

Assignment 2.1: Designing a Physical Network Layout for a Small Office

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NTW275: Network Infrastructure Design

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Physical Network Topology

The chosen physical network topology is a star topology. This choice is based on several factors:

1. **Centralized Management:** All devices connect to a central switch, making it easier to manage and troubleshoot the network.
2. **Scalability:** New devices can be easily added by connecting them to the central switch.
3. **Reliability:** If one connection fails, it doesn't affect the rest of the network.
4. **Performance:** Direct connections to the central switch minimize latency.

Hardware Components

1. Router: Cisco Business 240AC Series Router

Role: Acts as the gateway between the local network and the internet, providing routing and basic firewall capabilities.

Capabilities:

- Integrated firewall for network security
- Support for VLANs to segment network traffic
- WPA2 encryption for wireless networks
- 4 Gigabit Ethernet LAN ports for wired connections
- Dual-band WiFi support

Why Chosen: This router is suitable for small businesses, offering necessary security features (firewall, VLANs) and sufficient ports for the office's needs.

2. Switch: Cisco Business 250 Series Smart Switch

Role: Connects all wired devices in the office, allowing them to communicate with each other and the router.

Capabilities:

- VLAN support for network segmentation
- Layer 2 and basic Layer 3 features for efficient traffic management
- Power over Ethernet (PoE) options available
- Easy management interface

Why Chosen: This switch provides the necessary port density for the office while offering VLAN support and manageable features suitable for a small business environment.

3. Wireless Access Point: Cisco Business 140AC Series Access Point

Role: Provides wireless network coverage throughout the office.

Capabilities:

- WPA2 enterprise security for secure wireless connections
- VLAN support to extend network segmentation to wireless devices
- Dual-band WiFi for better performance
- Can be centrally managed with the router

Why Chosen: This AP offers enterprise-grade security features necessary for a medical office, along with VLAN support to maintain network segmentation for wireless devices.

IP Addressing Scheme

WAN (Internet) Connection:

- Assigned by ISP (not shown in private network)

Router:

- WAN Interface: Assigned by ISP
- LAN Interface (VLAN 10): 192.168.10.1/24
- LAN Interface (VLAN 20): 192.168.20.1/24

Switch:

- Management IP: 192.168.10.2/24 (on VLAN 10)

VLAN 10 (Medical Staff Network):

- Subnet: 192.168.10.0/24
- DHCP Range: 192.168.10.100 - 192.168.10.200
- Gateway: 192.168.10.1

VLAN 20 (Administrative/Guest Network):

- Subnet: 192.168.20.0/24
- DHCP Range: 192.168.20.100 - 192.168.20.200
- Gateway: 192.168.20.1

Static IP Assignments:

- Printer: 192.168.10.10
- EHR Server (if applicable): 192.168.10.20
- Wireless Access Point: 192.168.10.30

Meeting Specific Needs of the Small Office Environment

1. Security and Compliance:

- VLANs separate medical and administrative traffic, enhancing security.
- WPA2 encryption on wireless networks protects patient data.
- The integrated firewall in the router provides an additional layer of security.

2. Performance:

- Star topology ensures direct connections to the central switch, minimizing latency.
- Gigabit Ethernet support on all devices enables fast data transfer.

3. Reliability:

- If one device or connection fails, it doesn't affect the entire network.
- Enterprise-grade equipment chosen for durability and reliability.

4. Scalability:

- The star topology allows for easy addition of new devices.
- VLAN capability allows for logical expansion without physical changes.

5. Ease of Management:

- Centralized management through the router and switch interfaces.
- VLAN segmentation simplifies network management and troubleshooting.

6. Cost-Effectiveness:

- Chosen equipment balances necessary features with affordability for a small office.

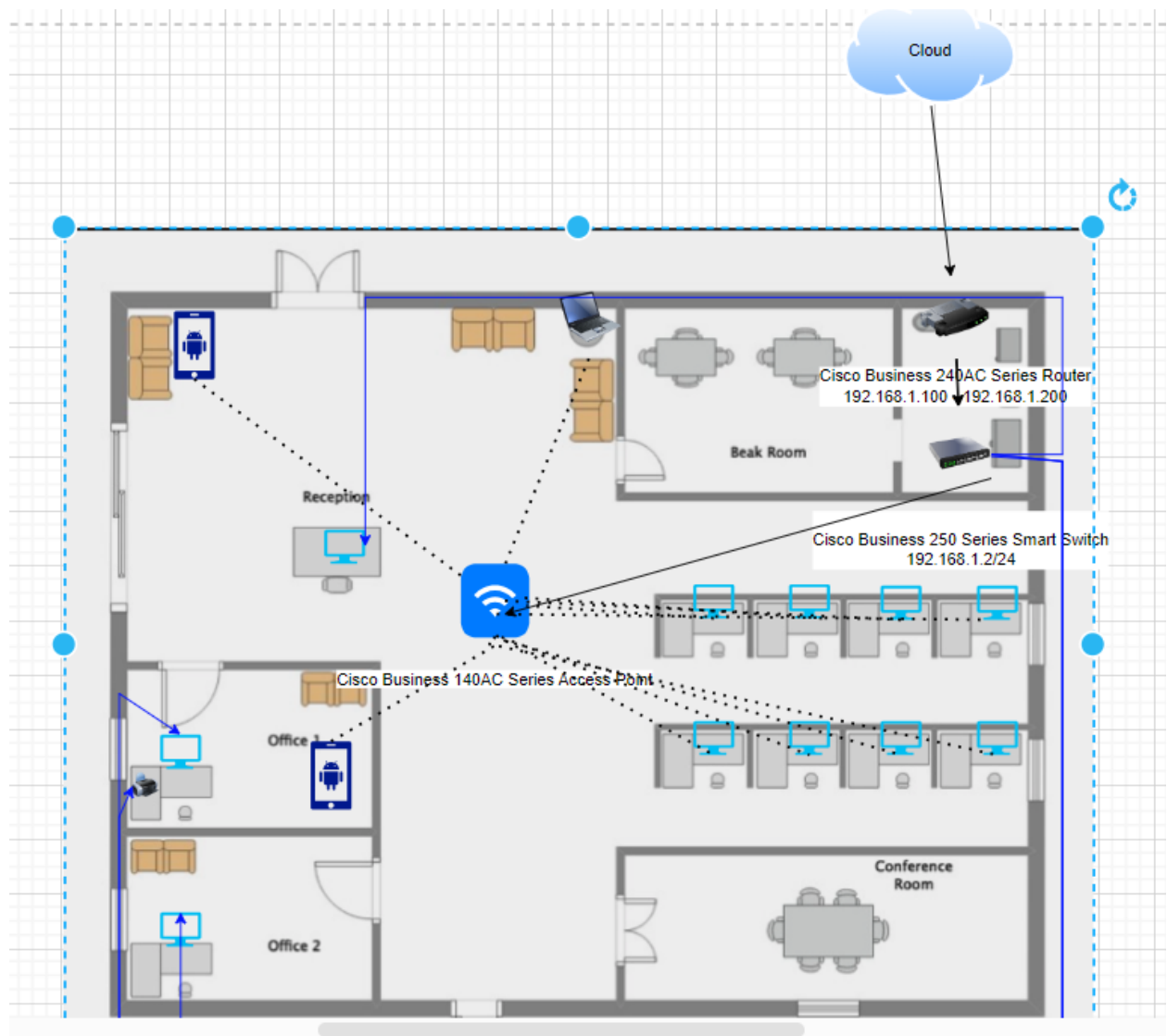
7. Compliance:

- Network segmentation and security features support HIPAA compliance requirements.

8. Flexibility:

- Dual-band WiFi and multiple VLANs allow for separation of staff and guest traffic.
- PoE option on the switch allows for easy deployment of IP phones or additional APs if needed.

This design provides a robust, secure, and scalable network infrastructure that meets the specific needs of a small medical office, balancing performance, security, and ease of management.



References:

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