**Cybersecurity Course 1 Capstone- Part III**

**Student Template**

**Part III- Performance and Security Recommendations**

This part of the Capstone evaluates your ability to review a home network and make recommendations about issues such as IP addresses, network connections, wi-fi signals, passwords, and firewalls.

In the scenario below, you have agreed to help a friend assess their home network. They have asked you to review the network and then make any recommendations for improving performance and security. Upon talking with your friend and reviewing the network, you have made the following observations:

**Observations**

* The house is a 2-story house that was built in the 1920’s with a lot of brick and stone, as well as plaster and lathe walls
* The ISP currently provides service through cable. The ISP cable enters the house from the top floor
* The ISP provides an all-in-one device that supports wi-fi and 4 wired ethernet ports for connecting devices. This device sits on the top floor.
* You’ve identified a wi-fi network named “Smith-Family-Wireless"
* The network consists of a mix of wireless devices including a laptop computer, tablet, smart phone, smart TV, video doorbell, and gaming console.
* No devices currently have a wired connection
* Your friend uses the laptop upstairs usually in one of the spare rooms, or down on the first floor
* The gaming console is down in the basement, and your friend reports that it often loses connection.
* Your friend reports that it is often difficult to get a good wi-fi or cellular signal in the basement, as well as at other points throughout the house.
* Your friend gave you permission to log into the all-in-one device to review the wireless network and security settings. You recognized that the password to log into the device’s administration web page is the same as the password to get on the wi-fi.
* You find that the wireless security is set to WEP
* Your friend indicates that several applications and games they use require certain ports to be opened in the firewall. To accomplish this, the firewall protection level has been set to low.

**Recommendations**

After reviewing the network, you have identified several areas of improvement. For each of the following performance or security findings, please provide your recommendation(s) to improve or resolve the issue. **Remember:** solving these problems sometimes requires trial and error. So, **you will sometimes need to provide more than one recommendation** to try to solve the problem.

Recommendations should be **specific and reasonable**. For example, a recommendation that does not include an explanation of why it might solve the problem is not specific. Additionally, calling someone for help or buying new equipment would not be considered a reasonable recommendation at this stage.

**Sample Question and Answers**

Here are some examples of answers that would be marked **Yes (Passing)** or **No (Not Passing)** based on the criteria indicated in the question. This question and related answers are not part of the assessment.

**Security Recommendation**

**Sample Question:** Please describe **at least 1 specific and reasonable recommendation** to address any security concerns related to the network’s SSID. Please describe what you would do and why it might solve the problem.

**Example of a Passing answers:** The answer is reasonable and specific, explaining why the solution might work

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| 1. The SSID for the network is Smith-Family-Wireless. Changing the SSID for the network to a name that does not identify the family or the residence might help deter an attacker from targeting this particular person or family based on the network name. |

**Examples of Not Passing answers**: Please note the lack of specificity

**Not Passing Example 1**: The answer is not a specific and it does not explain why this would work

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| 1. Change the SSID. |

**Not Passing Example 2**: The answer is not a reasonable recommendation because it does not address the SSID issue directly and it could cause more issues for devices that can’t connect through a wired connection.

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| 1. Remove the wireless network |

**Assessment Questions**

**Performance recommendations**

**Question #1:** Your friend would like to install a media server on the network to store photos and videos. The server will need a static IP address to make the connection more reliable. You know that 192.168.0.5 is an address that will work on the network, but you don’t want to use it if it is being used by another device.

Please describe **at least 1 specific and reasonable recommendation** to determine if the address is currently being used by another device. Please describe what you would do and why it might solve the problem.

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| 1. One specific and reasonable recommendation to determine if the IP address 192.168.0.5 is currently being used by another device on the network is to perform an IP address scan or network discovery. To do this, you can use network scanning tools such as Nmap or Angry IP Scanner. These tools allow you to scan the IP range of the network and identify devices that are actively using IP addresses. |

**Question #2:** Please describe **at least 2 specific and reasonable recommendations** for how you would work to improve performance with the poor wi-fi signal, particularly in the basement? Please describe what you would do and why it might solve the problem.

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| 1. A Wi-Fi range extender or a mesh network system can help extend the wireless coverage throughout the house, including the basement. Place the range extender or mesh network node strategically on the ground floor, ideally somewhere between the top floor and the basement, to ensure optimal signal strength in the basement.  2. Powerline networking adapters utilize the existing electrical wiring in your house to transmit data signals, providing a wired-like connection to areas where Wi-Fi signals are weak, such as the basement. Connect one powerline adapter to the router on the top floor and plug it into a power outlet nearby. Connect the other powerline adapter to a power outlet in the basement and connect it to a Wi-Fi access point or a wireless router. This is actually something I am considering on doing myself since the internet drops a lot throughout the house and spectrum continues to lie saying it should not!  Implementing either or both of these solutions should help improve the Wi-Fi performance in the basement, ensuring better connectivity for devices and reducing signal dropouts or slow speeds.  Top of Form |

**Question #3:** After going through all the best practices to make sure that the wireless signal in the house is performing adequately, you still have a Windows OS device that has symptoms of slow network performance. Other than taking steps to boost the wireless network signal, please describe **at least 2 specific and reasonable recommendations** to troubleshoot the network connectivity on that device. Please describe what you would do and why it might solve the problem.

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| 1. Outdated or faulty network drivers can significantly impact network performance. Updating or reinstalling the network drivers can resolve compatibility issues, bugs, or other issues that may be causing slow network speeds.  2. Windows OS has a power management feature that allows it to conserve power by reducing the power usage of various hardware components, including network adapters. However, this feature can sometimes lead to decreased network performance. I know this for a fact because I have had to deal with it quite a few times with a new PC build.  By updating or reinstalling the network drivers and adjusting the power management settings, you can address potential software related issues that may be affecting network performance on the Windows device. |

**Security recommendations**

**Question #4**: Describe at **least 1 specific and reasonable recommendation** for how you could work to improve security related to the wi-fi password. Please describe what you would do and why it might solve the problem.

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| 1. One specific and reasonable recommendation to improve security related to the Wi-Fi password is to upgrade the wireless security protocol from WEP to a more robust and secure protocol such as WPA2 or preferably WPA3. By upgrading the Wi-Fi security protocol to WPA2 or WPA3 and setting a strong passphrase, you significantly strengthen the security of your wireless network, protecting it from unauthorized access and potential security vulnerabilities associated with the outdated WEP protocol. The one major downfall to doing this I have come to realize is some systems will not support it. Such as my PS5, it will ask me to turn it off and go back to the old settings in order to pick up my WiFi ever since I bought a new router/modem, because of this I refuse to use a PS5. |

**Question #5:** Describe at **least 1 specific and reasonable recommendation** for how you could work to improve security related to the wi-fi security. Please describe what you would do and why it might solve the problem.

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| 1. One specific and reasonable recommendation to improve security related to Wi-Fi security is to enable MAC address filtering on the wireless router or all-in-one device. MAC address filtering allows you to control which devices can connect to your Wi-Fi network based on their unique MAC addresses. By allowing only specific MAC addresses to connect to your Wi-Fi network, you add an extra layer of security by preventing unauthorized devices from accessing your network, even if they have the correct Wi-Fi password. While MAC address filtering improves Wi-Fi security, it's important to note that MAC addresses can be spoofed or changed by knowledgeable individuals. Therefore, it's recommended to use MAC address filtering in conjunction with other security measures like a strong Wi-Fi password and encryption protocols. |

**Question #6:** Describe at **least 1 specific and reasonable recommendation** for how you could improve security related to the firewall. Please describe what you would do and why it might solve the problem.

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| 1. One specific and reasonable recommendation to improve security related to the firewall is to change the firewall protection level from "low" to "medium" or "high" on the all-in-one device provided by the ISP. By increasing the firewall protection level, you enhance the security of your network by fortifying its defenses against potential threats and reducing the likelihood of unauthorized access or compromise. |