**Networking Plan for Connecting All Six Buildings at SMIU**

**Overview**

This document outlines the detailed networking plan for connecting the six buildings of SMIU: IT Building, School Building, Talpur Building, Computer Science Building, Admin Building, and Media & Research Building. The plan ensures efficient communication between buildings while maintaining network security and management.

**1. Core Network Design**

* **Edge Router**:
  + Located in the School Building and acts as the main connection point to the internet.
  + Configured with NAT to translate private IP addresses to public IPs using the public IP pool 11.11.11.0/30.
  + Dynamic routing implemented using Single Area OSPF for scalability.
* **Inter-Building Connectivity**:
  + Buildings are interconnected via fiber-optic cables, ensuring high-speed data transfer.
  + A central Layer 3 switch is deployed in the School Building to act as the core switch, connecting all other buildings via trunk links.

**2. VLAN Implementation**

* **VLANs**:
  + VLANs are created for each department to isolate traffic and improve network management.
    - Faculty VLAN
    - Lab VLAN
    - Administration VLAN
    - IT VLAN
    - Academic Department VLAN
    - Examination VLAN
  + VLANs for each building are configured on their respective Layer 2 switches.
* **Inter-VLAN Routing**:
  + Configured on the Layer 3 switch in the School Building for communication between VLANs.
  + ACLs are applied to restrict access based on requirements (e.g., only Faculty and
  + Labs PCs can access LMS).

**3. Building-Specific Network Design**

* **IT Building**:
  + Contains seven labs, 20 classrooms, faculty PCs, and department PCs.
  + Each lab has its own VLAN to manage devices.
  + Static IPs assigned to printers and FTP servers.
* **School Building**:
  + Houses the Edge Router and Data Center with four servers (Web, LMS, Email, CMS).
  + Data Center servers are assigned static IPs and protected using port security.
  + Classrooms, faculty PCs, and departmental PCs are segmented into VLANs.
* **Talpur Building**:
  + Primarily used for classrooms and Mechatronics Labs.
  + A dedicated VLAN is created for labs to ensure secure communication.
* **Computer Science Building**:
  + Admission department and classrooms have separate VLANs.
  + Printers are assigned static IPs with access restrictions.
* **Admin Building**:
  + Houses the Library, HR, Procurement, and Finance departments.
  + Each department has its VLAN, and printers are statically assigned.
* **Media & Research Building**:
  + Contains classrooms and faculty PCs.
  + Faculty VLAN is implemented with restricted access to printers.

**4. IP Addressing and Subnetting**

* **IP Addressing**:
  + Base pool: 46.46.0.0/24 (roll number 46 is used as the basis).
  + VLSM (Variable Length Subnet Masking) is used to allocate IPs efficiently for each department.
  + DHCP is configured on the Edge Router to dynamically assign IPs to devices in all buildings.
* **Static IP Assignments**:
  + Servers and printers in each building are assigned static IPs for consistent identification.

**5. Security Measures**

* **Port Security**:
  + Applied to all servers and lab devices to prevent unauthorized access.
* **Access Control Lists (ACLs)**:
  + Configured to restrict access to Faculty Printers and the LMS.
  + Only Faculty and Lab PCs can access the LMS server.
* **Device Management**:
  + Routers and switches are password-protected (console, Telnet, and privileged modes).
  + Remote management enabled on all switches and routers.

**6. Detailed Network Topology Description**

Without requiring images, the network topology can be described as follows:

1. **Core Infrastructure**:
   * The School Building contains the central Layer 3 switch and Edge Router.
   * Each building connects to the core switch via high-speed fiber links.
2. **Individual Building Networks**:
   * IT Building: Seven labs, classrooms, faculty PCs, and department PCs are connected to managed Layer 2 switches. VLANs separate labs and departments for better management.
   * Talpur Building: Classrooms and Mechatronics Labs use dedicated VLANs. All devices connect to a Layer 2 switch linked to the core switch in the School Building.
   * Admin Building: Library, HR, Procurement, Finance, and other departments connect via a Layer 2 switch with department-specific VLANs.
   * Computer Science Building: Admission and Academic departments connect through separate VLANs to a Layer 2 switch.
   * Media & Research Building: Classrooms and faculty PCs are organized in Faculty VLANs and connect via a Layer 2 switch.
3. **Server Connectivity**:
   * All servers (Web, LMS, Email, CMS) are located in the Data Center of the School Building.
   * Servers have static IPs and are accessible through inter-VLAN routing.
4. **DHCP and IP Management**:
   * The Edge Router handles DHCP for dynamic IP assignments across all VLANs.
   * Static IPs are used for servers and printers.
5. **Routing and Restrictions**:
   * OSPF ensures dynamic routing between buildings.
   * ACLs restrict access to resources like printers and LMS servers based on VLAN policies.

**7. Testing and Validation**

* **Connectivity**:
  + Ping tests verify device-to-device communication across all VLANs.
  + Traceroutes confirm proper routing paths.
* **Security**:
  + Port security logs are reviewed to detect unauthorized access attempts.
  + ACLs are tested to ensure restrictions work as intended.
* **DHCP and Static IPs**:
  + DHCP lease logs are checked for proper dynamic IP assignment.
  + Static IPs are validated by accessing printers and servers directly.
* **Remote Management**:
  + Telnet and SSH access to switches and routers are tested for remote management functionality.

**Conclusion**

This document provides a comprehensive plan to connect all six buildings at SMIU, ensuring efficient, secure, and scalable network operations without relying on visual diagrams. By implementing VLANs, inter-VLAN routing, DHCP, and robust security measures, the network infrastructure meets all specified requirements.