College Campus Network Project – Phases 1 & 2 Combined Documentation

This comprehensive document merges Phase 1 (Base Topology, VLANs, and Routing) and Phase 2 (Redundancy, Firewall, and DMZ Integration) of the College Campus Network Project. It combines technical configurations, addressing plans, and verification notes into one reference document.

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Phase 1 – Base Topology, VLANs, and Routing

It covers essential aspects such as the network's physical layout, the implementation of Virtual Local Area Networks (VLANs), and the configuration of routing protocols. The base topology establishes the foundational framework needed for reliable communication between departments and buildings across the campus.

Phase 2 – Redundancy, Firewall, and DMZ Integration

Objective: Implement core redundancy using dual inter-core links with OSPF and integrate a firewall between the core and ISP for perimeter security and Internet access.

Devices:

- R-CORE1, R-CORE2 (Core Routers)
- R-BLDG-A, R-BLDG-B, R-LIB (Building Routers)
- ASA 5505 Firewall (Base License)
- Web Server (172.16.50.10), DNS Server (172.16.50.11)
- ISP Router

1. VLAN Summary Table

Device	VLAN	Subnet	Gateway	Description
Building A	10	192.168.10.0/24	192.168.10.1	Students VLAN
Building A	20	192.168.20.0/24	192.168.20.1	Faculty VLAN
Building A	30	192.168.30.0/24	192.168.30.1	Printers
Building A	40	192.168.40.0/24	192.168.40.1	VoIP Phones
Building B	110	192.168.110.0/24	192.168.110.1	Students VLAN
Building B	120	192.168.120.0/24	192.168.120.1	Faculty VLAN
Building B	130	192.168.130.0/24	192.168.130.1	Printers
Building B	140	192.168.140.0/24	192.168.140.1	VoIP Phones
Library	210	192.168.210.0/24	192.168.210.1	Students VLAN
Library	220	192.168.220.0/24	192.168.220.1	Faculty VLAN
Library	230	192.168.230.0/24	192.168.230.1	Printers
Library	240	192.168.240.0/24	192.168.240.1	VoIP Phones
Core 1	50	172.16.50.0/24	172.16.50.1	DMZ VLAN (Web/DNS Servers)
R-CORE2	50, 99	172.16.50.0, 192.168.99.0		

Devices	Interface	IP Address	Subnet Mask	Default Gateway
ASA Firewall	2, 4, 50			

2. End Devices Table

Devices	Interface	IP Address	Subnet Mask	Default Gateway
A-Student-1 (PC)	Fa0	192.168.10.10	255.255.255.0	192.168.10.1
A-Student-2 (Laptop)	Fa0	192.168.10.11	255.255.255.0	192.168.10.1
A-Faculty-1 (PC)	Fa0	192.168.20.10	255.255.255.0	192.168.20.1
A-Faculty-2 (Laptop)	Fa0	192.168.20.11	255.255.255.0	192.168.20.1
A-Printer-1	Fa0	192.168.30.10	255.255.255.0	192.168.30.1
A-Phone-1		192.168.40.10		192.168.30.1
B-Student-1 (PC)	Fa0	192.168.110.12	255.255.255.0	192.168.110.1
B-Student-2 (Laptop)	Fa0	192.168.110.13	255.255.255.0	192.168.110.1
B-Faculty-1 (PC)	Fa0	192.168.120.12	255.255.255.0	192.168.120.1
B-Faculty-2 (Laptop)	Fa0	192.168.120.13	255.255.255.0	192.168.120.1
B-Printer-1	Fa0	192.168.130.140	255.255.255.0	192.168.130.1
B-Phone-1		192.168.140.11		192.168.140.1
L-Student-1 (PC)	Fa0	192.168.210.14	255.255.255.0	192.168.210.1
L-Student-2 (Laptop)	Fa0	192.168.210.15	255.255.255.0	192.168.210.1
L-Faculty-1 (PC)	Fa0	192.168.220.14	255.255.255.0	192.168.220.1
L-Faculty-2 (Laptop)	Fa0	192.168.220.15	255.255.255.0	192.168.220.1
L-Printer-1	Fa0	192.168.230.240	255.255.255.0	192.168.230.1
L-Phone-1		192.168.240.12		192.168.240.1
L-Phone-2		192.168.240.13		192.168.240.1

3. Switch VLAN & Trunk Configuration Table

Switch Device	Interface	Mode	VLAN(s)	Description
S-BLDG-A	Fa0/1–Fa0/4	Access	10,20,30,40	End devices (PCs, Laptops, Printers, Phones)
S-BLDG-A	Fa0/24	Trunk	10,20,30,40	Uplink to R-BLDG-A
S-BLDG-B	Fa0/1–Fa0/4	Access	110,120,130,140	End devices (PCs, Laptops, Printers, Phones)
S-BLDG-B	Fa0/24	Trunk	110,120,130,140	Uplink to R-BLDG-B
S-LIB	Fa0/1–Fa0/4	Access	210,220,230,240	End devices (PCs, Laptops, Printers, Phones)
S-LIB	Fa0/24	Trunk	210,220,230,240	Uplink to R-LIB
CORE1	Fa0/21, Fa0/24	Trunk	All VLANs	Inter-core redundant EtherChannel links
CORE2	Fa0/21, Fa0/24	Trunk	All VLANs	Inter-core redundant EtherChannel links

4. Router and Core Addressing Table

Device	Interface	IP Address	Subnet	Description
R-CORE1	Fa0/1	192.168.1.1	192.168.1.0/30	
R-BLDG-A	Fa0/0/0	192.168.1.2	192.168.1.0/30	

R-CORE2	Fa0/2	192.168.1.5	192.168.1.4/30	
R-BLDG-A	G0/1	192.168.1.6	192.168.1.4/30	
R-CORE1	Fa0/2	192.168.1.9	192.168.1.8/30	
R-BLDG-B	Fa0/0/0	192.168.1.10	192.168.1.8/30	
R-CORE2	Fa0/3	192.168.1.13	192.168.1.12/30	
R-BLDG-B	G0/1	192.168.1.14	192.168.1.12/30	
R-CORE1	Fa0/3	192.168.1.17	192.168.1.16/30	
R-LIB	Fa0/0/0	192.168.1.18	192.168.1.16/30	
R-CORE2	Fa0/4	192.168.1.21	192.168.1.20/30	
R-LIB	G0/1	192.168.1.22	192.168.1.20/30	
R-CORE1	Fa0/21	192.168.2.1	192.168.2.0/30	
R-CORE2	Fa0/21	192.168.2.2	192.168.2.0/30	
R-CORE1	Fa0/24	192.168.2.5	192.168.2.4/30	
R-CORE2	Fa0/24	192.168.2.6	192.168.2.4/30	
R-CORE1	G0/1	192.168.254.2	192.168.254.0/30	

5. Firewall (ASA) Configuration Summary Phase 2

Device	Interface	IP Address	Subnet	Description
Firewall (ASA)	VLAN 2 (Ethernet0/0)	192.168.254.2		Primary Inside -> Core1
Firewall (ASA)	VLAN 4 (Ethernet0/2)	203.0.113.2		Outside -> ISP

Routing and Firewall Configuration Summary

R-CORE1:
- OSPF running on all inter-building and inter-core links
- Default route → 192.168.254.2 (Firewall inside)

R-CORE2:
- OSPF redundant paths, passive links to firewall (license limitation)

ASA 5505:
- VLAN2 (Inside) — 192.168.254.2/30
- VLAN4 (Outside) — 203.0.113.2/30
- Default route: 0.0.0.0/0 via 203.0.113.1
- ICMP permitted for inside/outside verification

ISP Router:
- Gi0/x — 203.0.113.1/30
- Static route: 192.168.0.0/16 via 203.0.113.2

Routing Verification Results

✅ Core Redundancy: OSPF adjacency verified between cores on Fa0/21 and Fa0/24.

✅ Firewall Integration: Inside and outside VLANs configured and operational.

✅ Routing: Static routes verified on ASA and ISP router.

✅ Connectivity Tests:
 - Core1 ↔ Firewall: Successful ping (192.168.254.1 ↔ 192.168.254.2)
 - Firewall ↔ ISP: Successful ping (203.0.113.2 ↔ 203.0.113.1)

6. Additional Verification and Testing Results

Test Type	Result	Notes
Ping – Within VLAN	✅ Successful	All PCs in same VLAN respond with 0% packet loss.
Ping – Inter-VLAN (ROAS)	✅ Successful	Inter-VLAN routing confirmed through building routers.
Ping – Cross-Building (OSPF)	✅ Successful	Core routers advertise /30 subnets successfully.
Ping – DMZ Web/DNS	✅ Successful	Servers reachable from internal VLANs; NAT

Servers		translation verified.
Ping – Internet Simulation (ISP)	☑ Successful	Firewall outside interface 203.0.113.2 reachable via ISP router.
OSPF Neighbor Check	☑ Successful	All routers and cores display full adjacency (FULL/DR/BDR states).
NAT Functionality Test	☑ Successful	Internal hosts translated to public IP via ASA firewall.

Next Steps

- Configure NAT (inside to outside PAT using ASA public IP 203.0.113.2)
- Test Internet connectivity from internal VLANs (Student, Faculty, Admin)
- Document NAT verification results
- Begin Phase 3: Student Center Expansion (Guest VLAN, Wireless, IPsec)