campus network

Group D

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Group members

Campus Network Design Project

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Name & Surname	W	F	W	F	W	F	W	F	W	F	W	F	W	F	W	F
Maduvha Mavhusha ST10191191	X	x	A	X	X	A	X	X								
Ntsako Majozi ST10155751	X	x	x	A	X	X	X	X								
Mpho Raletjena ST10190094	X	X	X	X	X	X	X	X								
Tsholo Chuene ST10179994	X	X	X	A	X	X	X	X								
Lefa Mashabela ST10232393	X	X	X	A	X	X	X	X								

X=INDICATES a member was present

A=INDICATES a member was absent

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INTRODUCTION

In the realm of modern educational institutions, the importance of a robust and efficient campus network infrastructure cannot be overstated. This project endeavors to address this critical need by proposing the design and configuration of a comprehensive campus network for a college. In this endeavor, our group has set its sights on creating a network that will cater to the requirements of 100 active users, who are strategically distributed across three primary buildings: the main college building, building 1, and building 2. Each of these structures possesses distinct needs, ranging from wireless accessibility to stringent security protocols. The ultimate objective of this undertaking is to establish a network that is both efficient and secure, thus fostering an environment conducive to the academic and administrative activities of the college.

Campus Network Design

In this project, our group aims to design and configure a comprehensive campus network infrastructure for a college. The network will accommodate 100 active users, distributed across three main buildings: the main college building, building 1, and building 2. Each building has unique requirements, including wireless access and secure connectivity. Our primary goal is to create an efficient and secure network that supports the college's academic and administrative activities.

Overview

Our project centers around the design and configuration of a campus network for a college. The college comprises three buildings: the main building, building 1, and building 2. The buildings are interconnected by various distances, and each has its own set of requirements.

- **Number of Active Users:** 100
- **Building Distribution:**
  - Main Building: 30 users
  - Building 1: 30 users
  - Building 2: 40 users

Project Scope

In this project, our group aims to design and configure a comprehensive campus network infrastructure for a college. The network will accommodate 100 active users, distributed across three main buildings: the main college building, building 1, and building 2. Each building has unique requirements, including wireless access and secure connectivity. Our primary goal is to create an efficient and secure network that supports the college's academic and administrative activities. A Scenario Overview: Campus Network Design Overview Our project centers around the design and configuration of a campus network for a college. The college comprises three buildings: the main building, building 1, and building 2. The buildings are interconnected by various distances, and each has its own set of requirements. - Number of Active Users: 100 - Building Distribution: - Main Building: 30 users - Building 1: 30 users - Building 2: 40 users - Wireless Access: Each building contains a lobby, a 200 sqft open space, where wireless access to the network is essential. - Security: A Only authorized personnel are allowed to access the wireless network. - Distances between Buildings: - Main Building to Building 1: 300 meters - Main Building to Building 2: 90 meters - Building 1 to Building 2: 70 meters - Internet Connection: A high-speed cable Internet connection is available in the main building and must be shared among all users. - User Devices and Printers: Each user possesses one computer device, and three high-speed printers are present in each building. Project Objectives: 1. Design and configure the campus network infrastructure for efficient connectivity. 2. Implement a secure wireless access solution, ensuring only authorized users can connect. 3. Share the high-speed cable Internet connection among all users. 4. Establish appropriate IP address management and schema for the network. 5. Determine the necessary equipment, topology, features, and services required. 6. Create a comprehensive bill of materials detailing the equipment and quantities needed for the setup. Throughout this project, our group will collaborate to design, configure, and document the campus network infrastructure, ensuring that it meets the needs of the college's diverse user base while prioritizing security, efficiency, and reliability.

IP NETWORK TABLE

Network Segment	IP Range	Subnet Mask	Description
Servers	10.0.0.0 - 10.0.15.255	255.255.240.0	Database
Wireless Network	10.1.0.0 - 10.1.15.255	255.255.240.0	Wi-Fi
Printers	10.2.0.0 - 10.2.15.255	255.255.240.0	Printer Devices
Core Router	10.3.0.0 - 10.3.15.255	255.255.240.0	Router
VoIP	10.4.0.0 - 10.4.15.255	255.255.240.0	Phones
Management	10.5.0.0 - 10.5.15.255	255.255.240.0	Admin
CCTV	10.6.0.0 - 10.6.15.255	255.255.240.0	Surveillance
Internet	Public IP addresses	N/A	Internet Access

IP address management:

The IP addresses will be managed using a DHCP server. The DHCP server will be located on the core router.

Secure wireless access:

The wireless network will be secured using WPA2 encryption. Only authorized users will be able to connect to the wireless network.

Internet sharing:

The high-speed cable Internet connection will be shared using a router. The router will be located in the main building.

Features and services:

The campus network will provide the following features and services:

- File sharing
- Printer sharing
- Internet access
- Email

- VoIP
- Video conferencing

CONFIGURATIONS

- Internet Connection:

A high-speed cable Internet connection is available in the main building and must be shared among all users.

- User Devices and Printers:

Each user possesses one computer device, and three high-speed printers are present in each building.

Project Objectives:

1. Design and configure the campus network infrastructure for efficient connectivity.
2. Implement a secure wireless access solution, ensuring only authorized users can connect.
3. Share the high-speed cable Internet connection among all users.
4. Establish appropriate IP address management and schema for the network.
5. Determine the necessary equipment, topology, features, and services required.
6. Create a comprehensive bill of materials detailing the equipment and quantities needed for the setup.

Throughout this project, our group will collaborate to design, configure, and document the campus network infrastructure, ensuring that it meets the needs of the college's diverse user base while prioritizing security, efficiency, and reliability.

Hardware requirement analysis:

The following hardware is required for the campus network:

- 1 core router
- 2 distribution switches
- 3 access switches
- 3 wireless access points
- 100 IP addresses
- 30 Ethernet cables
- 30 wireless access points

IP address schema:

Device	IP Address	Subnet Mask	Description
Core Router	10.3.0.1/20	255.255.240.0	Core Router
Distribution Switch 1	10.3.0.2/20	255.255.240.0	Distribution Switch 1
Distribution Switch 2	10.3.0.2/20	255.255.240.0	Distribution Switch 2
Access Point 1	10.1.0.1/20	255.255.240.0	Access Point 1 [Building 1]
Access Point 2	10.1.0.2/20	255.255.240.0	Access Point 2 [Building 2]
Access Point 3	10.1.0.3/20	255.255.240.0	Access Point 3 [Building 3]
Server	10.0.0.1/20	255.255.240.0	Server
Building 1 Users	10.1.0.4 - 10.1.0.33/20	255.255.240.0	Users in Building 1
Building 2 Users	10.1.0.34 - 10.1.0.63/20	255.255.240.0	Users in Building 2
Building 3 Users	10.1.0.64 - 10.1.0.103/20	255.255.240.0	Users in Building 3

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- Printer sharing
- Internet access
- Email
- VoIP
- Video conferencing

Bill of materials:

Materials	Bill (Pricing)
1 core router	R150 000
2 distribution switches	R150 000
3 access switches	R120 000
3 wireless access points	R75 000
100 IP addresses	R100 000
30 Ethernet cables	R900
30 wireless access points	R4 500

The following is a bill of materials for the campus network:

- Hardware: R260,000
- 1 core router: R150,000 each
- 2 distribution switches: R75,000 each
- 3 access switches: R40,000 each
- 3 wireless access points: R25,000 each
- 100 IP addresses: R1,000
- 30 Ethernet cables: R30 each
- 30 wireless access points: R150 each

The total cost of the campus network is relatively expensive, but it is important to consider the long-term benefits of a reliable and secure network infrastructure. A well-designed and implemented network can help to improve productivity, collaboration, and communication within the college. It can also help to protect the college's data and assets from cyberattacks.

It is also important to note that the cost of the campus network may vary depending on the specific requirements of the college. For example, if the college needs to support more users or devices, the cost of the network will increase. Additionally, if the college wants to implement additional features or services, such as video conferencing or cloud storage, the cost of the network will also increase. It is important to work with a qualified network engineer to develop a customized solution that meets the specific needs of the college and fits within its budget

List of Needs:

Networking Equipment:

- Routers, switches, access points
- Network cables and connectors
- Firewall and security devices
- Wireless controllers
- Power backup systems (UPS)

Computing Equipment:

- Computers for 100 users
- High-speed printers for each building
- Server hardware (if needed)

Software and Licensing:

- Network management software
- Security software and licenses
- IP address management tools
- Internet sharing and monitoring software

Internet Connection:

- High-speed cable Internet subscription

Security Measures:

- Authentication and access control systems
- Encryption and cybersecurity measures

Cabling and Infrastructure:

- Ethernet cables
- Wireless access point installation
- Physical network infrastructure setup

Training and Documentation:

- Training for IT staff and end-users
- Documentation for network configuration and management

Deadlines:

Task	Deadline	Notes
Equipment Procurement	Within 4 weeks from project start	N/A
Network Infrastructure Setup	Main Building: Within 2 weeks Building 1: Within 2 weeks Building 2: Within 2 weeks	Concurrent with equipment procurement
Security Implementation	Concurrent with infrastructure setup	N/A
Internet Sharing Configuration	Concurrent with infrastructure setup	N/A
IP Address Management	Concurrent with infrastructure setup	N/A
Training and Documentation	Within 1 week after network setup completion	N/A
Testing and Quality Assurance	Within 1 week after network setup completion	N/A
Project Review and Finalization	Within 1 week after testing and quality assurance	N/A

Budget Breakdown:

1. **Hardware**:

- Core Router: R150,000
- 2 Distribution Switches (2 x R75,000): R150,000
- 3 Access Switches (3 x R40,000): R120,000
- 3 Wireless Access Points (3 x R25,000): R75,000
- IP Addresses: R1,000
- Ethernet Cables (30 x R30): R900
- Wireless Access Points (30 x R150): R4,500

Total Hardware Cost: R501,400

2. **Software and Licensing**:

- Security Software and Licenses: R10,000
- Network Management Software: R5,000
- Internet Sharing and Monitoring Software: R5,000

Total Software and Licensing Cost: R20,000

3. **Internet Connection**:

(Monthly cost, not included in initial setup)
- Estimated Monthly Internet Subscription: (To be provided separately)

4. **Security Measures:**

- Authentication and Access Control Systems: R15,000
- Encryption and Cybersecurity Measures: R10,000

Total Security Measures Cost: R25,000

5. **Cabling and Infrastructure**:

- Additional Cabling and Infrastructure Costs: R15,000

Total Cabling and Infrastructure Cost: R15,000

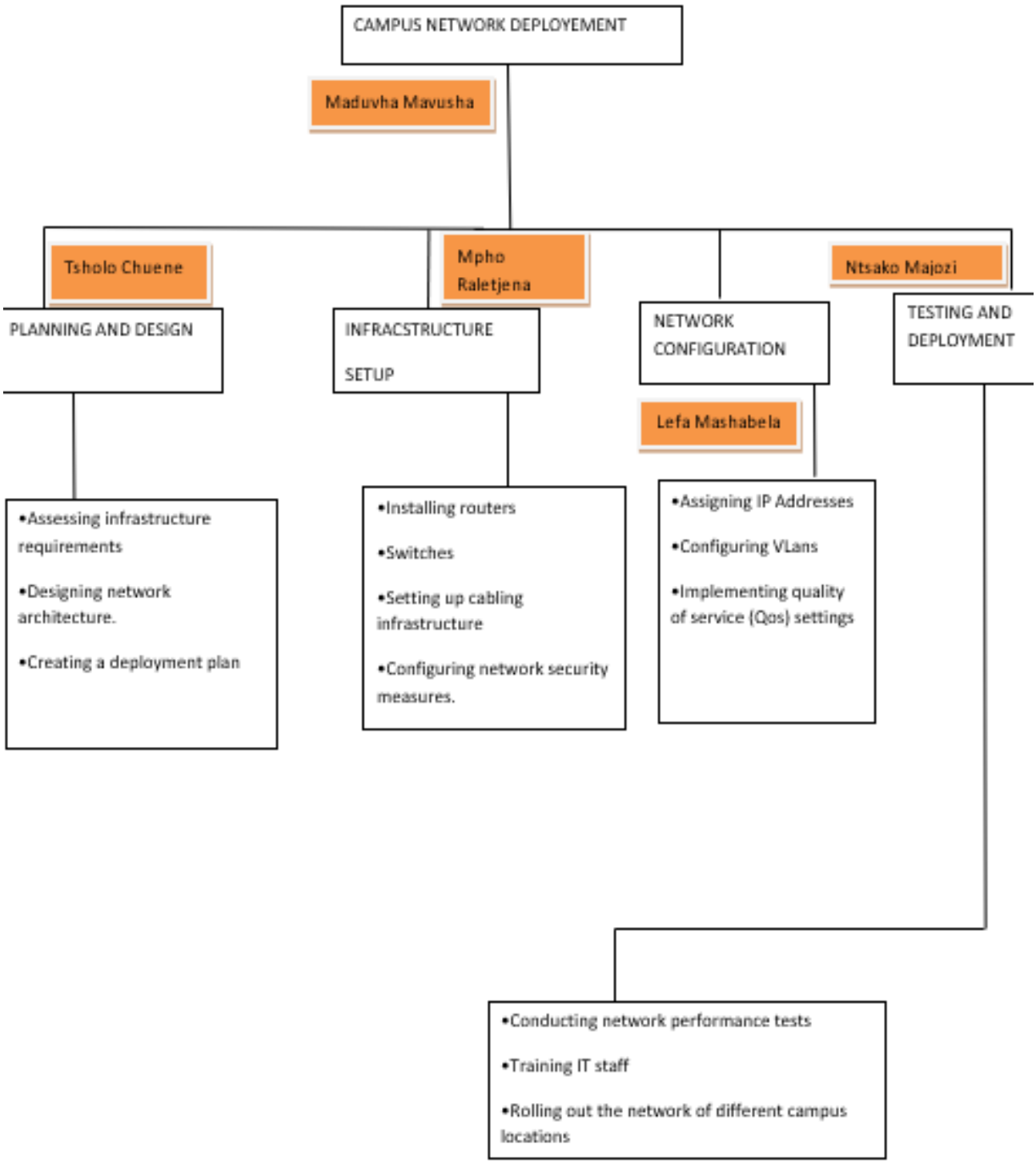
6. **Training and Documentation:**
- Training Costs: R10,000
- Documentation Costs: R5,000

Total Training and Documentation Cost: R15,000

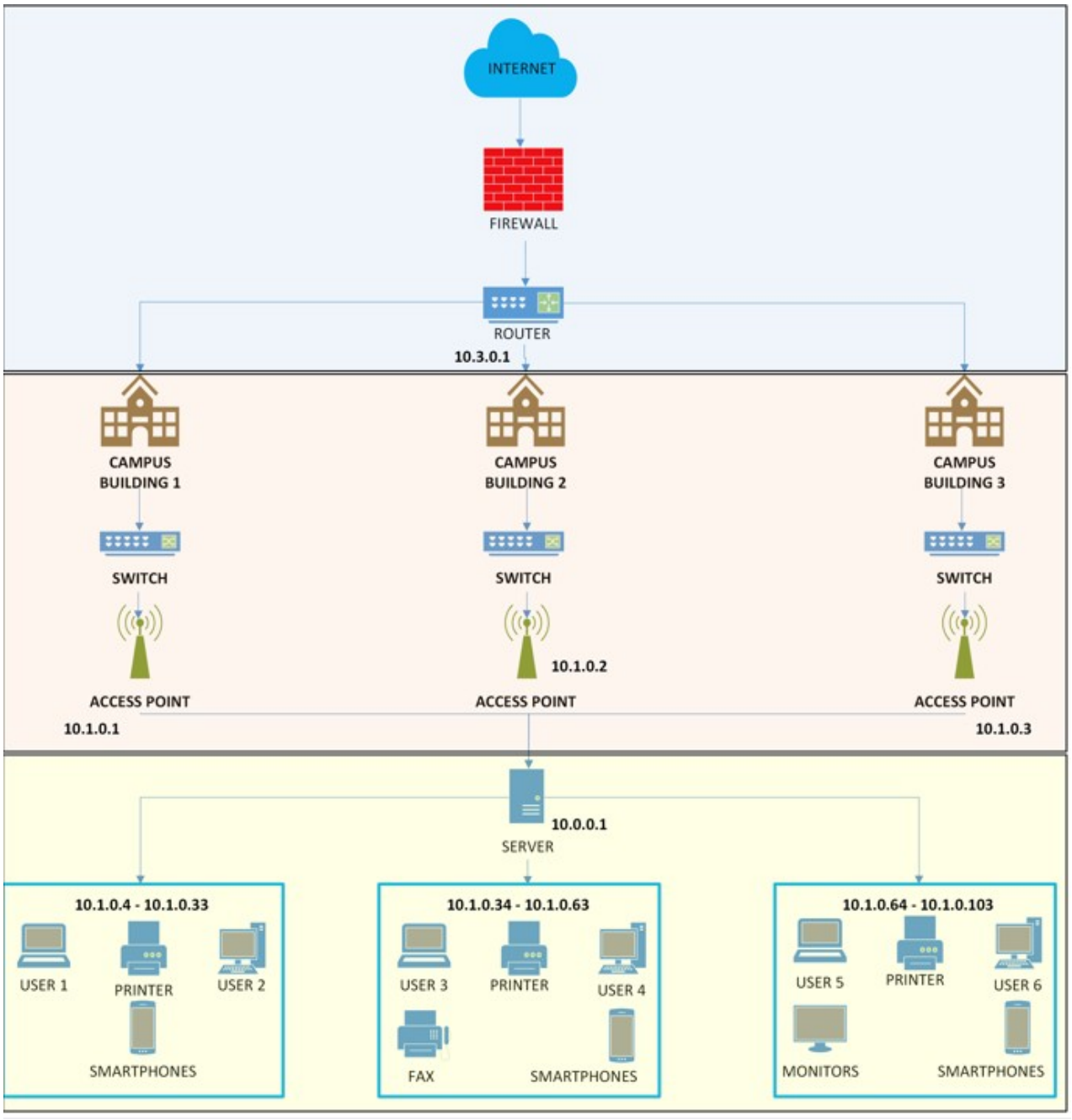
Estimated Project Budget:
- **Hardware**: R501,400
- **Software and Licensing:** R20,000
- **Security Measures**: R25,000
- **Cabling and Infrastructure**: R15,000
- **Training and Documentation**: R15,000

- **Monthly Internet Subscription**: To be provided separately

Work breakdown structure (WBS):



Network/Topology diagram



CORE LAYER
DISTRIBUTION LAYER
ACCESS LAYER

Explanation:

Internet: This is the external network that provides connectivity to the outside world.

Firewall: The firewall protects the campus network from external threats and filters incoming and outgoing traffic.

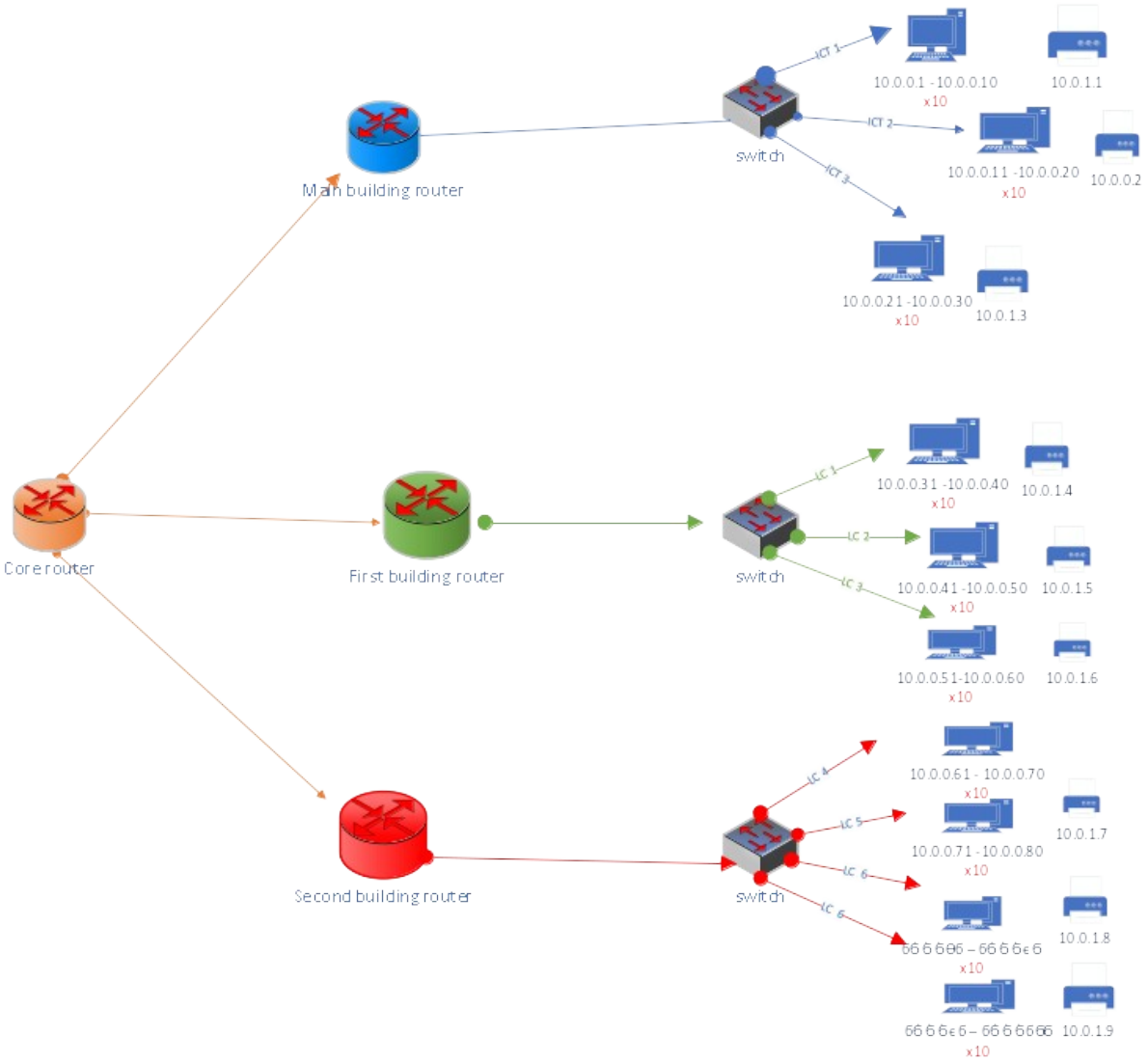
Router: The router connects the campus network to the Internet and routes traffic between the internal LANs and the external network.

Buildings: Each building on the campus has its own LAN, which may include multiple floors or departments.

Switches: These switches provide local network connectivity within each building. They connect devices within the same building to each other and to the router.

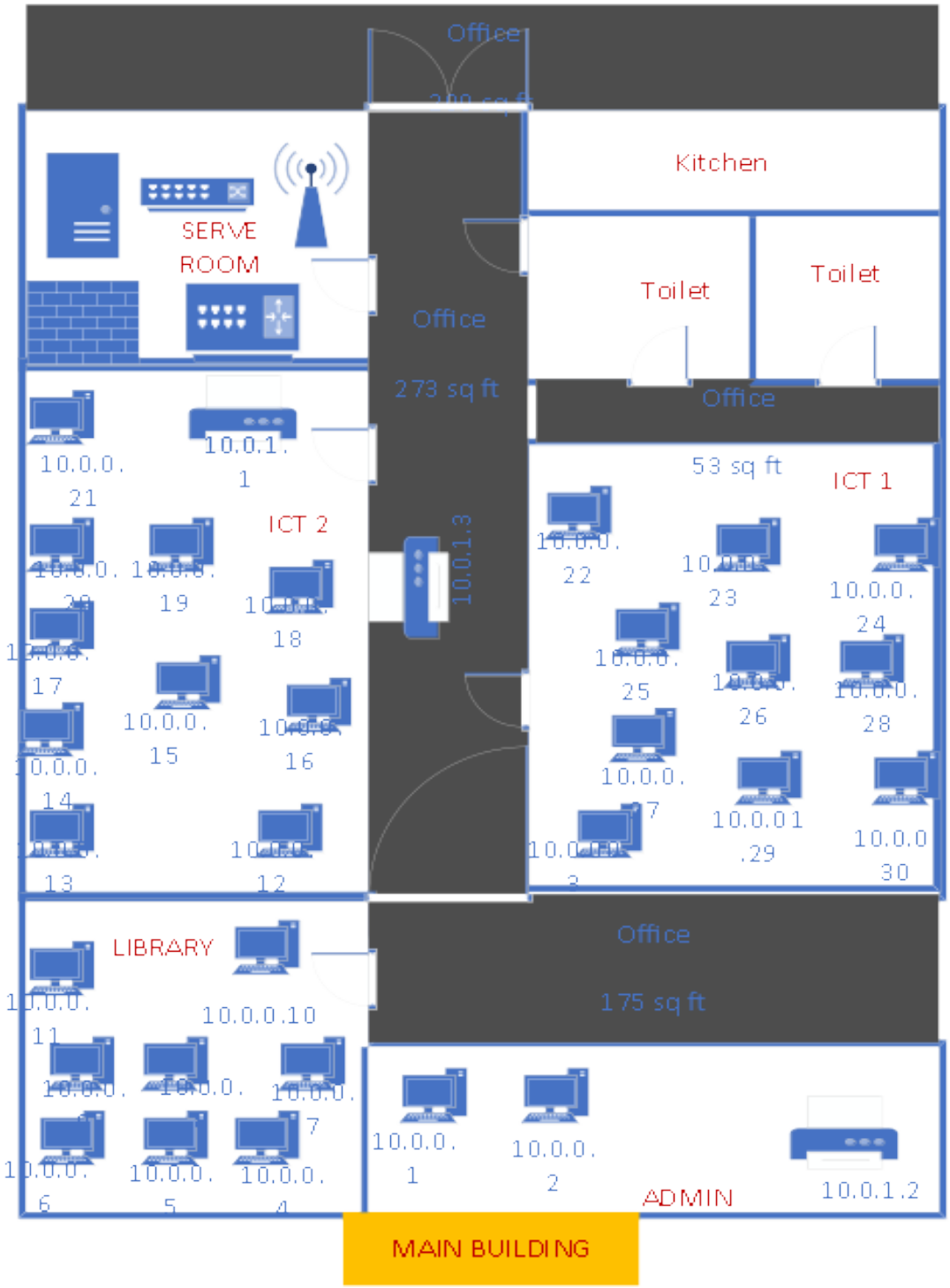
Access Points: Access points provide wireless connectivity within each building, allowing devices like laptops and smartphones to connect to the network.

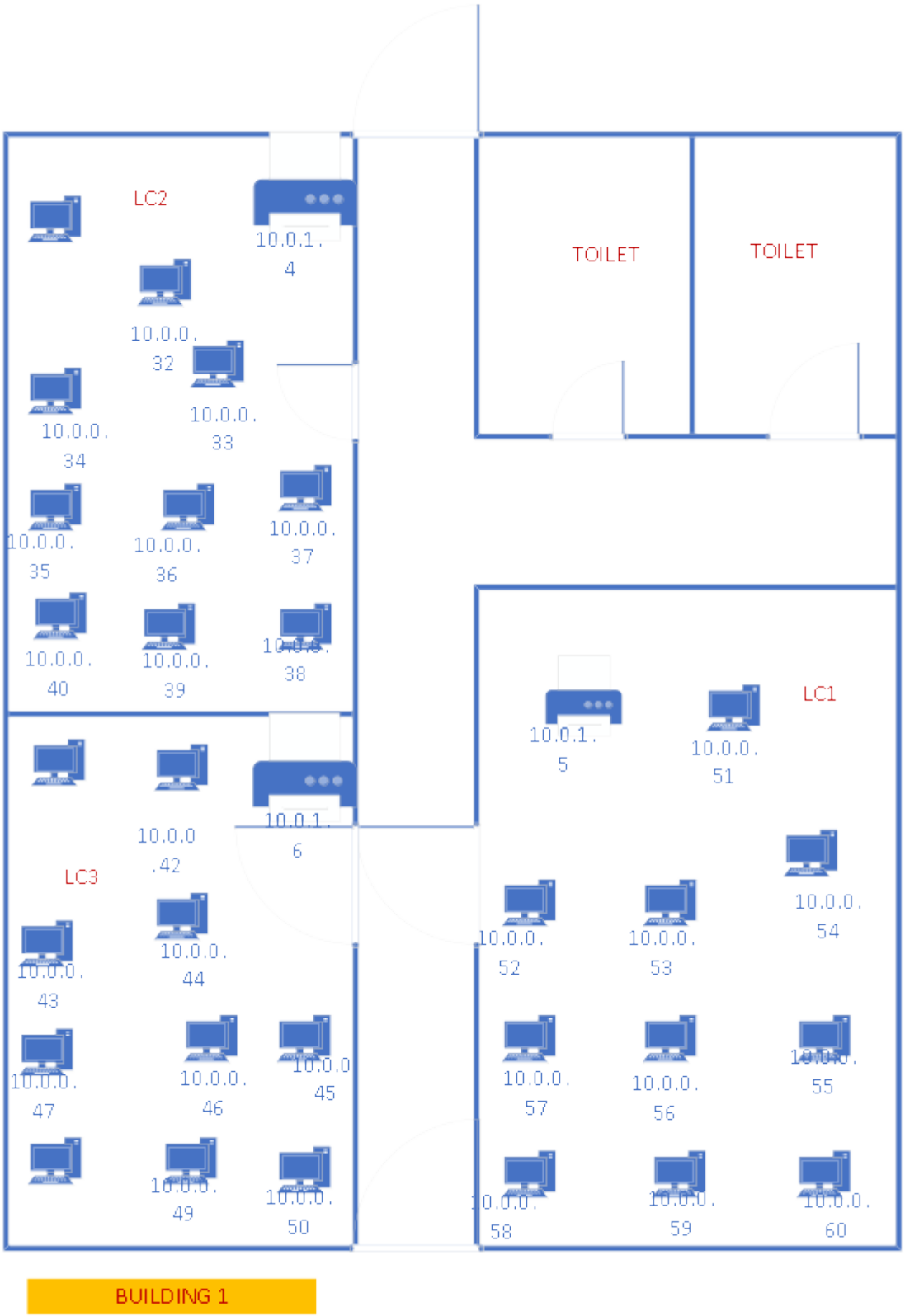
Devices: These represent end-user devices such as computers, laptops, and mobile devices, which connect to the network via wired or wireless connections.



Connection of the buildings

Floor Plan


Office
Kitchen
SERVE
ROOM
Toilet
Toilet
Office
273 sq ft
Office
53 sq ft
ICT 1
ICT 2
10.0.0.
21
10.0.1.
1
10.0.1.3
10.0.0.
22
10.0.0.
23
10.0.0.
24
10.0.0.
19
10.0.0.
18
10.0.0.
25
10.0.0.
26
10.0.0.
28
10.0.0.
17
10.0.0.
15
10.0.0.
16
10.0.0.
14
10.0.0.
27
10.0.01
.29
10.0.0
30
10.0.0.
13
10.0.0.
12
LIBRARY
Office
175 sq ft
10.0.0.
11
10.0.0.10
10.0.0.
1
10.0.0.
2
10.0.0.
6
10.0.0.
5
10.0.0.
4
ADMIN
10.0.1.2
MAIN BUILDING


LC2
10.0.1.
4
10.0.0.
32
10.0.0.
33
10.0.0.
34
10.0.0.
35
10.0.0.
36
10.0.0.
37
10.0.0.
40
10.0.0.
39
10.0.0.
38
TOILET
TOILET
LC1
10.0.1.
5
10.0.0.
51
10.0.0.
54
10.0.0.
52
10.0.0.
53
10.0.0.
57
10.0.0.
56
10.0.0.
58
10.0.0.
59
10.0.0.
60
LC3
10.0.0
.42
10.0.1.
6
10.0.0.
44
10.0.0.
43
10.0.0.
47
10.0.0.
46
10.0.0
45
10.0.0.
49
10.0.0.
50
BUILDING 1


LC4
10.0.0.
61
10.0.1.
7
10.0.0.
62
10.0.0.
63
10.0.0.
64
10.0.0.
65
10.0.0.
66
10.0.0.
67
10.0.0.
68
10.0.0.
69
10.0.0.
70
LC5
10.0.1.
8
10.0.0.
71
10.0.0.
72
10.0.0.
73
10.0.0.
74
10.0.0.
75
10.0.0.
76
10.0.0.
77
10.0.0.
78
10.0.0.
79
10.0.0.
80
LC6
10.0.0.
91
10.0.0.
92
10.0.0.
93
10.0.0.
94
10.0.0.
95
10.0.0.
96
10.0.0.
97
10.0.0.
98
10.0.0.
99
10.0.0.
100
9
10.0.1.
LC7
10.0.0.
81
10.0.0.
82
10.0.0.
83
10.0.0.
84
10.0.0.
85
10.0.0.
86
10.0.0.
87
10.0.0.
88
10.0.0.
89
10.0.0.
90

BUILDING 2

Inventory Sheet

	Quantity	Unit Cost (R)	Total Cost (R)
Core Router	1	150,000	150,000
Distribution Switches	2	75,000	150,000
Access Switches	3	40,000	120,000
Wireless Access Points	3	25,000	75,000
IP Addresses	100	1,000	1,000
Ethernet Cables	30	30	900
Wireless Access Points	30	150	4500

Total Hardware Cost:	**R 501,400**

Software and Licensing Inventory:

Item Description	Quantity	Unit Cost (R)	Total Cost (R)
Security Software	1	10,000	10,000
Network Management Software	1	5,000	5,000
Internet Software	1	5,000	5,000

Total Software and Licensing Cost:	**R 20,000**

Security Measures Inventory:

Item Description	Quantity	Unit Cost (R)	Total Cost (R)
Authentication Systems	1	15,000	15,000
Encryption and	1	10,000	10,000

Cybersecurity

Total Security Measures Cost:	**R25,000**

Cabling and Infrastructure Inventory:

Item Description	Quantity	Unit Cost (R)	Total Cost (R)
| Additional Cabling and Infrastructure	1	15,000	15,000

Total Cabling and Infrastructure Cost:	**R 15,000**

Training and Documentation Inventory:

Item Description	Quantity	Unit Cost (R)	Total Cost (R)
Training Costs	**1**	**5,000**	**5,000**
Documentation Costs	**1**	**5,000**	**5,000**

Total Training and Documentation Cost:	**R 15,000**

Total Project Budget:	**R 576,400**

Abstract

Enhancing Connectivity and Efficiency: A Campus Network Infrastructure Upgrade

Abstract:

The dependability and effectiveness of a campus network infrastructure are crucial in a time when digital connectivity and data-driven operations are crucial. In order to address the changing needs of our educational institution, this project, named "Enhancing Connectivity and Efficiency: A Campus Network Infrastructure Upgrade," is a thorough effort.

Objective:

The main goal of this project is to build a strong, adaptable, and secure campus network that meets the needs of our students, teachers, and staff today while also putting us in a position to take advantage of future technology developments. The main goals are as follows:

Improved Connectivity:

To provide seamless and high-speed network connectivity across all campus buildings and areas, ensuring a smooth online learning and administrative experience.

Enhanced Security:

To bolster network security through advanced firewall systems, intrusion detection mechanisms, and regular security audits, safeguarding sensitive data and intellectual property.

Scalability:

To design a network architecture that can accommodate future growth in the number of devices and bandwidth requirements.

Reliability:

To minimize network downtime through redundant links, failover mechanisms, and proactive maintenance.

Efficient Resource Management:

To optimize network resources, such as bandwidth allocation and load balancing, for improved performance and cost-effectiveness.

Scope:

The scope of this project encompasses the following major components:

Network Hardware Upgrade:

This includes the procurement and installation of modern core routers, distribution switches, access switches, and wireless access points to replace outdated infrastructure.

Security Enhancement:

Implementation of advanced security measures, including next-generation firewalls, intrusion prevention systems, and regular security audits, to protect against cyber threats.

Server and Application Deployment:

Provisioning and configuration of servers to host essential applications, ensuring reliability and accessibility.

Comprehensive Documentation:

Creation of detailed network documentation, including network diagrams, configuration files, and operational procedures, to facilitate efficient network management.

Significance:

This project holds paramount significance as it directly impacts the educational and administrative functions of our institution. By investing in a modernized campus network infrastructure, we are poised to offer an enhanced educational experience, streamline administrative operations, and remain competitive in a rapidly evolving digital landscape. Moreover, the project aligns with our commitment to data security and the responsible utilization of technological resources.

As we embark on this journey to fortify our campus network, we anticipate not only improved network performance but also a heightened sense of connectivity and adaptability across our entire academic community.

In conclusion, This abstract provides a concise overview of the campus network project, outlining its objectives, scope, and significance, and serves as an introduction to the project's details and goals.