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**Network Design Report for Fayetteville, NC Office.**

The Fayetteville, NC office will house 50 employees including the new vice president of sales and marketing. The network they need is to be reliable connectivity for operations within the company. This includes live video teleconferencing with other offices/remote employees, print jobs sent to Albany HQ. The internet service options available include fiber cables, and a T1. The considerations for the design are it being reliable, having scalability, cost efficient, and easy to manage.  
 This network design must support the company use of VPN for remote workers, and high-speed reliable internet is necessary for video calling when needing of a conference. The IT department located at Albany HQ manages all the corporate laptops and services. This means remote management and the need for support are key factors in the design. Offices must also ensure secure, encrypted connections with a VPN for employees.  
 Scalability and the ease of management, fiber internet is a preferred way since it has high speeds, low latency, and bandwidth capacity. For the network hardware we recommend using the high-performance routers, managed switches, firewalls, and VPN servers to secure and manage the traffic.

The IP ranges we consider here we will recommend is using Class C private IP range with up to 254 available addresses will suffice. This can be adjusted as needed for scalability. In addition to this we will need to reserve IPs for network infrastructure such as printers, switches, and access points.

**Hardware Recommendations:**

The following network hardware is recommended to ensure performance and security.:

* High performance routers for directing traffic from various parts of the network and to the WAN.
* Managed switches for controlling and segmenting network traffic to get scalability and ease of troubleshooting.
* Firewalls to secure the network. Managing VPN access and protecting against external threats.
* VPN servers to provide secure, encrypted important stuff for remote and mobile employees.
* Wireless access points to have full network coverage within the offices.

**Comparison of LAN Topology Options:**

When designing networks for the office several LAN topologies options were brought out for consideration. Each has its own strengths and weaknesses and must be evaluated based on the office’s size.

1. **Star Topology**

Strengths:  
Reliability: The failure of a single workstation does not affect it.

Ease of troubleshooting: since all devices are connected to a central switch. Isolation issues are easier.

Scalability: New devices can be added here with such minor impact on the rest of the network.

Performance3: High-performance can be achieved due to the fact each device has a dedicated connection.

Weaknesses:   
 Single point of failure: If the central switch fails, the entire network fails.   
 Cost: Requires more cabling and higher performance switch. Can increase the cost.

1. **Bus Topology**

Strengths:

Cost effective: Requires less cabling

Simplicity: Easy to install and extend.

Weaknesses:  
 Performance degradation: More devices are added the speed of the speed can decrease.

Troubleshooting difficulty: Failure in the main cable can cause entire network to fail. Makes it harder to pinpoint issues.

Scalability: Limited ability to scale, due to the additional devices can slow down

1. Mesh Topology:

Strengths:

Redundancy: Provides multiple paths for data to travel. IF one connection fails, data can still be transferred to a different path.

Reliability: extremely reliable due to the decentralized nature of it.

Scalability: Good for large networks with different devices.

Weaknesses:

Cost: Extremely expensive due to the need for more cabling.

Complexity: Hard to manage and configure. Even for smaller networks.

Overkill: Given the size and needs for the office, mesh topology would be more complex.

**Recommendations:**

For the Fayetteville office I would recommend the star topology. Most suitable for this office size due to the simplicity of the office itself, the cost-effectiveness, and scalability. With the high-speed central switch connected to fiber internet. The topology will allow for such reliable video conferencing. Securing the VPN access, and remote IT management the star topology will be easier to expand and grow and adding different switches.

**Conclusion**:

In conclusion, the network design layout for this company for Fayetteville office will incorporate high speed fiber internet, VPN connections, and a reliable star topology built on robust hardware. The setup will ensure the office can meet business needs while maintaining scalable and cost effective for the future of the company. With the solutions in place, the office will have network infrastructure supporting seamless communication. with other offices and employees remote, and close. 