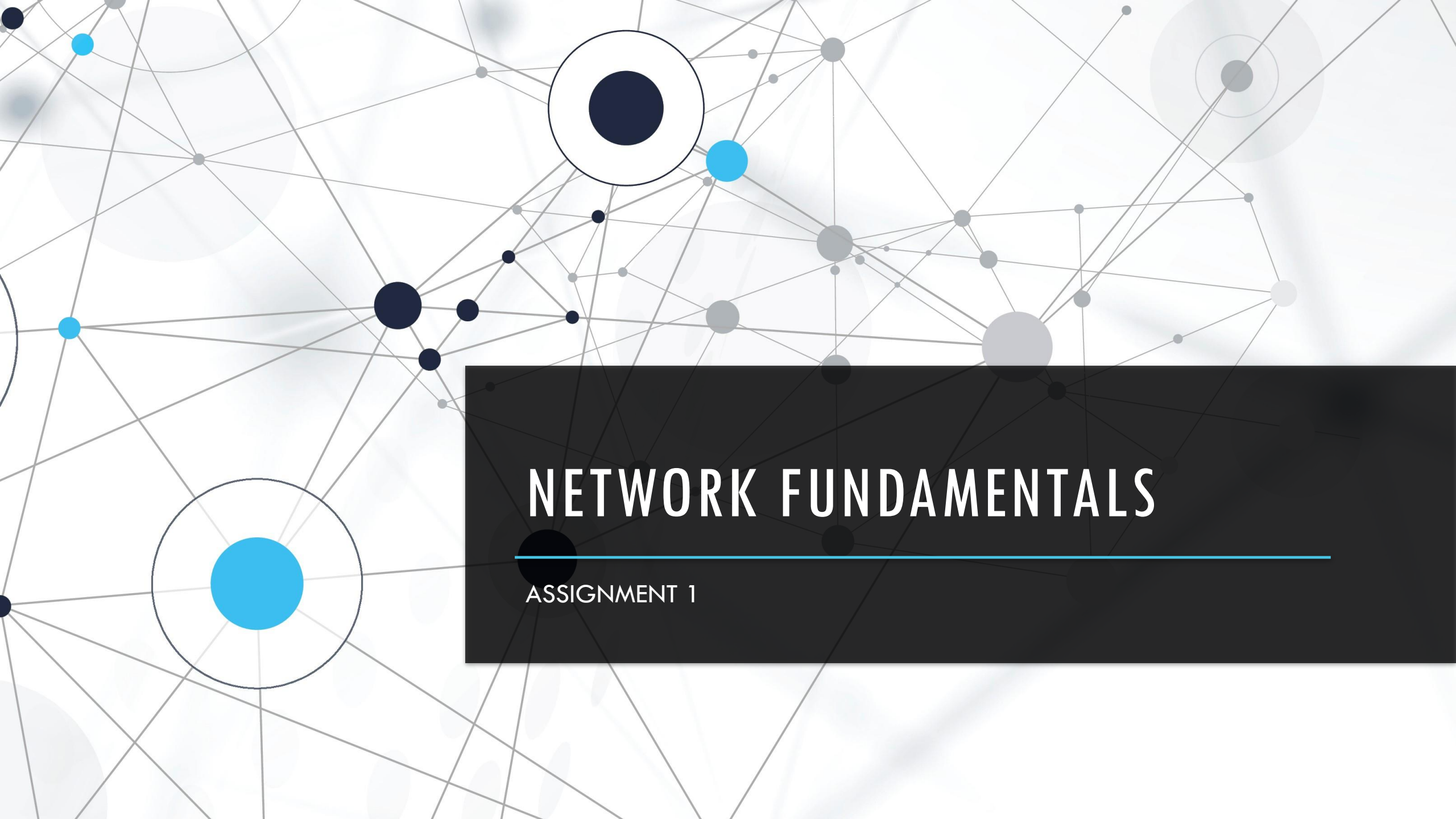


NETWORK FUNDAMENTALS

ASSIGNMENT 1

GROUP MEMBERS

ID	NAME
IT23184176	C.P.WANNIARACHCHI
IT23150652	D.C.B.V.D.S.WIMALASENA
IT23199194	K.P.D.M.SOMACHANDRA

SCENARIO

LMN Financial Group is a prominent financial services organization with 5 branches spread across the country. The company caters to a diverse range of clients, including individuals, businesses, and institutions. With a workforce of over 30,000 employees, LMN Financial heavily relies on a robust network infrastructure for seamless communication, secure financial transactions, and data management. The IT department is tasked with modernizing the network architecture to meet the growing demands of the organization.

FOCUSSED PARTS ON THE NETWORK

CORE NETWORK

DISTRIBUTION NETWORK

ACCESS NETWORK

WIRELESS NETOWORK

SECURITY

MANAGEMENT

BACKUP AND REDUNDANCY

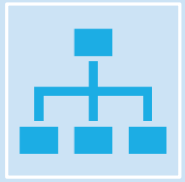
CENTRALIZED NAETWORK MANAGEMENT SYSTEM

ASSUMPTIONS

THIS NETWORK PROJECT HAS A BUDGET OF 1.3 MILLION USD.

ALL BRANCHES HAVE HIGHSPEED INTERNET CONNECTIVITY

LOGICAL TOPOLOGY DESIGN

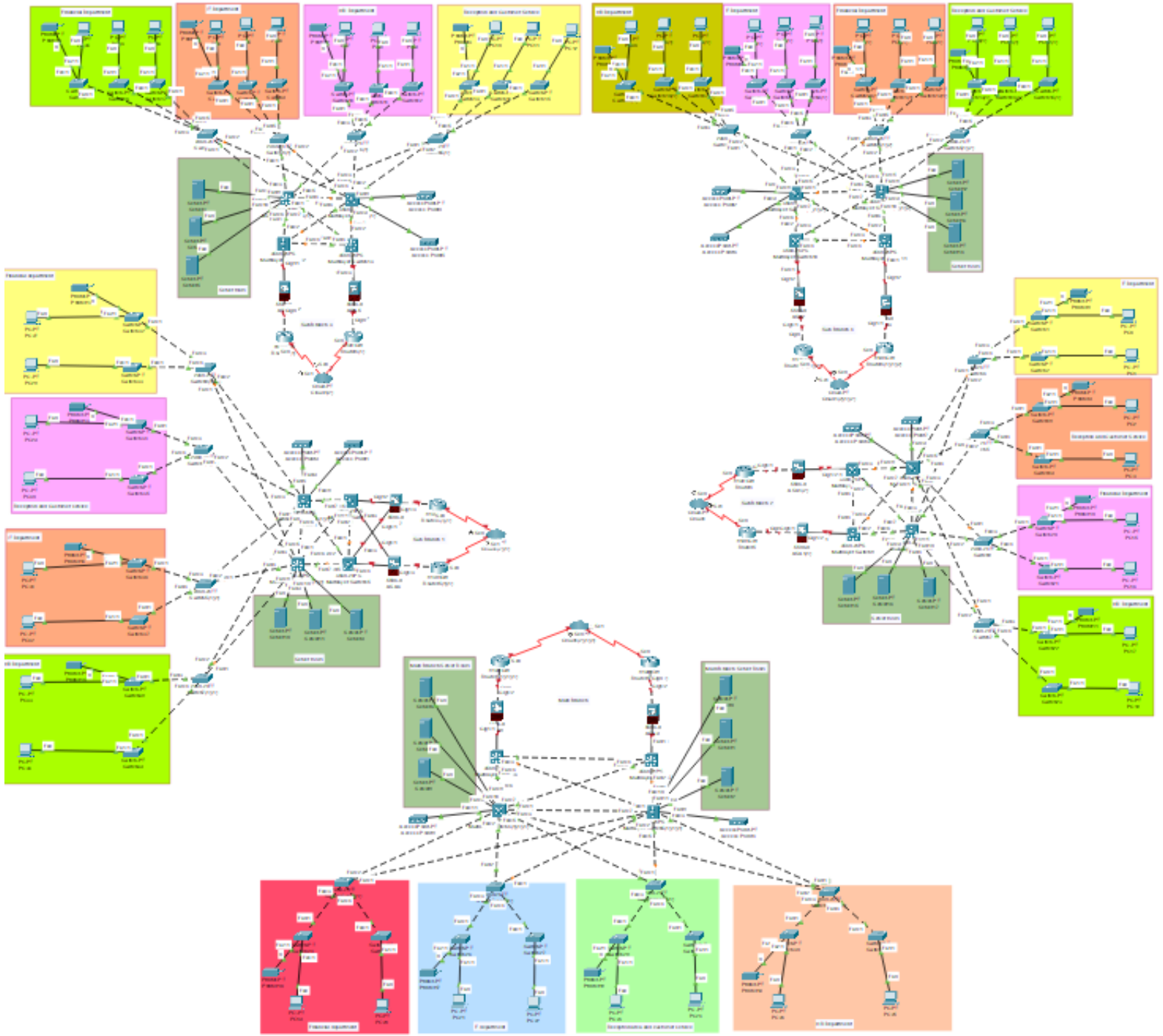


The logical topology design for the proposed network is build with a hierarchical structure

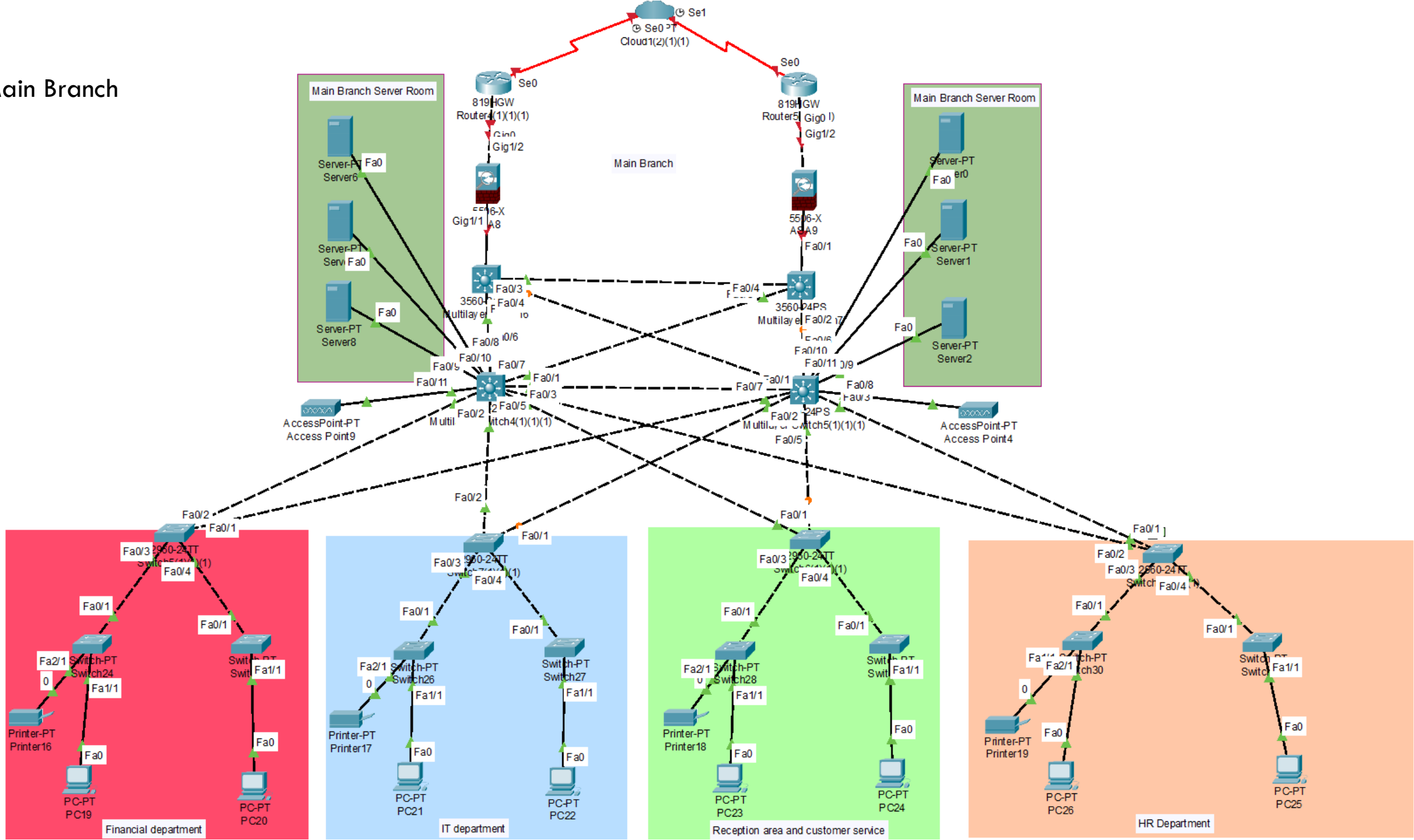
Server room for the whole company is located in the main branch.

Each branch is connected to the cloud

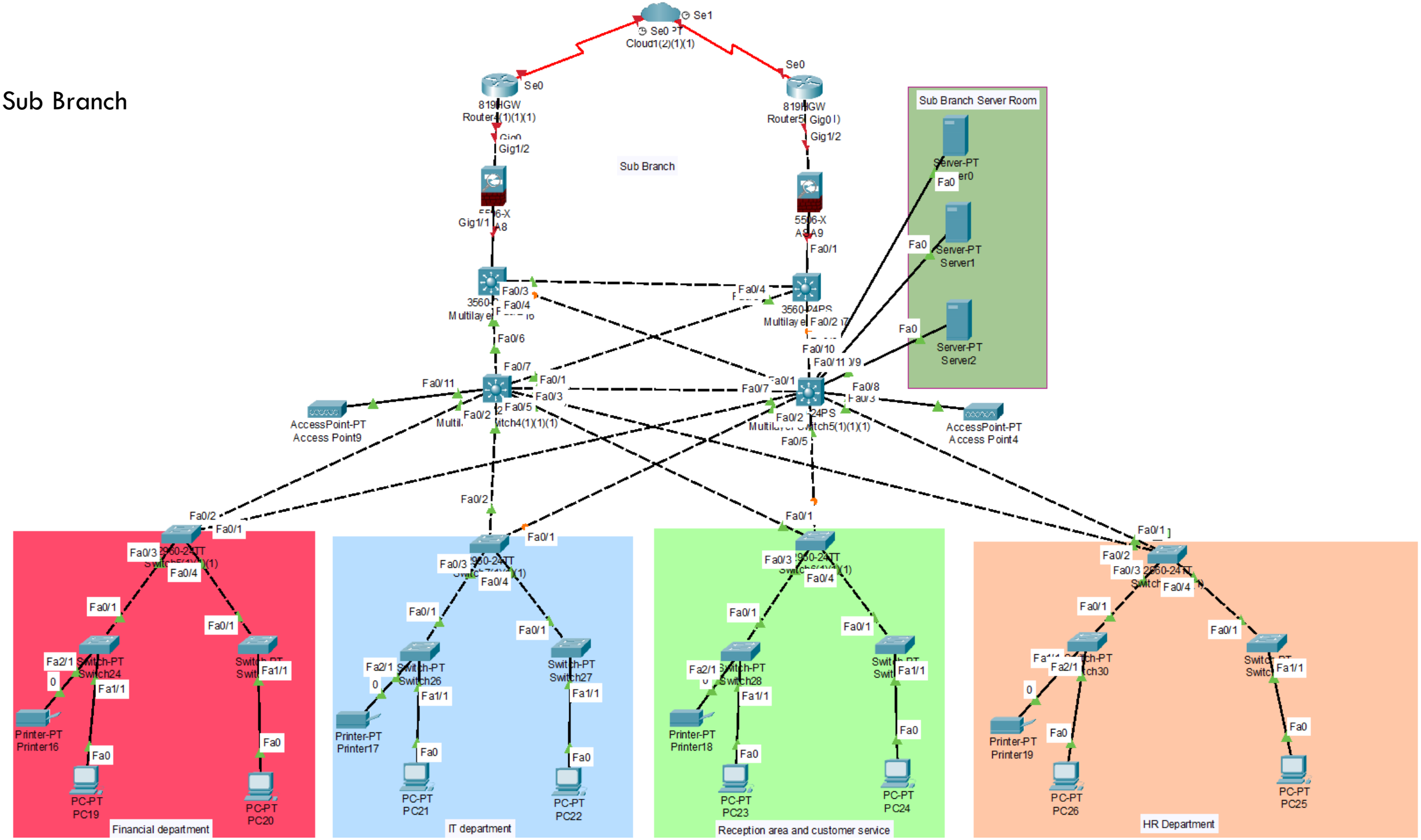
Whole Network



Main Branch


Main Branch
Main Branch Server Room
Main Branch Server Room
Server-PT Server6
Server-PT Server8
Server-PT Server1
Server-PT Server2
Cloud1(2)(1)(1)
819HGW Router4(1)(1)(1)
819HGW Router5
Main Branch
AccessPoint-PT Access Point9
AccessPoint-PT Access Point4
Financial department
IT department
Reception area and customer service
HR Department
Printer-PT Printer16
Printer-PT Printer17
Printer-PT Printer18
Printer-PT Printer19
PC-PT PC19
PC-PT PC20
PC-PT PC21
PC-PT PC22
PC-PT PC23
PC-PT PC24
PC-PT PC25
PC-PT PC26
Switch-PT Switch24
Switch-PT Switch26
Switch-PT Switch27
Switch-PT Switch28
Switch-PT Switch30

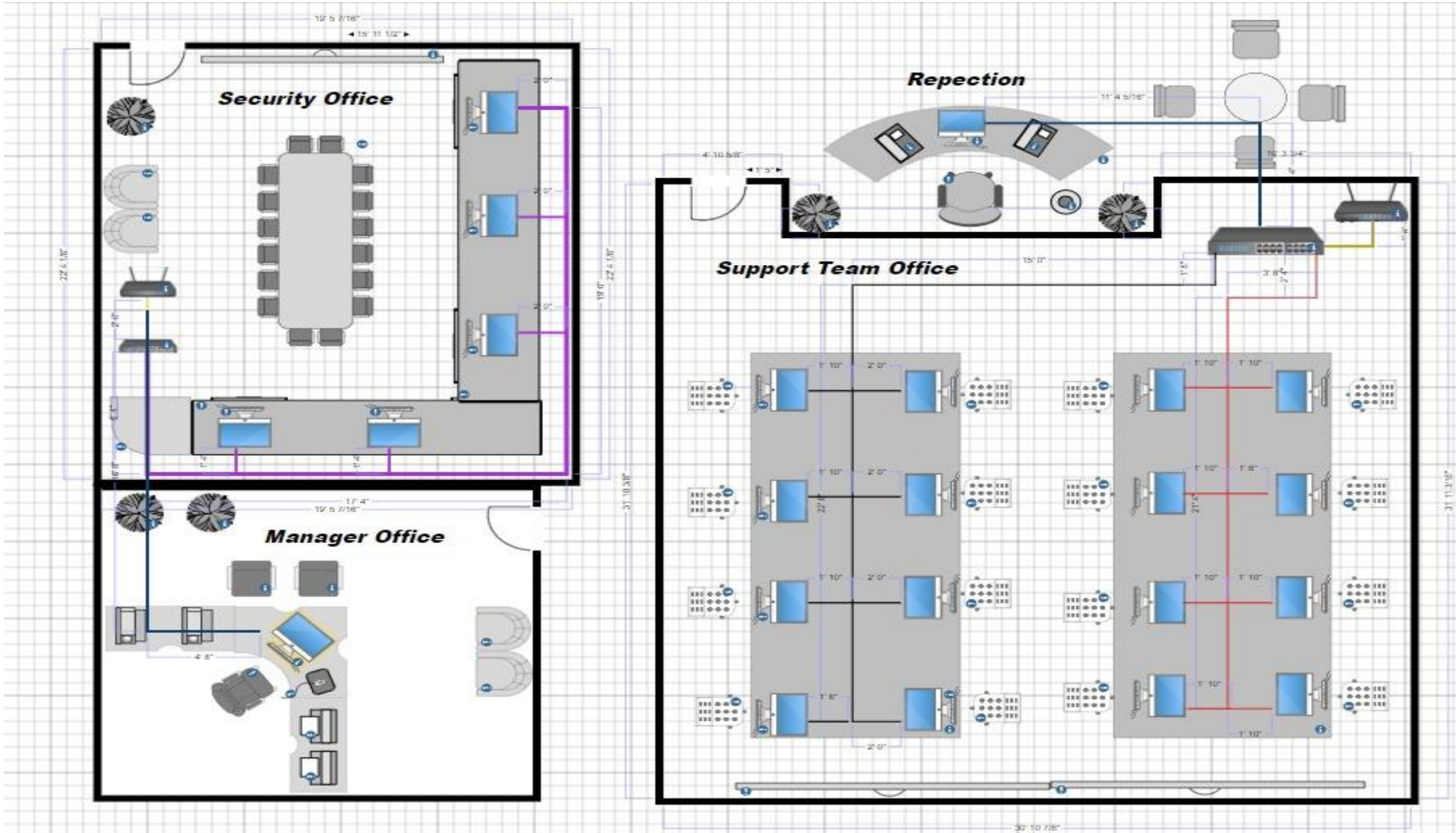
A Sub Branch


Se1
Se0
Cloud1(2)(1)(1)
Se0
Se0
819HGW
Router4(1)(1)(1)
819HGW
Router5
Gig0/1
Gig0/
Gig1/2
Gig1/2
Sub Branch
Sub Branch Server Room
Server-PT
Fa0
Server-PT
Server1
Server-PT
Server2
5506-X
A8
5506-X
A9
Gig1/1
Fa0/1
Fa0/3
Fa0/4
Fa0/4
Fa0/6
Fa0/10
Fa0/11
Fa0/9
Fa0/7
Fa0/1
Fa0/11
Fa0/1
Fa0/8
Fa0/3
Fa0/5
Fa0/2
Fa0/2
Fa0/5
AccessPoint-PT
Access Point9
AccessPoint-PT
Access Point4
Fa0/2
Fa0/1
Fa0/1
Fa0/3
Fa0/4
Fa0/1
Fa0/1
Fa2/1
Switch-PT
Switch24
Fa1/1
Fa1/1
Fa0
Fa0
Printer-PT
Printer16
PC-PT
PC19
PC-PT
PC20
Financial department
Switch-PT
Switch26
Switch-PT
Switch27
Printer-PT
Printer17
PC-PT
PC21
PC-PT
PC22
IT department
Switch-PT
Switch28
Printer-PT
Printer18
PC-PT
PC23
PC-PT
PC24
Reception area and customer service
Switch-PT
Switch30
Printer-PT
Printer19
PC-PT
PC26
PC-PT
PC25
HR Department

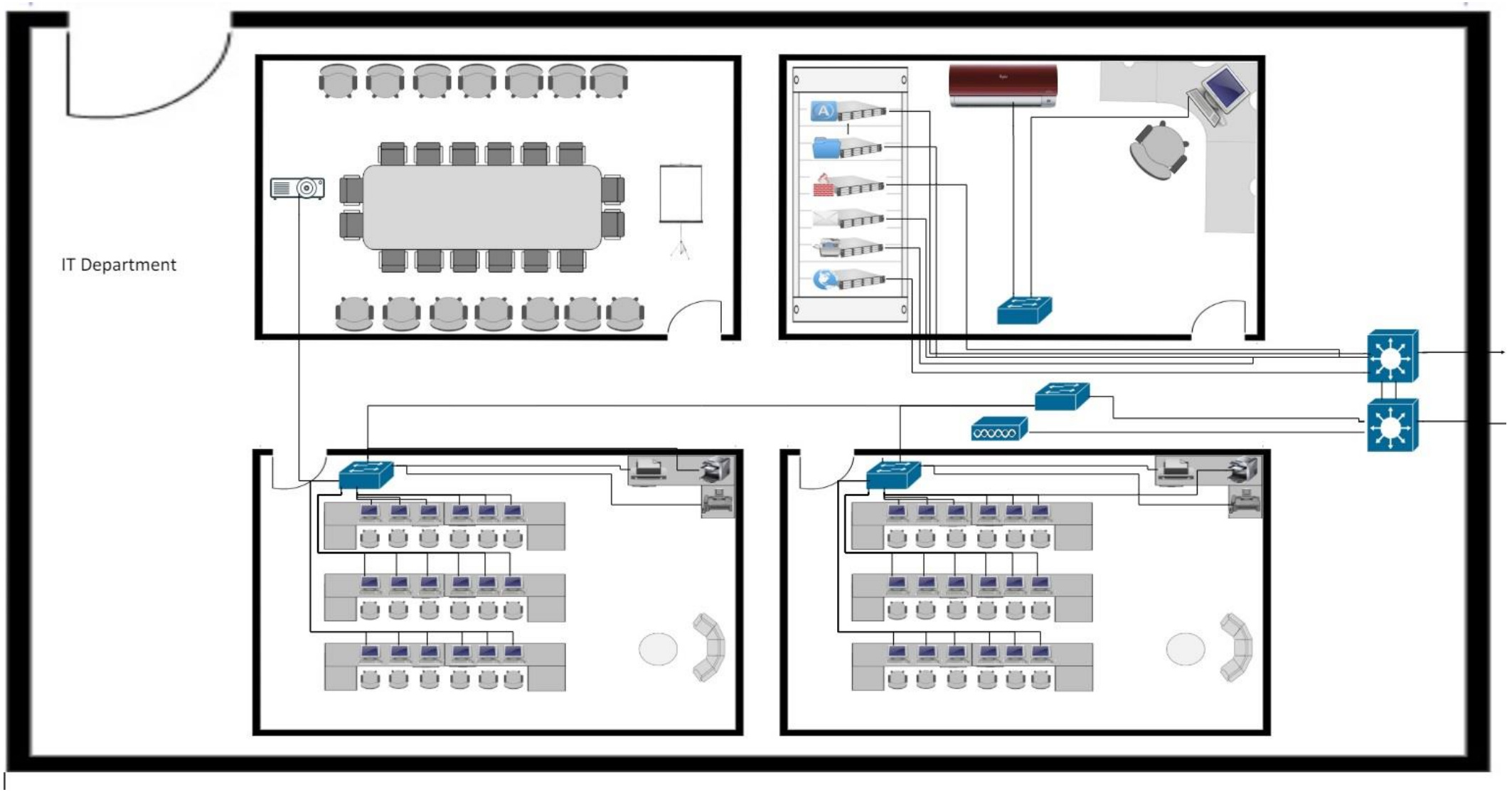
PHYSICAL DIAGRAM

1. Reception and customer service department
2. IT department
3. Financial department
4. HR Department
5. Main Server Room in the Main Branch

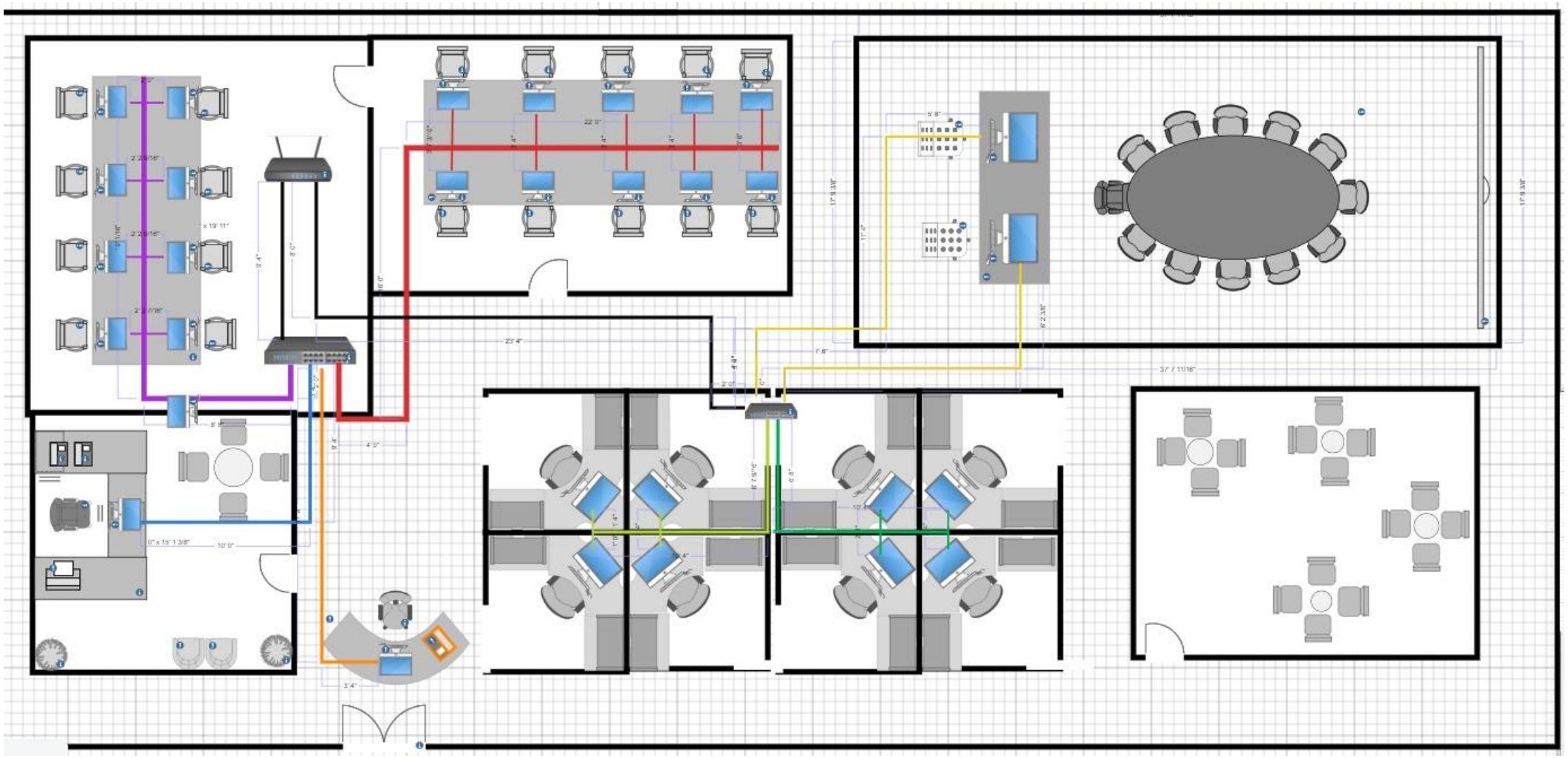
Reception and Customer Service



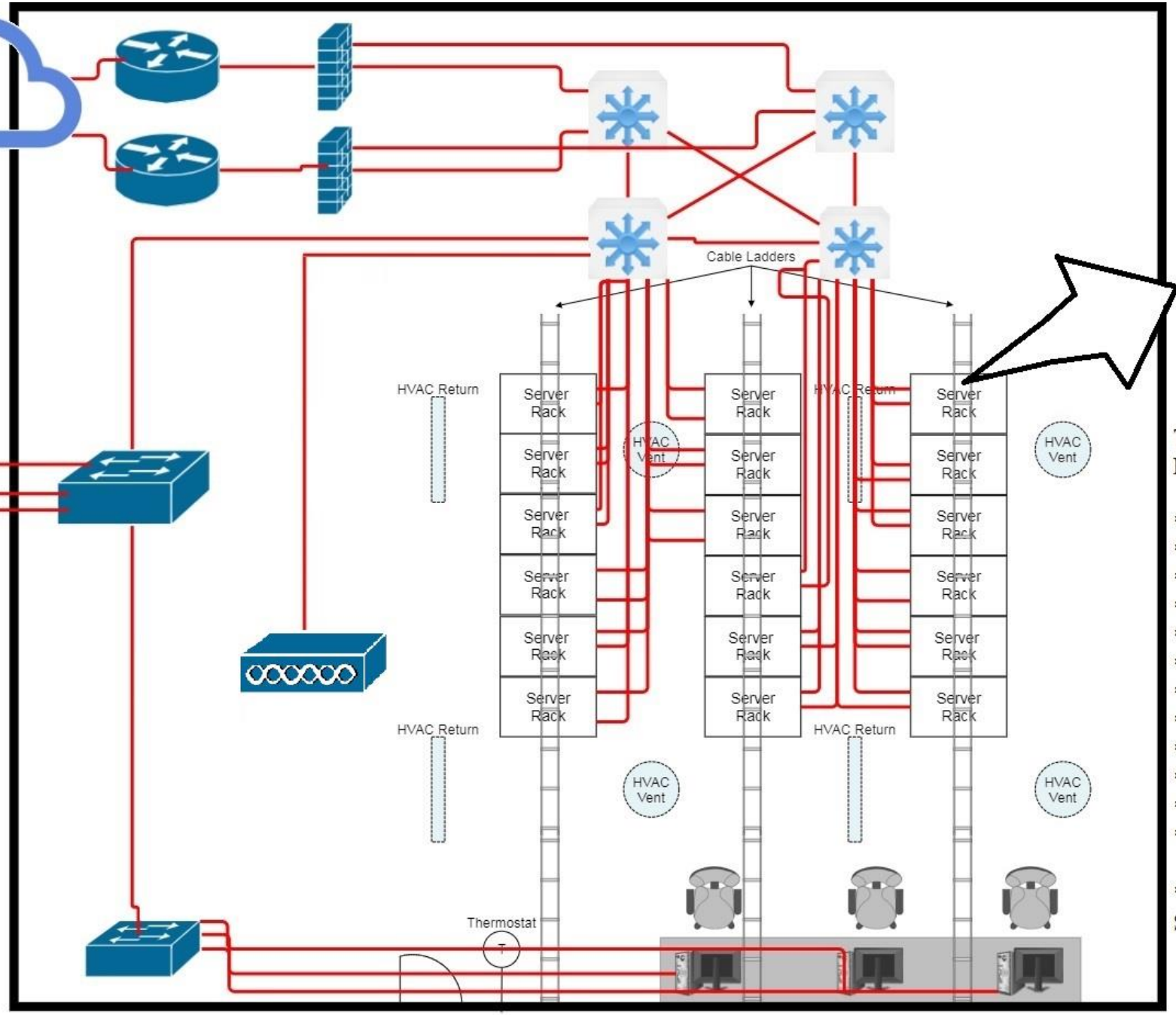
IT Department

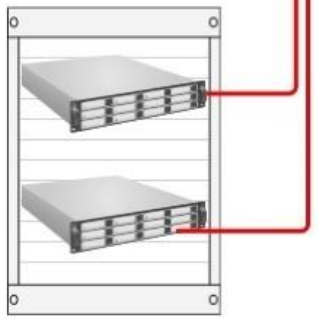


Financial Department



Main Server Room Situated in the Main Branch



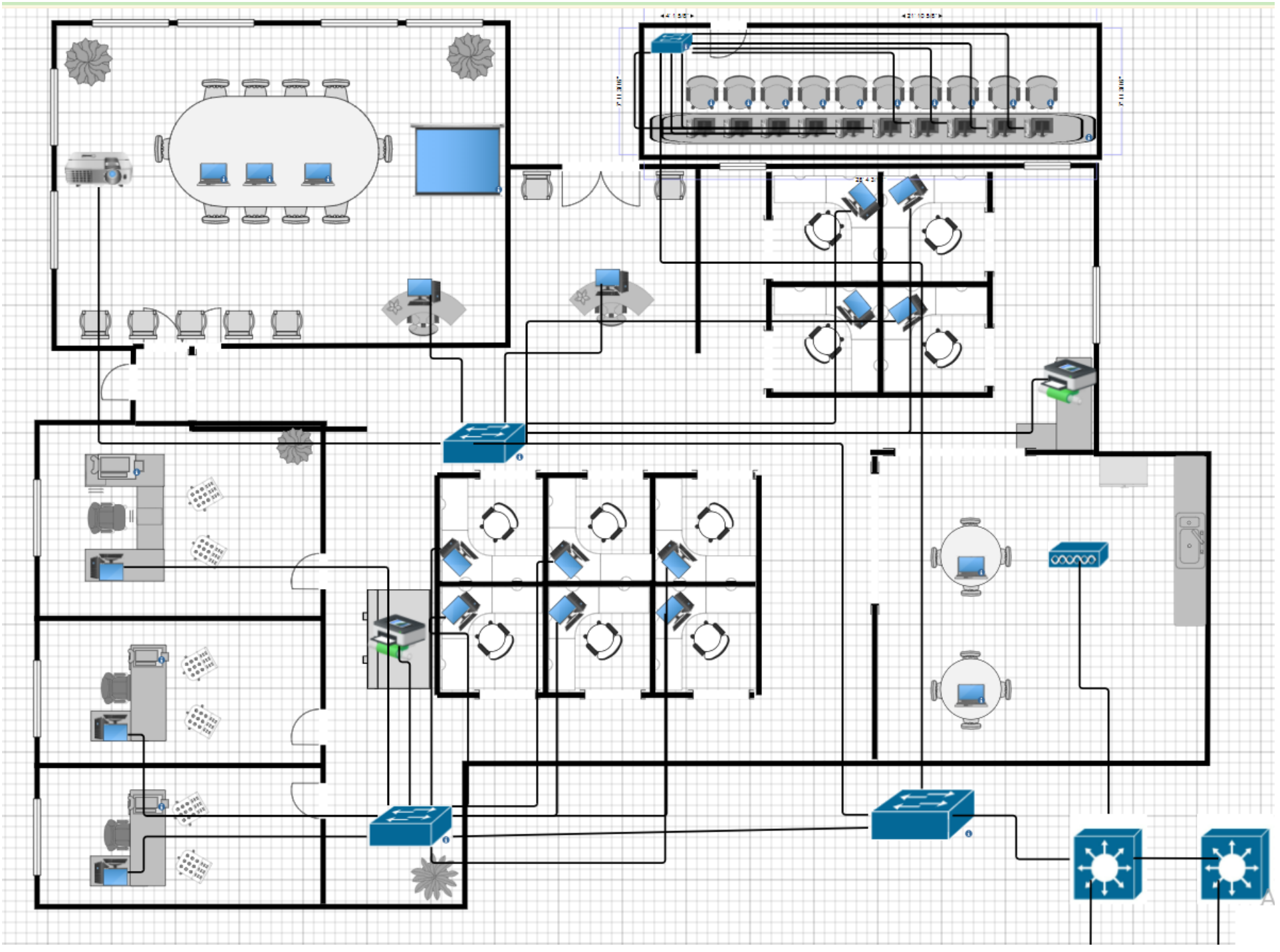


Type of Servers and Devices present

* File Server
* Email Server
* Web Server
* Database Server
* Firewall Server
* Printer Server
* Application Server
* Backup Server
* Firewall Server
* DNS Server
* Load Balancer
* VPN Server

* Cooling System(Ventilators)

HR
Department



APPROPRIATE MEDIA TYPES FOR THE NETWORK

Access layer

Aruba 6000 48G Class4 PoE 4SFP 370W Switch

The HPE Aruba networking CX6000 switch is an ideal switches for branch offices. Designed for reliable , simple and security enhanced access.

APPROPRIATE MEDIA TYPES FOR THE NETWORK

- Access layer

Aruba 6000 48G Class4 PoE 4SFP 740W Switch

Convenient and cost-effective wired access solution for networks supporting IoT, mobile, and cloud applications.

APPROPRIATE MEDIA TYPES FOR THE NETWORK

Distribution layer

Cisco Catalyst 9400 Series 48-Port UPOE 10/100/1000

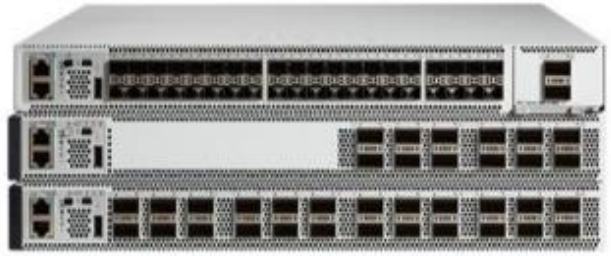
The Cisco Catalyst 9400 is Cisco's lead modular enterprise switching access platform built for security, IoT and cloud. This switch series forms the foundational building blocks for SD-Access - Cisco's leading enterprise architecture. The platform provides unparalleled investment protection with a chassis architecture that is capable of supporting up to 9Tbps of system bandwidth.

APPROPRIATE MEDIA TYPES FOR THE NETWORK

- Core layer

Cisco Catalyst 9500 48-port x 1/10/25G

The Cisco Catalyst 9500 Series Switches are the next generation of enterprise-class core and aggregation layer switches, supporting full programmability and serviceability.



APPROPRIATE MEDIA TYPES FOR THE NETWORK

- Network layer

Cisco ISR4431-SEC/K9

Cisco 4431 Integrated Services Router, which supports 3 Network Interface Modules (NIM) slots, delivers 500 Mbps to 1 Gbps aggregate throughput. This router also supports two kinds of DDRM, data plane and control/services plane, which make administrator easy to manage the router.

APPROPRIATE MEDIA TYPES FOR THE NETWORK

Network layer

ASA5585-S20-K9 Cisco ASA 5585 Series Firewall

Cisco ASA 5585-X ASA5585-S20-K9 is a high-performance, 2-slot chassis, with the firewall/VPN Security Services Processor (SSP) occupying the bottom slot, and the IPS Security Services Processor (IPS SSP) in the top slot of the chassis. The firewall/VPN SSP is required to run IPS on the Cisco ASA 5585-X.

APPROPRIATE MEDIA TYPES FOR THE NETWORK

Access layer end devices

1.Access point - C9130AXI-H - Cisco Catalyst 9130 WiFi 6 Access Point x 5

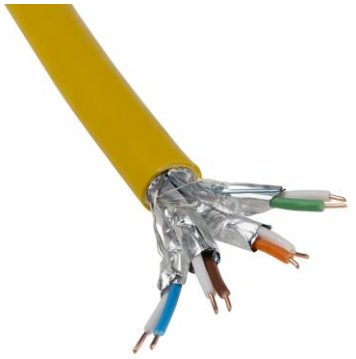
APPROPRIATE MEDIA TYPES FOR THE NETWORK

Access point - C9130AXI-H - Cisco Catalyst 9130 WiFi 6 Access Point x 5

Servers - Supermicro SuperServer 2014TP HTR x 32

CAT 6 cables

CAT 7 cables



BUDGET ALLOCATION

Layer / Device	Product	Current Market Price(Including Discount) in US $	Quantity	Total in US $
Access Layer	Aruba 6000 48G Class4 PoE 4SFP 370W (Switch)	$1016	4 X 4 X 5 = 80	$81,280
	Aruba 6000 48G Class4 PoE 4SFP 740W (Switch)	$5569	1 X 4 X 5 = 20	$111,380
Distribution Layer	Cisco Catalyst 9400 Series 48-Port UPOE 10/100/1000 (RJ-45). (Multilayer Switch)	$10,858.88	2 X 5 = 10	$108,590
Core Layer	Cisco Catalyst 9500 48-port x 1/10/25G (Multilayer Switch)	$6,632	2 X 5 =10	$66,320
Network Layer	Cisco ISR4431-SEC/K9 (Router)	$11,838	2 X 5 = 10	$118,380
Server	Supermicro SuperServer 2014TP	$13000	(6 X 4) + (12 X 1) = 36	$468,000
Firewall	ASA5585-S20-K9 Cisco ASA 5585 Series Firewall	$35,171.00	2 X 5 = 10	$351,710
Access Point	C9130AXI-H - Cisco Catalyst 9130 WiFi 6 Access Point	US $1,548.00	4 X 5 = 20	$30,960 Total Budget = $1,336,620 = $1.336620 million

IP ADDRESSING SCHEMA(VLSM)

Branch	No of hosts	NetID	BroadcastID	Usable IP address range
B1(main)	12000	172.16.0.0/18	172.16.63.255	172.16.0.1 – 172.16.63.254
B2	8000	172.16.64.0/19	172.16.95.255	172.16.64.1 – 172.16.95.254
B3	6500	172.16.96.0/19	172.168.127.255	172.16.96.1 – 172.16.127.254
B4	5000	172.16.128.0/19	172.16.159.255	172.16.128.1 – 172.16.159.254
B5	4000	1726.160.0/20	172.16.175.255	172.16.160.1 – 172.16.175.254

PROTOCOLS

➢ **Application layer**

- DNS – Ensure that domain name resolution occurs properly.
- DHCP – This protocol facilitates quick and automated assignment of IP addresses ensuring highspeed connectivity for employees.
- SMTP – This supports authentication mechanisms, allowing LMN financial group to comply with regulatory requirements for secure email communication.
- SFTP – Checks and error recovery,ensuring that files are transferred without corruption.
- HTTPS – Security , Compliance , Trust and authentication.

PROTOCOLS

- **Network layer**

- IP – Internet Protocol
- ICMP – Diagnostic and error reporting purposes.
- CMP – Help administrators to troubleshoot network issues and diagnose connectivity problems.
- ARP – To discover the MAC address associated with the destination IP address
- Ipsec – Ensures the confidentiality, integrity and authenticity of the network.
- EIGRP – Used because there are 4 multilayer switches in the network

PROTOCOLS

- **Session layer**

- SSH – Provides secure encrypted communication channels.
- RDP – Allows users to remotely access and control desktops and servers within the organization.

PROTOCOLS

- **Presentation layer**

- SSL – Encrypts data to maintain confidentiality and integrity during data transmission.
- XML – Data interchange formats used widely in web applications for data exchange and integration.

PROTOCOLS

- **Transport Layer**

- TCP – Establishes a connection before data transmission begins, ensuring both ends are ready to communicate.
- UDP- Used for specific scenarios such as live online meetings.

PROTOCOLS

- **Datalink layer**

- PPP – provides encapsulation and authentication.
- DLC – Used for secure, reliable and efficient data transfer in WAN environments.
- ARP – resolving network layer addresses (IP addresses) into link layer addresses (MAC addresses).

PROTOCOLS

- **Physical layer**

  - IEEE 802.3 – Standard for ethernet, one of the most widely used network technologies in the world.It defines the specifications for the electrical and mechanical aspects of ethernet communication.

LAN AND WAN TECHNOLOGIES

LAN Technologies

- VLANs used to separate traffic within the network in each branch.
- PoE (Power over Ethernet) – This enables the delivery of power and data over the same ethernet cable.This can simplify deployment and maintenance of devices such as security cameras and access points.

LAN AND WAN TECHNOLOGIES

WAN Technologies

- VPN – used to provide secure remote connection between branches.
- IP VPN – Offers the advantage of integration with existing IP networks.
- Multiprotocol Label Switching – Provides high performance with low latency and high reliability, making it ideal for a financial organization.

SECURITY

- **Physical security**

- Access control systems such as keycards, badges and biometric access.
- 24/7 surveillance systems with CCTV cameras at strategic locations.
- Security personnels
- Alarm systems
- Cooling Systems

SECURITY

- **Network security**
  - This organization network is protected by Cisco ASA 5585 Series Firewalls.
  - All routers are protected by passwords.

REFERENCES

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- www.cisco.com/c/en/us/support/routers/4441-x-integrated-services-router-isr/model.html
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- https://www.bechtle.com/es-en/shop/hpe-aruba-6000-48g-poe-740w-switch--4718446--p

THANK YOU