

Build Out and Integration of The New Fayetteville, NC Office.

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In expectation of the forthcoming build-out of the Fayetteville office, careful planning has started to establish a robust network infrastructure. Recognizing the essential role that a well-designed network plays in the seamless functioning of modern businesses, our approach includes a comprehensive analysis of critical considerations ranging from network design and topology to IP addressing, security measures, and backup strategies. This endeavor aims not only to meet the immediate connectivity needs of the office but also to lay the groundwork for scalable expansion, ensuring that the network aligns seamlessly with the organization's growth trajectory. The integration of advanced technologies, observance of industry standards, and a forward-thinking approach underscore our commitment to creating a network environment that is not just a utility but a strategic asset for the Fayetteville office and efficient integration with the Albany, NY, and Springfield, MA locations.

1. Network Design/Topology:

- Star Topology: This design involves connecting all devices in the network to a central point, usually a switch or hub. Each office in the Fayetteville setup will have its central switch or switches, creating a star-like pattern. This topology is chosen for its simplicity, easy troubleshooting, and scalability. If one connection fails, the impact is localized, the network remains functional, and faulty hardware can be quickly replaced.
- Fiber Connections and VPN: Fiber optic cables provide high bandwidth and low latency, crucial for demanding applications. A VPN connection between offices ensures a secure and reliable link and redundancy with a secondary ISP, further enhancing connectivity resilience.

- Wire guard VPN connection between each office with redundancy to the other offices, providing constant connectivity for video conferencing, file sharing, printing, and network monitoring.

2. IP Addressing:

- The TCP/IP protocol is the most efficient for general network usage; UDP will step in for video and voice conferencing.
- The IP-addressing proposal suggested allocating a subnet with 512 possible host addresses, allowing for connecting a wide range of devices in each office.

Network Address Translation (NAT) is suggested to manage the translation of traffic between internal and external networks efficiently.

- a. Office 1: 192.168.0.0/23 (Addresses: 192.168.0.1 to 192.168.1.254)
- b. Office 2: 192.168.2.0/23 (Addresses: 192.168.2.1 to 192.168.3.254)
- c. Office 3: 192.168.4.0/23 (Addresses: 192.168.3.1 to 192.168.5.254)

3. Network Hardware and Bandwidth:

- Selecting reliable and scalable routers, switches, and access points is essential. Redundancy in critical components minimizes downtime, and real-time monitoring tools provide visibility into network performance.
- Choosing ISPs should provide high bandwidth and availability to ensure stable and fast connections between offices. Keeping with a provider offering fiber will provide a low legacy voice and video conferencing connection.

4. Security:

- Commercial firewalls are crucial for preventing unauthorized access and active monitoring to prevent cyber-attacks. The ability to inspect incoming and outgoing

packets enhances control over data flow. Network control (ACL) lists add an extra layer of security by restricting device access. The best choice would be Cisco-branded firewalls.

5. Backup/Recovery:

- Onsite and off-site backups provide a comprehensive strategy for data recovery. Cloud-based backups add redundancy and facilitate data replication between offices and the cloud.

6. Comparing ISPs available

- Selecting the right Internet Service Provider (ISP) is crucial for the success of the Fayetteville office. Key considerations include:
 - a. The bandwidth capabilities of the ISP impact the efficiency of daily operations. High-speed connections support fast data transfer, positively influencing productivity.
 - b. Rugged security features like intrusion detection, active traffic monitoring, and encryption are essential to safeguard sensitive data. Security importance aligns with maintaining a secure network environment.
 - c. The reliability of the ISP, measured by uptime and historical performance, is critical for ensuring uninterrupted connectivity and minimizing downtime. Secondary network connectivity provides failover functions, keeping the office online during an outage.
- Comparison of ISPs: Spectrum vs. CenturyLink
 - a. Speed

1. Spectrum: 1Gbps download, 35Mbps upload.
 2. CenturyLink: 940Mbps bi-directional download/uploads.
- b. Additional options
1. Both providers offer static IP options.
- c. Reliability
1. Both providers are fiber-based, providing reliable and high-performance connections.
- d. Impact on Business Goals and Objectives
- a. Spectrum
 - i. Pros: Higher download speed (1Gbps) may enhance data transfer for data-intensive operations—backup connection via wireless connectivity.
 - ii. Cons: Higher cost compared to CenturyLink.
 - b. CenturyLink
 - i. Pros: Affordable pricing, sufficient speed (940Mbps), and static IP for enhanced security.
 - ii. Cons: Slightly lower download speed compared to Spectrum.
- e. Determining the Appropriate Internet Provider:
1. Considering the business goals and objectives, CenturyLink is the preferred choice due to its balanced offering of reliable, high-speed fiber connectivity with additional options at a more cost-effective

price. This aligns with the intention to establish an efficient, secure, and budget-conscious network environment.

7. Hardware and Software Solutions:

- Commercial/industrial routers, switches, and access points are deployed from reputable manufacturers like Cisco, Juniper, and MikroTik.
- Implement and deploy centralized network monitoring tools for real-time visibility into performance, tools like OpenVAS, LibreNMS, NMS, Grafana, Influx DB, Snort, and similar monitoring options.

8. Printer Configuration:

- Utilizing networked printers with tracking capabilities for centralized print management, deployment, upgrades, and usage tracking.
- With driver and software deployment and distribution automation, we can maintain the dependability and stability of software and hardware across a broad range of devices like desktops, laptops, and tablets.
- Implementing access controls to manage and track printer usage applies limits for users who do not need printer access.
- Installing HP multifunction laser printers would allow anyone on the network to print, copy, and scan from the machines.
 - a. With network-based printers, printing from remote offices to other offices over the VPN is possible and can be done effectively per user.
 - b. At least two machines per location to balance the load and always have an available printer if one goes offline.

9. Bandwidth and Device Solutions for Teleconferencing:

- Adequate bandwidth allocation to support seamless teleconferencing.
- Use of quality conferencing hardware and software solutions.
 - a. Polycom- POLY STUDIO X70 WITH TC8 can provide excellent quality and is a highly recommended company in their field.
- Implementation of QoS (Quality of Service) configurations to prioritize teleconferencing traffic; with quality hardware, these protocols and controls are easily implemented and monitored so we can provide the best experience to the employees and customers.

This comprehensive approach ensures that the Fayetteville office meets its immediate connectivity needs and establishes a foundation for scalable and efficient network operations.

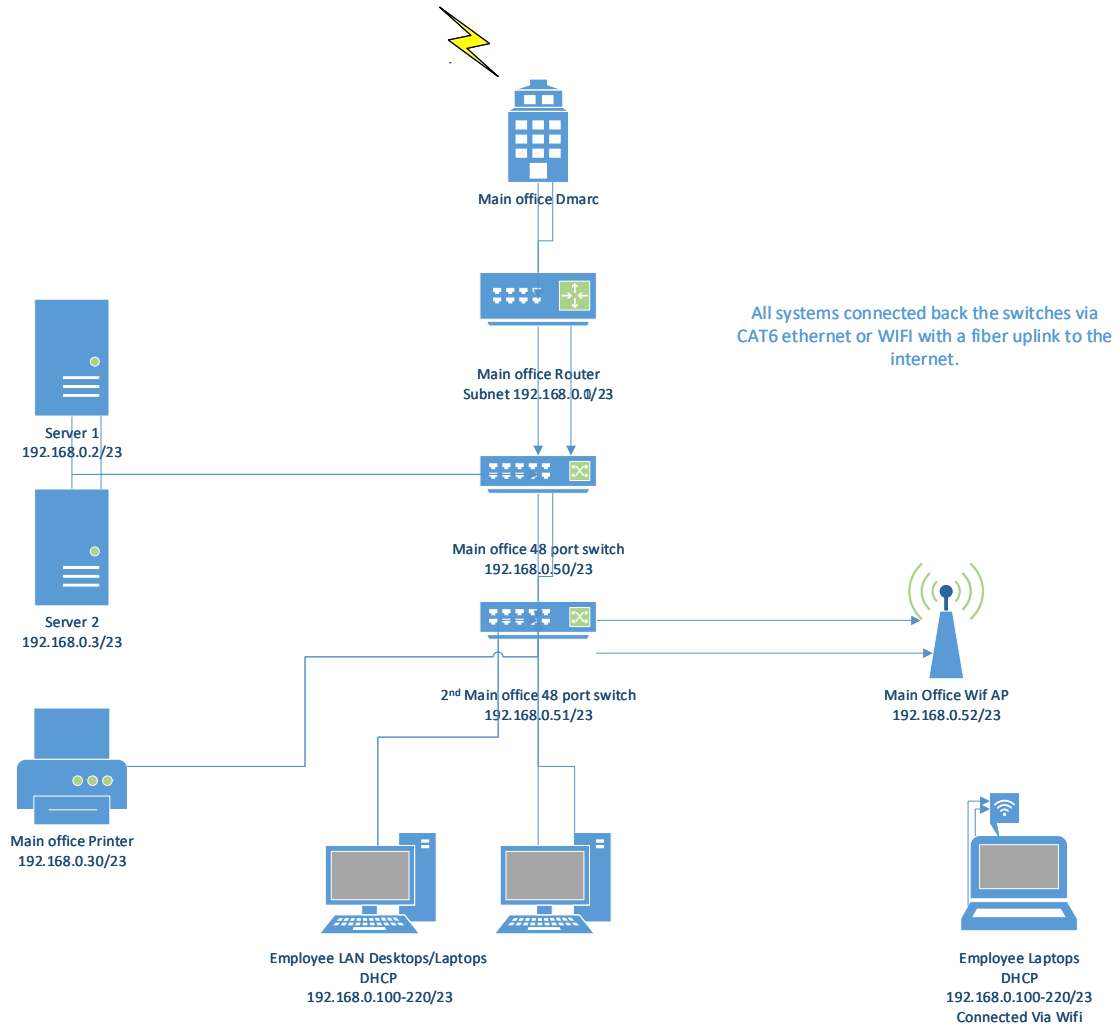
10. Additional Key Considerations:

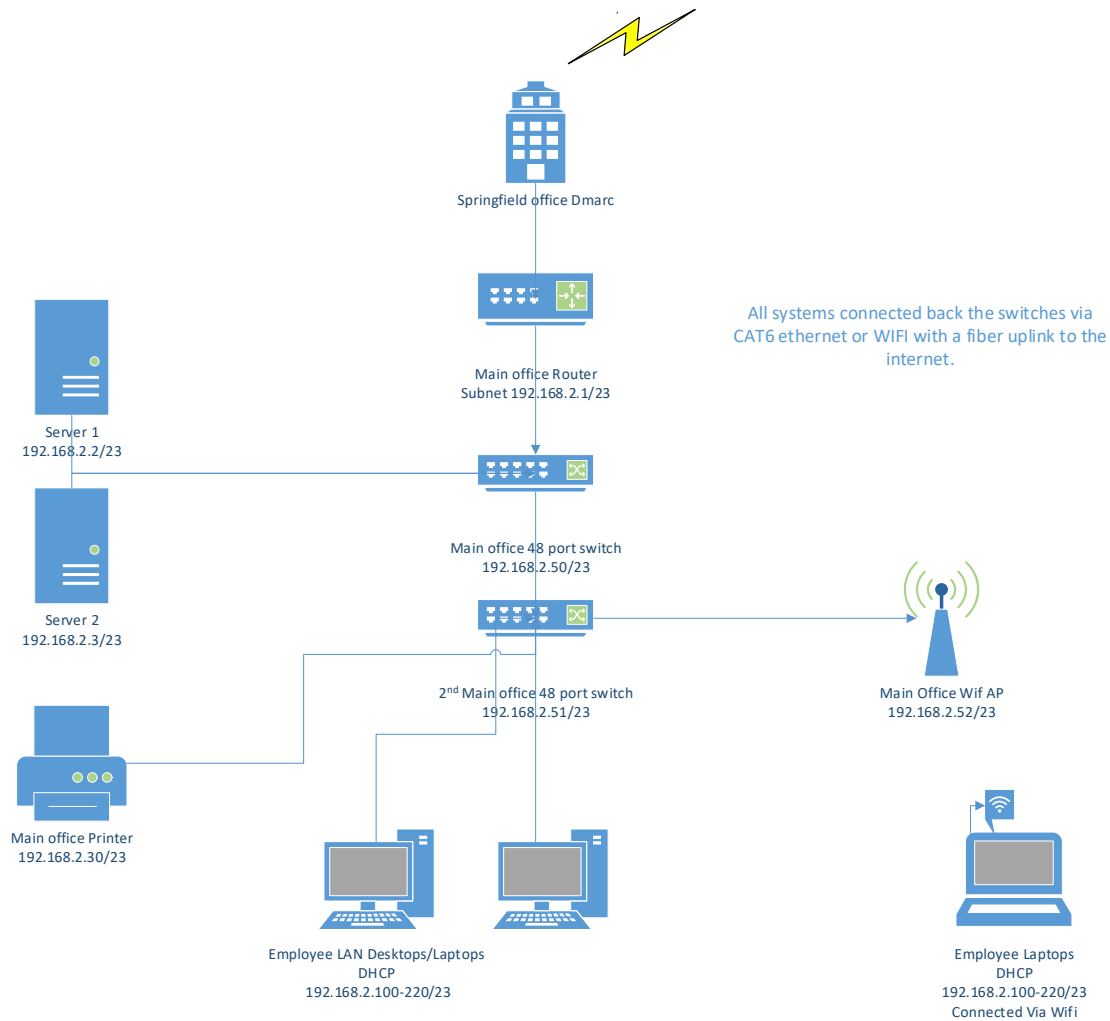
- a. LAN Topologies, topologies like Ring, Mesh, Bus, Hybrid, and Tree were considered, but Star Topology was deemed most suitable for its support practices.
- b. Appropriate Topology: Choice the Star Topology is chosen due to its simplicity, ease of expansion, and localized impact in case of failure.
- c. Possible Topology Choices:
 1. Ring Topology: Devices connected circularly.
 2. Mesh Topology: Devices are interconnected, providing multiple paths.
 3. Bus Topology: Single central cable with devices connected.
 4. Hybrid Topology: Combination of different topologies.

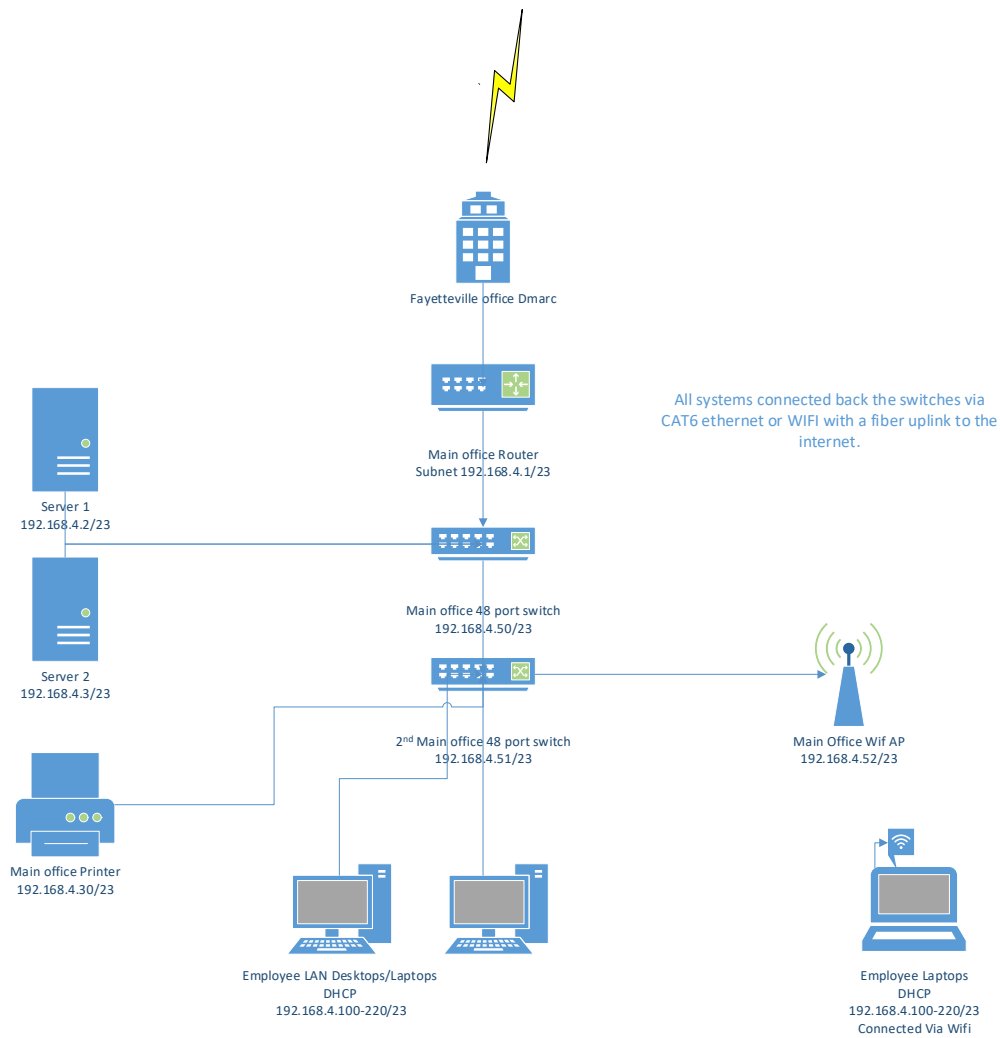
5. Tree Topology: Hierarchy of star topologies interconnected.

- Data Transport:
 - a. Synchronous/Asynchronous Data Transport: Considering whether the data transfer is synchronous (real-time) or asynchronous (non-real time) based on application requirements.
 - b. Virtual LANs (VLANs): Implementing VLANs to efficiently manage traffic and enhance security by segmenting the network.

Therefore, the above considerations should be used for planning the new office location; the network hardware, ISP, and detailed build-out can be created based on the recommendations above and can be used as an outline to produce a more detailed layout of the office, network, and locations.







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