20.160/27	Se9/0	192.168.33.198/30	RN
192.168.20.192/27	Se9/0	192.168.33.198/30	RN
192.168.20.224/27	Se9/0	192.168.33.198/30	RN
192.168.21.0/27	Se9/0	192.168.33.198/30	RN
192.168.21.32/27	Se9/0	192.168.33.198/30	RN
192.168.21.64/27	Se9/0	192.168.33.198/30	RN

Router (6)

Network Destination	Interface	Next Hop	Status
192.168.33.192/30	Se9/0	-	DC
192.168.33.196/30	Se5/0	-	DC
192.168.150.192/30	Se6/0	-	DC
192.168.150.196/30	Se7/0	-	DC
192.168.30.0/26	Se5/0	192.168.33.197/30	RN
192.168.30.128/27	Se5/0	192.168.33.197/30	RN
192.168.30.64/27	Se9/0	192.168.33.193/30	RN
192.168.30.96/27	Se9/0	192.168.33.193/30	RN
192.168.10.0/26	Se7/0	192.168.150.198/30	RN
192.168.10.64/26	Se7/0	192.168.150.198/30	RN
192.168.10.128/27	Se7/0	192.168.150.198/30	RN
192.168.10.160/27	Se7/0	192.168.150.198/30	RN
192.168.10.192/27	Se7/0	192.168.150.198/30	RN
192.168.10.224/27	Se7/0	192.168.150.198/30	RN
192.168.11.0/27	Se7/0	192.168.150.198/30	RN
192.168.11.32/27	Se7/0	192.168.150.198/30	RN
192.168.11.64/27	Se7/0	192.168.150.198/30	RN
192.168.11.96/27	Se7/0	192.168.150.198/30	RN
192.168.11.128/27	Se7/0	192.168.150.198/30	RN
192.168.11.160/27	Se7/0	192.168.150.198/30	RN
192.168.11.192/27	Se7/0	192.168.150.198/30	RN
192.168.11.224/27	Se7/0	192.168.150.198/30	RN
192.168.20.0/27	Se6/0	192.168.150.194/30	RN
192.168.20.32/27	Se6/0	192.168.150.194/30	RN
192.168.20.64/27	Se6/0	192.168.150.194/30	RN
192.168.20.96/27	Se6/0	192.168.150.194/30	RN
192.168.20.128/27	Se6/0	192.168.150.194/30	RN
192.168.20.160/27	Se6/0	192.168.150.194/30	RN
192.168.20.192/27	Se6/0	192.168.150.194/30	RN
192.168.20.224/27	Se6/0	192.168.150.194/30	RN
192.168.21.0/27	Se6/0	192.168.150.194/30	RN
192.168.21.32/27	Se6/0	192.168.150.194/30	RN
192.168.21.64/27	Se6/0	192.168.150.194/30	RN

Cisco Packet Tracer



4th Floor

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	B0401 - 2	C0412 - 1	ICMP		0.000	N	0	(edit)
	Successful	B0402 - 2	C0407 - 2	ICMP		0.000	N	1	(edit)
	Successful	B0403 - 2	C0401 - 2	ICMP		0.000	N	2	(edit)
	Successful	B0404 - 2	A0605-06 PC-1	ICMP		0.000	N	3	(edit)
	Successful	B0404 - 1	A0601 PC-3	ICMP		0.000	N	4	(edit)
	Successful	B0401 - 2	C0508 PC-2	ICMP		0.000	N	5	(edit)
	Successful	B0402 - 2	B0504 PC-2	ICMP		0.000	N	6	(edit)
	Successful	B0401 - 2	ASA0504 PC-3	ICMP		0.000	N	7	(edit)

5th Floor

PDU List Window

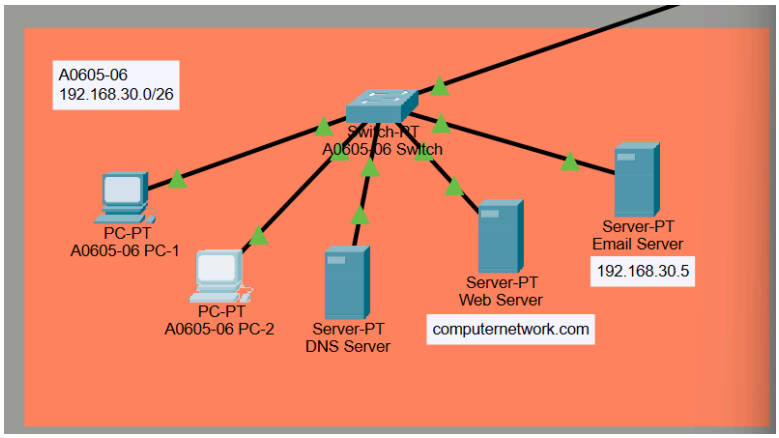
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	C0511 P…	Auditorium PC-2	ICMP		0.000	N	0	(edit)
	Successful	C0511 P…	C0507 PC-2	ICMP		0.000	N	1	(edit)
	Successful	C0511 P…	A0603 PC-3	ICMP		0.000	N	2	(edit)
	Successful	C0511 P…	A0608 PC-3	ICMP		0.000	N	3	(edit)
	Successful	ASA050…	B0401 - 2	ICMP		0.000	N	4	(edit)
	Successful	C0509 P…	C0401 - 1	ICMP		0.000	N	5	(edit)
	Successful	C0509 P…	C0412 - 2	ICMP		0.000	N	6	(edit)

6th Floor

PDU List Window

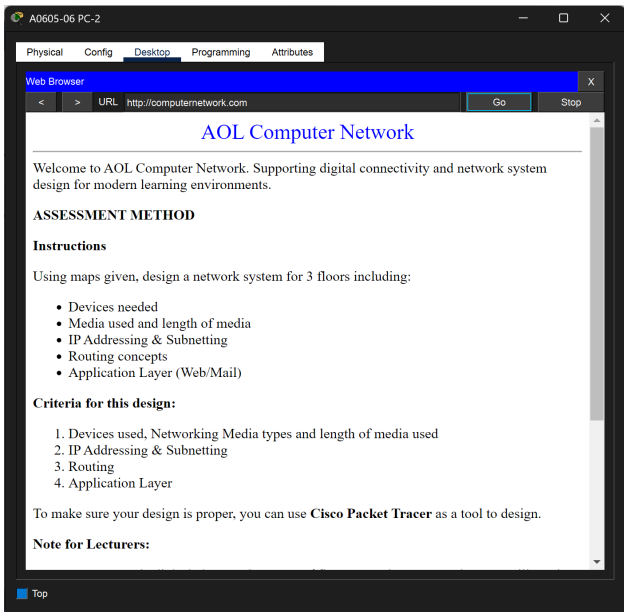
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	A0603 P…	A0608 PC-3	ICMP		0.000	N	0	(edit)
	Successful	A0603 P…	C0511 PC-1	ICMP		0.000	N	1	(edit)
	Successful	A0603 P…	Auditorium PC-1	ICMP		0.000	N	2	(edit)
	Successful	AO603 P…	C0507 PC-1	ICMP		0.000	N	3	(edit)
	Successful	A0605-0…	B0401 - 2	ICMP		0.000	N	4	(edit)
	Successful	A0605-0…	C0401 - 2	ICMP		0.000	N	5	(edit)
	Successful	A0605-0…	C0411 - 1	ICMP		0.000	N	6	(edit)

II. Application Layer



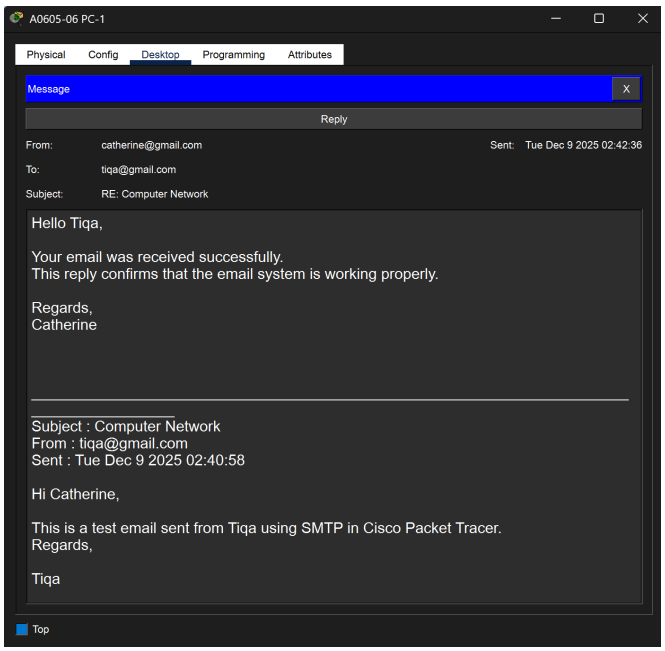
WEB - HTTP

Two servers are used, namely a DNS Server and an HTTP Server. The DNS Server functions to translate the website address from http://computernetwork.com into the IP address of the HTTP Server. Subsequently, the user's browser accesses the website using the domain name, and the webpage that has been created on the HTTP Server can then be displayed.



Email - STMP

In this project, an Email Server is used to handle the email delivery process using the SMTP protocol. Each user has an email account to perform email testing. The test results show that emails are successfully sent from one PC to another through the server.



CHAPTER III
Conclusion

I. Conclusion

Based on the analysis and design carried out, the computer network designed for the three floors of the BINUS Alam Sutera campus building meets the criteria of efficiency, scalability, and reliability. The network design includes the selection of hardware devices, transmission media, subnetting using the Variable Length Subnet Mask (VLSM) method, and inter-floor routing implemented through static routing. Simulations conducted using Cisco Packet Tracer demonstrate that the network operates properly and is able to meet connectivity requirements across all floors.

In addition, the cost estimation provides a realistic overview of the budget required for network implementation. Application layer testing also ensures that the network is capable of supporting various services required by users.

II. Recommendations

Regular maintenance is required to ensure that network hardware and software operate properly. If network demand increases, it is recommended to upgrade hardware such as routers and switches so that the network can continue to handle higher traffic volumes. Providing training for campus IT staff on network configuration and troubleshooting will improve effectiveness in handling issues. Regular evaluations of network performance should also be conducted to ensure that the network consistently meets campus operational needs.