Simulating The Network Infrastructure

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មុខវិជ្ជាៈ Computer Networking (ឆ្នាំទីៈ ៣ | ដំនាន់ទីៈ 25 | ក្រុមទី 11 | ថ្នាក់ៈ E5)

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Simulating
Network Infrastructure

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Assignment Group 11

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Introduction

This report outlines the detailed network setup for an educational institution with two buildings: Building A and Building B. The infrastructure includes Cisco networking equipment to ensure robust and secure connectivity. The network is divided into subnets and VLANs to efficiently manage different departments and functions, with inter-building communication facilitated through static routes and a DMZ for internet access.

Network Components

Below will list all the network components and devices for building this network design including the device name, model and quantity.

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Hardware

Device	Quantity
Cisco ASA 5506	1
Cisco Switch PT	5
Cisco Router PT	6
Cisco Access Point	3
Cisco Server PT	3
Printers	2

Network Configuration

Building B

- **Sub LANs:**
    - LAB DHCP Pool: 192.168.0.11/24
    - Classroom and Library DHCP: 192.168.11.0/24

Building A

- **VLANs:**
    - Teacher: 192.168.2.0/24
    - Staff: 192.169.1.0/24
    - Guest: 192.168.100.0/24

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Network Design

Building B

Sub LAN: Lab DHCP Pool

- **IP Range:** 192.168.0.11/24
- **DHCP Server:** Configured to assign IP addresses dynamically within the 192.168.0.11/24 range.

```
interface Ethernet0/0
 ip address 192.168.0.1 255.255.255.0
 no shutdown

ip dhcp pool LAB_POOL
 network 192.168.0.0 255.255.255.0
 default-router 192.168.0.1
 dns-server 8.8.8.8
```

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Sub LAN: Classroom and Library DHCP

- **IP Range:** 192.168.11.0/24
- **DHCP Server:** Configured to assign IP addresses dynamically within the 192.168.11.0/24 range.

```
interface Ethernet0/1
 ip address 192.168.11.1 255.255.255.0
 no shutdown

ip dhcp pool CLASSROOM_LIB_POOL
 network 192.168.11.0 255.255.255.0
 default-router 192.168.11.1
 dns-server 8.8.8.8
```

Building A

VLAN: Teacher

- **VLAN ID:** 10
- **IP Range:** 192.168.2.0/24
- **DHCP Server:** Configured to assign IP addresses dynamically within the 192.168.2.0/24 range.

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```
vlan 10
 name Teacher

interface vlan 10
 ip address 192.168.2.1 255.255.255.0
 no shutdown

ip dhcp pool TEACHER_POOL
 network 192.168.2.0 255.255.255.0
 default-router 192.168.2.1
 dns-server 8.8.8.8
```

VLAN: Staff

- **VLAN ID:** 20
- **IP Range:** 192.168.1.0/24
- **DHCP Server:** Configured to assign IP addresses dynamically within the 192.168.1.0/24 range.

```
vlan 20
 name Staff

interface vlan 20
 ip address 192.168.1.1 255.255.255.0
 no shutdown

ip dhcp pool STAFF_POOL
 network 192.168.1.0 255.255.255.0
 default-router 192.168.1.1
 dns-server 8.8.8.8
```

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VLAN: Guest

- **VLAN ID:** 30
- **IP Range:** 192.168.100.0/24
- **DHCP Server:** Configured to assign IP addresses dynamically within the 192.168.100.0/24 range.

```
vlan 30
 name Guest

interface vlan 30
 ip address 192.168.100.1 255.255.255.0
 no shutdown

ip dhcp pool GUEST_POOL
 network 192.168.100.0 255.255.255.0
 default-router 192.168.100.1
 dns-server 8.8.8.8
```

Inter-Building Communication

Static Routing

Static routes are set up on routers in both buildings to facilitate communication between the LANs. This section includes the configuration commands for setting up static routes.

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Router Configuration for Building A

```
Gateway of last resort is 192.168.5.2 to network 0.0.0.0

C     192.68.3.0/24 is directly connected, FastEthernet0/0
C     192.168.1.0/24 is directly connected, FastEthernet0/0.10
C     192.168.2.0/24 is directly connected, FastEthernet0/0.20
      192.168.4.0/24 is variably subnetted, 2 subnets, 2 masks
S        192.168.4.0/24 [1/0] via 192.168.5.2
S        192.168.4.0/30 [1/0] via 192.168.5.2
      192.168.5.0/30 is subnetted, 1 subnets
C        192.168.5.0 is directly connected, Serial3/0
      192.168.6.0/25 is subnetted, 1 subnets
S        192.168.6.0 [1/0] via 192.168.5.2
C     192.168.100.0/24 is directly connected, FastEthernet0/0.30
S*    0.0.0.0/0 [1/0] via 192.168.5.2
```

Router Configuration for Building B

```
Gateway of last resort is 192.168.4.2 to network 0.0.0.0

C     192.168.0.0/24 is directly connected, FastEthernet0/0
S     192.168.1.0/24 [1/0] via 192.168.4.2
S     192.168.2.0/24 [1/0] via 192.168.4.2
S     192.168.3.0/24 [1/0] via 192.168.4.2
      192.168.4.0/30 is subnetted, 1 subnets
C        192.168.4.0 is directly connected, Serial2/0
      192.168.5.0/30 is subnetted, 1 subnets
S        192.168.5.0 [1/0] via 192.168.4.2
      192.168.6.0/30 is subnetted, 1 subnets
S        192.168.6.0 [1/0] via 192.168.4.2
      192.168.7.0/25 is subnetted, 1 subnets
S        192.168.7.0 [1/0] via 192.168.4.2
C     192.168.11.0/24 is directly connected, FastEthernet1/0
S     192.168.100.0/24 [1/0] via 192.168.4.2
S*    0.0.0.0/0 [1/0] via 192.168.4.2
```

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DMZ Network

Both LANs in Buildings A and B route to the internet via a DMZ network, controlled by the Cisco ASA 5506 firewall.

ASA 5506 Configuration

```
interface GigabitEthernet0/1
 nameif inside
 security-level 100
 ip address 192.168.0.1 255.255.255.0

interface GigabitEthernet0/2
 nameif dmz
 security-level 50
 ip address 10.0.0.1 255.255.255.0

interface GigabitEthernet0/3
 nameif outside
 security-level 0
 ip address <Public-IP>

access-list OUTSIDE_IN extended permit ip any any

nat (inside,dmz) source static any any
nat (dmz,outside) source static any any

route outside 0.0.0.0 0.0.0.0 <Gateway-IP>
```

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Security Considerations

Firewall

The Cisco ASA 5506 firewall provides robust security by managing traffic between the internal network and the internet. It employs NAT (Network Address Translation) and access control lists to secure network traffic.

VLAN Segmentation

Using VLANs to segment the network helps isolate traffic, improving security by reducing the risk of broadcast storms and limiting the spread of potential threats within the network.

Configuration Details

Router Configuration

Detailed router configuration for the router that is between Building A and Building B includes IP addressing, static routing, and interface settings.

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All router interface and static route configuration

```
interface FastEthernet0/0
 ip address 192.168.6.1 255.255.255.0
 ip access-group 101 out
 duplex auto
 speed auto
!
interface FastEthernet1/0
 ip address 192.168.7.2 255.255.255.128
 duplex auto
 speed auto
!
interface Serial2/0
 ip address 192.168.4.2 255.255.255.252
 clock rate 2000000
!
interface Serial3/0
 ip address 192.168.5.2 255.255.255.252
!
```

```
ip classless
ip route 192.168.0.0 255.255.255.0 192.168.4.1
ip route 192.168.3.0 255.255.255.0 192.168.5.1
ip route 192.168.2.0 255.255.255.0 192.168.5.1
ip route 192.168.1.0 255.255.255.0 192.168.5.1
ip route 192.168.4.0 255.255.255.0 192.168.5.1
ip route 192.168.7.0 255.255.255.128 192.168.7.1
ip route 192.168.11.0 255.255.255.0 192.168.4.1
ip route 192.168.6.0 255.255.255.128 192.168.7.1
ip route 192.168.100.0 255.255.255.0 192.168.5.1
!
ip flow-export version 9
!
```

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Switch Configuration

Configuration details for Cisco Switch PT, including VLAN setup and trunking.

```
VLAN Name                             Status    Ports
---- -------------------------------- --------- 
-------------------------------
1    default                          active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                Fa0/9
10   staff                            active    Fa0/10, Fa0/11, Fa0/12,
Fa0/13
                                                Fa0/14, Fa0/15, Fa0/16,
Fa0/17
                                                Fa0/18, Fa0/19
20   teacher                          active    Fa0/20, Fa0/21, Fa0/22,
Fa0/23
                                                Fa0/24
30   guest-vlan                       active    Gig0/2
```

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Access Point Configuration

Configuration for Cisco Access Points to ensure proper connectivity and security.

DHCP Server Configuration

Configuration for DHCP servers in both buildings to dynamically assign IP addresses.

```
ip dhcp pool LAB_POOL
 network 192.168.0.0 255.255.255.0
 default-router 192.168.0.1
 dns-server 8.8.8.8

ip dhcp pool CLASSROOM_LIB_POOL
 network 192.168.11.0 255.255.255.0
 default-router 192.168.11.1
 dns-server 8.8.8.8

ip dhcp pool TEACHER_POOL
 network 192.168.2.0 255.255.255.0
 default-router 192.168.2.1
 dns-server 8.8.8.8
```
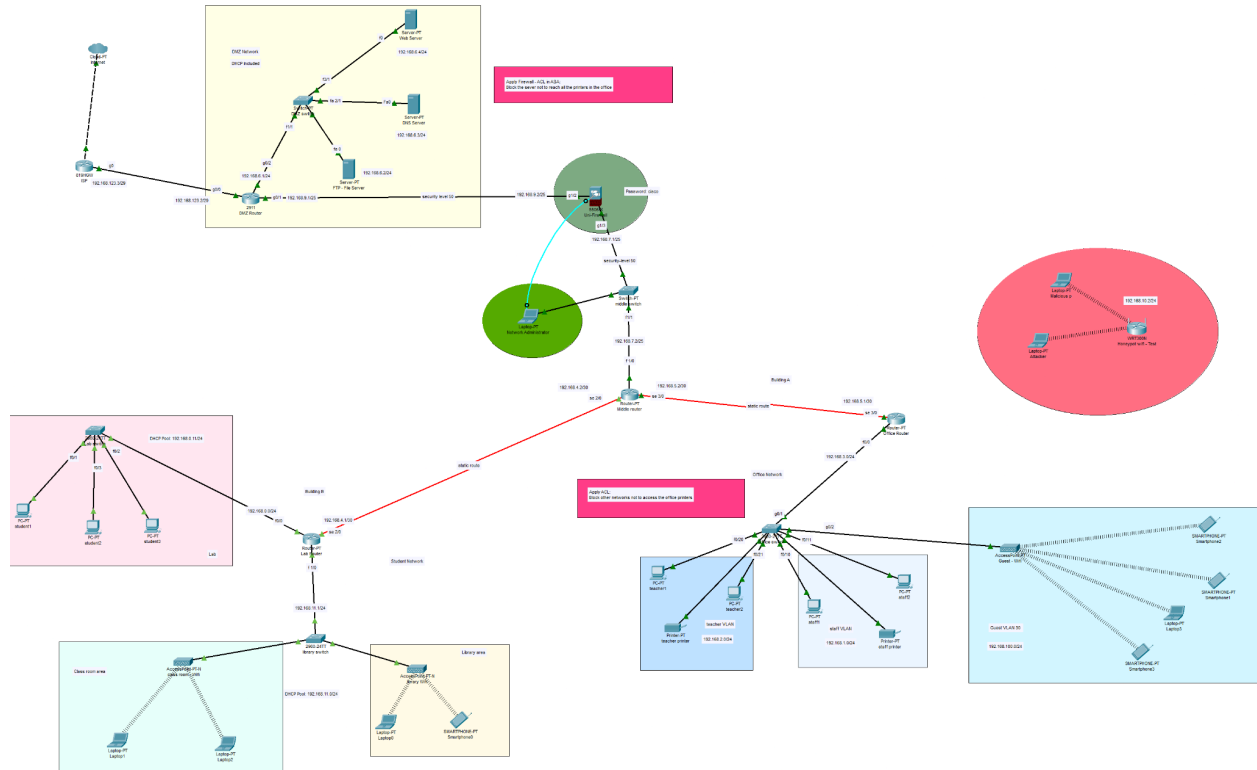
```
ip dhcp pool STAFF_POOL
 network 192.168.1.0 255.255.255.0
 default-router 192.168.1.1
 dns-server 8.8.8.8

ip dhcp pool GUEST_POOL
 network 192.168.100.0 255.255.255.0
 default-router 192.168.100.1
 dns-server 8.8.8.8
```
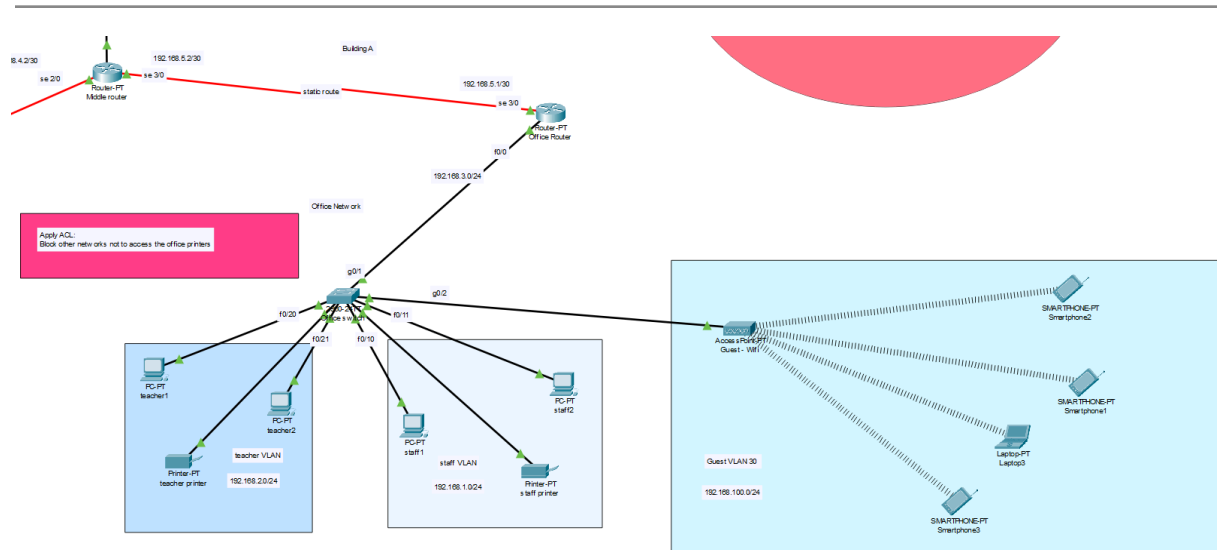
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Network Diagrams

This is the illustration of overall network design.
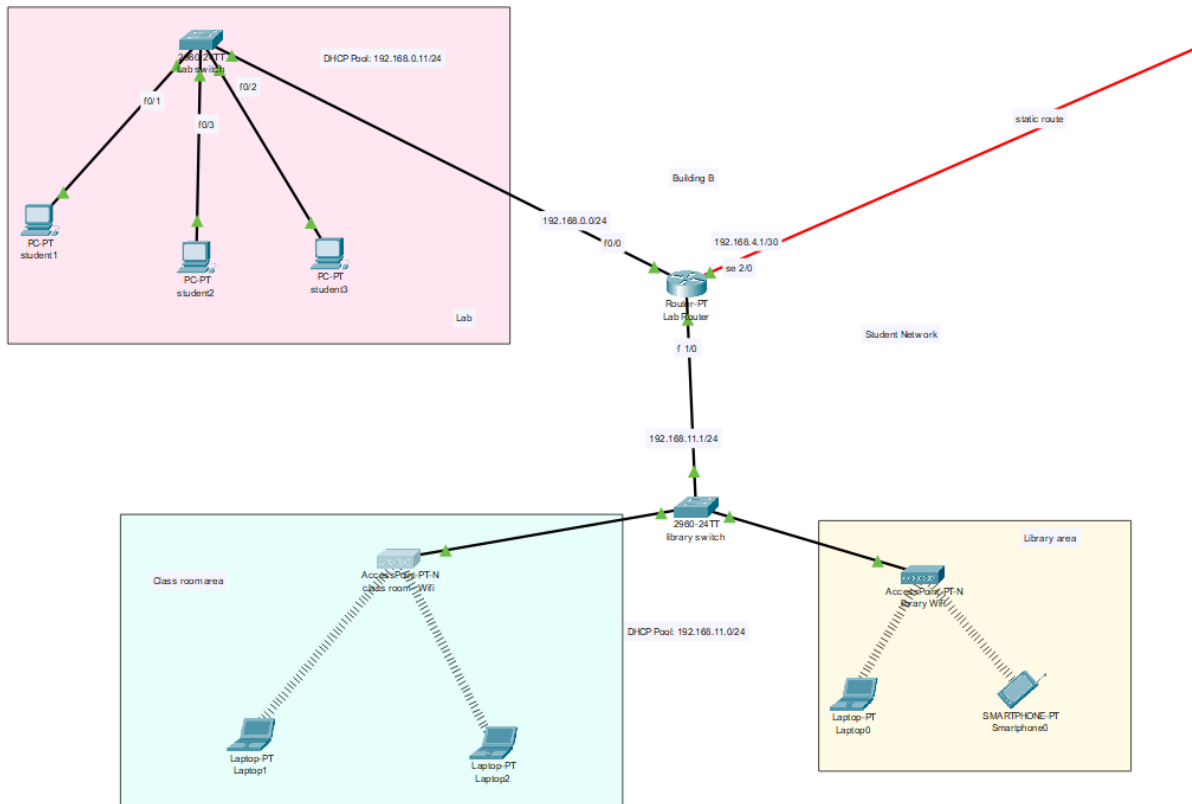
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Building A Network Diagram

This will illustrate a Building A network diagram

Building A

8.4.2/30
192.168.5.2/30
se 2/0
se 3/0
Router-PT
Middle router

static route

192.168.5.1/30
se 3/0
Router-PT
Office Router

f0/0
192.168.3.0/24

Office Network

Apply ACL:
Block other networks not to access the office printers

g0/1
g0/2
Access switch
f0/20
f0/11
f0/21
f0/10

PC-PT
teacher1

PC-PT
teacher2

teacher VLAN

Printer-PT
teacher printer
192.168.2.0/24

PC-PT
staff1

PC-PT
staff2

staff VLAN
192.168.1.0/24

Printer-PT
staff printer

Access Point-PT
Guest - Wifi

Guest VLAN 30
192.168.100.0/24

SMARTPHONE-PT
Smartphone2

SMARTPHONE-PT
Smartphone1

Laptop-PT
Laptop3

SMARTPHONE-PT
Smartphone3

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Building B Network Diagram
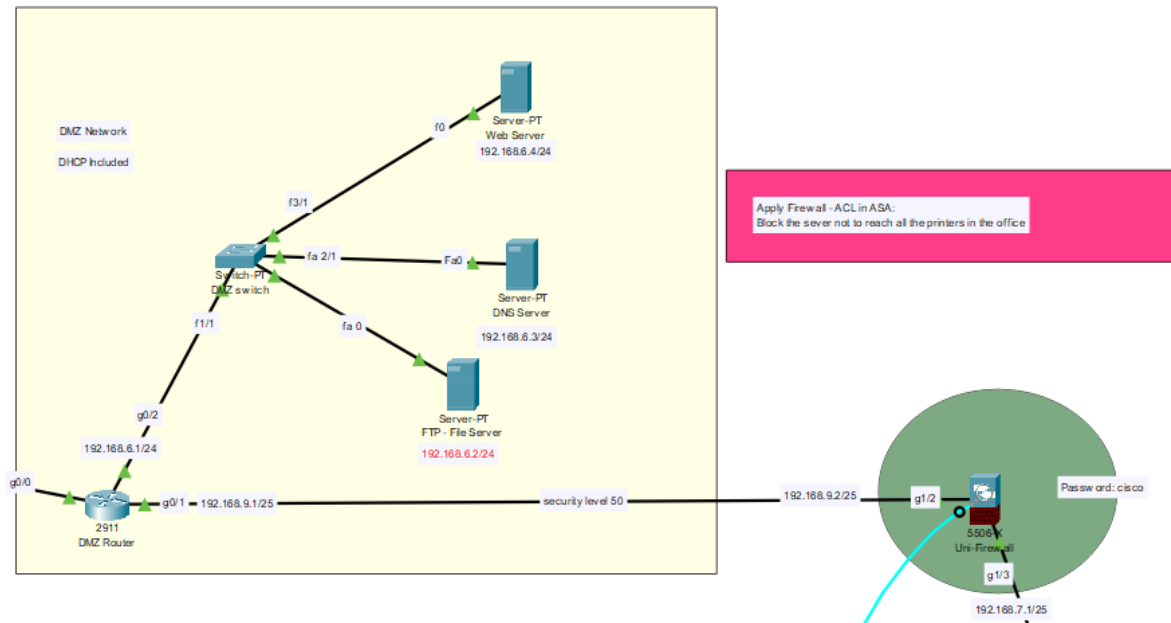
This will illustrate a network diagram for Building B.

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DMZ Network

This will illustrate a network diagram for DMZ network before accessing or routing to the internet.

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Conclusion

This comprehensive network setup ensures efficient and secure communication within the institution. The use of Cisco devices provides robust connectivity, and the segmented design with subnets and VLANs meets the specific needs of different departments. The implementation of static routing and a DMZ for internet access further enhances the network's functionality and security.