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CIDM 6340 Network Management & InfoSec

Managing my Network

**What did I do?**

I researched various network architectures, optimal methodologies, and frameworks for network design. I scrutinized papers and online articles from Network Management and Advanced Topics about topics including scalability, security, and network protocols. Furthermore, I considered pragmatic scenarios, end-user demands, and the most commonly encountered device varieties in residential settings.

**What were the results?**

**Users**

The users are comprised of two adults, one of whom works remotely from home, and three children who attend school and participate in virtual classes for additional lessons. Depending on the task, each utilizes multiple devices, including laptops, tablets, and smartphones, which they employ interchangeably. Additionally, they offer smart home appliances, including PlayStation 5 gaming consoles and Smart TVs.

They require a reliable network in their residence for uninterrupted transmission of entertainment and activities, as well as high-quality video conferencing for work, education, and recreation. In addition, possessing a reliable network connection for smart home devices and IoTs, including Alexa and the home security system, and the ability to utilize cloud-based collaboration tools for work.

**Network Requirements***.*

Availability: Ensuring minimal outages and dependable connectivity are essential for work, particularly from 9 am to 5 pm (although this may be subject to change), as well as for educational purposes after school, dependable streaming, and smart home functionality—capability to grant non-critical traffic precedence over critical applications.

Capacity: To concurrently support multiple devices and sufficient bandwidth to support the Internet of Things, video conferencing, and streaming simultaneously. The necessity to safeguard against unauthorized access and cyber threats is also considered.

Area Covered: For smart home devices, the network must extend to every building area, providing complete coverage of every room, including outdoor areas—the necessity to provide for potential future expansion, such as adding users and devices during social gatherings.

**Equipment Needed**

***Router***

***Wired:*** Establishing Ethernet connections for smart home devices, gaming consoles, and workstations, among other wired and wireless connections, via a router that serves as a central centre. The TP-Link Archer C4000 is a tri-band router that, according to my research, is intended to provide dependable and rapid connectivity to multiple devices. For this residence, The TP-Link Archer C4000 will be my recommendation. Featuring sophisticated security functionalities and Quality of Service (QoS) configurations, this device is suitable for communities engaged in a wide array of online activities.

***Wireless:*** Prioritize the deployment of critical applications on the 5GHz band when configuring a dual-band Wi-Fi 6 router to facilitate high-speed wireless connections. Due to its reputation for gaming-oriented features, this household will find the ASUS RT-AX86U a dependable option, given that it utilizes critical online applications, including gaming, video conferencing, and streaming. During the configuration process, it is possible to allocate priority to the 5GHz band on the router for tasks that necessitate greater bandwidth and reduced latency. This will guarantee a reliable and expeditious wireless connection for essential operations.

Quality of service (QoS) feature that enables users to prioritize critical devices and applications while ensuring a stable connection for bandwidth-intensive duties is a key characteristic that makes the ASUS RT-AX86U a decent option. Furthermore, its functionality is optimized by device capabilities and network traffic, as it operates on both the 2.4GHz and 5GHz frequencies. To conclude, Suitable for devices such as smart home gateways, gaming consoles, and desktop computers, as it features numerous Gigabit Ethernet ports for wired connections.

Bluetooth is an additional wireless device that can facilitate communication with smart home devices and attach peripherals such as wireless keyboards and mice, speakers, and the like. Implementing mobile data services on tablets and smartphones via a dependable 5G mobile network is a contingency plan to access the Internet in case of Wi-Fi connectivity issues.

***Access Points***

An access point places wireless connectivity ahead of network security, traffic management, and communication between a local area network (LAN) and the Internet. They constitute the backbone of the household network when combined. Its principal purpose is establishing connections between the network and wireless devices, including laptops, smartphones, and tablets. Access points can disseminate Wi-Fi signals, thereby enabling wireless communication among devices. In conclusion, installation is simplified via access points by eliminating the necessity for wires and cables, and the signal range is expanded by eliminating inactive areas.

Important considerations when installing wireless access points include averting other electronic devices and selecting areas with feeble Wi-Fi signals. From the gateway, Ethernet cables are routed to the specific locations of each access point. Connect a PoE router or switch to the AP via the Ethernet cable at its opposite end.

***Switch***

Local area networks run without a switch as a fundamental component. A switch delivers data selectively to its designated recipient instead of a gateway that distributes data to all connected devices. It provides multiple devices within a LAN with a centralized point of association. Network obstruction is minimized by directing data by MAC addresses. The switch links devices within a single network by expanding the LAN and providing additional interfaces for electrical connections. Optimal internet speeds can be maintained by connecting devices such as a gaming console and desktop computer via Ethernet cables to a switch in this residence.

***Internet of Things (IoT) hub***

It fortifies network security and isolates Internet of Things (IoT) devices by establishing a distinct, fortified network segment. This would impede unauthorized access by assailants to critical devices (such as laptops or smartphones) in the event of a compromise of an IoT device. Isolating the IoT would also restrict sensitive data's vulnerability to potential intrusions and prevent congestion on the primary network, thereby guaranteeing improved performance. Establishing a Virtual LAN (VLAN), accomplished by segregating and isolating a domain at the data link layer of a computer network, is one method to accomplish this. VLANs operate as distinct networks despite sharing the same infrastructure.

***Cloud services***

Connecting to the cloud to broadcast videos, share files, and store data. By utilizing a centralized storage solution such as Google Drive or One Drive, users are able to securely store their files in the cloud and retrieve them when necessary, regardless of their location. This prevents them from utilizing device storage, which can become significantly full when considering pre-installed applications. Consistent cloud backups guarantee uninterrupted access to data and information in the event of device loss or modification.

***Service Level Agreement***

The optimal course of action is obtaining a broadband provider that guarantees 99.9% uptime and provides high-speed Internet via a Service Level Agreement (SLA). In order to ensure uninterrupted connectivity, a secondary 4G/5G provider is utilized.

**What Did You Learn?**

I learnt that gaining insight into user behaviours and needs is of the utmost importance when designing a network that accommodates the varied requirements of the family. Scalability testing guarantees that the network can accommodate forthcoming device additions and evolving usage patterns. Redundancy ensures continuous network access by providing both connectivity and services. Implementing network segmentation increases security and safeguards sensitive data, particularly for IoT devices. An amalgamation of tethered and wireless connections affords adaptability for mobile devices and smart home appliances while ensuring stability for critical applications. Utilizing cloud services increases the adaptability of the network by enabling collaborative work, data storage, and multimedia transmission. To guarantee uninterrupted network functionality and prompt resolution of issues, selecting a dependable service provider with a strong SLA is critical.