**Final Project**

Matthew A Keaton

Southern New Hampshire University

IT 212: Intro to Computer Networks

Professor Joel Short

April 20, 2025

1. **Key Considerations**
   1. This office will follow the structure of the Open Systems Interconnection (OSI) model to set up its network infrastructure properly. For the physical layer (layer 1) of the OSI model, the new office should use fiber optic internet since it currently provides the fastest internet option. Fiber optic will ensure a strong connection for the new office. The data link layer (layer 2) should allow the employees to connect to the network by wired connection or using Wi-Fi. For the transport (layer 4) of the OSI model, sending traffic to another host on a network, the new office should use a Virtual Private Network (VPN) to secure data being sent across networks to other locations, such as the print jobs sent to Albany. The application layer (layer 7) will ensure video conferencing and print services will function smoothly. Using IP range from 10.0.0.0 to 10.255.255.255/24 will give us enough private addresses to use with room for growth and divide into /24 subnets for each department.
   2. At the new Fayetteville office, we’ll use fiber internet for fast and reliable online access and Cat6a cables to connect computers, printers, and other devices inside the office. We’ll set up strong and fast Wi-Fi for wireless connections so employees can connect with laptops and phones. Data will move through wired and wireless networks within the office. To connect with the other offices, we’ll use a VPN tunnel over the internet, which will help keep the data safe. The common network hardware we’ll use is a router/modem, switches, access points (AP), MMF fiber optic cable, and efficient power management.
2. **LAN Topology**
   1. The strength of having a star topology is that the central appliance makes it easier to manage or troubleshoot all traffic. Another strength is that the star topology makes adding or removing devices easier without affecting the whole network, which is ideal for adding a new office. If a device fails, it won’t affect the entire network unless the main central switch is at fault. However, a weakness is that if the central switch fails, the entire network is down. The Fayetteville office LAN Topology should be star topology. This will allow the central appliance to serve as the main point for communication and make it easier to troubleshoot.
3. **Internet Service Provider (ISP)**
   1. Spectrum and Metronet are the two available internet providers in Fayetteville, NC. According to HighSpeedInternet.com (n.d.), Spectrum has 60% availability in Fayetteville, NC, and offers speeds up to 1 Gbps. Metronet has 80% availability in Fayetteville, NC, and uses fiber with speeds up to 5 Gbps. Metronet service provider is the best option for the new office in Fayetteville, NC. Metronet offers high-speed fiber internet and has the highest availability throughout Fayetteville at 80%, which makes it more accessible. Metronet is the best ISP choice because it is faster, more reliable, and secure and can grow or move with the company.
4. **Hardware and Software, Printer, and Bandwidth**
   1. The hardware needed to support the new office includes a router with firewalls to protect the network, switches to help control internet traffic, and wireless access points to allow employees reliable access throughout the office. Software needed is network monitoring tools that allow IT to track and fix any issues on the network. Another software that must be included is Microsoft 365 to allow employees to create documents, send emails, file share, and video conference to support daily work needs. There needs to be print management software included that helps track the printer, control access, and automate driver distribution.
   2. We will use Print Manager Plus software for our print configuration to handle printing from different parts of the office. This software lets employees print from anywhere in the office and can automatically install printer drivers for each user, making setup quick and easy. Print Manager Plus will also help us track the usage of who is printing, which can save time and money. This will also allow us to set access controls for printer users to enhance security and keep important documents safe. (Print Manager, n.d.). This configuration will make printing in the office secure, reliable, and efficient for everyone.
   3. To meet the teleconferencing needs, the new location should have internet speeds of at least 300 Mbps of bandwidth to support multiple people on video calls for meetings without experiencing freezing or lagging. Since the software we are using is Microsoft Office 365, we will use Microsoft Teams as the primary choice for teleconferencing. Any desktops in the office will need webcams installed to ensure employees can access team meetings with video on.
5. **Potential Errors**
   1. The new office may face some potential network errors such as connection issues where employees experience slow internet speed due to high traffic, an overload in bandwidth where too many people are accessing video conferencing at the same time, hardware failure from faulty wiring or routers overheating, and outages from natural disasters.
   2. To effectively troubleshoot the issues above, we can start by isolating the issue by checking if the problem exists on one computer or is happening to everyone. We can check the hardware or Wi-Fi strength if it happens to just one person. If it happens to everyone, we should check the router or ISP. When troubleshooting bandwidth issues, we will notice when too many people join a video call at once, and we can prioritize these calls to ensure they get faster speeds during that time. To test if a device is reachable, we can use the “ping” command or “traceroute” to see where the connection gets stuck. We should also have a disaster recovery plan to minimize downtime and back up our systems during a natural disaster.
   3. The troubleshooting approaches above will help locate and fix problems at the new office by quickly discovering what is wrong. Using tools like ping, traceroute, and setting call priorities ensure smoother video meetings and keep the Fayetteville office running even during outages.
6. **Additional Considerations**
   1. To ensure the Fayetteville office network continues working well, we can use port scanning tools like Nmap or Zenmap to check if devices and programs are running as they should. Interface monitoring will watch the routers and switches to ensure they’re working properly and not getting too busy.
   2. To ensure the new office systems are secure and updated, we will use patch management tools to help find, test, and install updates. Microsoft offers a free Windows Server Update Services (WSUS) tool that lets the IT team manage and deploy Windows updates across multiple systems. Other tool options like SolarWinds Patch Manager and ManageEngine Patch Manager are available to automate patching for Windows and third-party apps, along with other features that will test patches before going live.
   3. To help manage and control inventory at the new Fayetteville office, we will use tools that automatically find and keep track of the devices on the network. A tool called ManageEngine, created by the company Zoho Corporation, can be used to scan the network and list details about each device, like the IP address, what software is installed, its name, and hardware specifications. This will make it easy for us to keep track of what we have and find anything that shouldn’t be on our network, and it will also help with planning for updates or repairs.

**References**

CompTIA. (n.d.). *CertMaster Learn Network+: Exam N10-009*. CompTIA.

HighSpeedInternet.com. (n.d.). *Top 5 Internet Providers in Fayetteville, NC*. Retrieved April 08, 2025, from <https://www.highspeedinternet.com/nc/fayetteville>

Print Manager. (n.d.). *Print Manager Plus: Control and manage your printing*. Retrieved April 08, 2025, from <https://www.printmanager.com/index.htm>