Disparity in Transmission Speed between Wireless and Wired Networks

Researcher: Mobin Kheibary [994421017]

Supervisor: Dr. Mir Saman Tajbakhsh

Task Description:

Bandwidth in Wireless and Wired Networks

Examine the reasons behind the higher transmission speed in wired networks compared to wireless networks. Bandwidth in wireless networks is significantly greater than in wired networks, yet the transmission speed in wired networks is much higher than in wireless networks. Analyze and provide a detailed explanation for this phenomenon.

Comprehensive Solution:

The higher transmission speed in wired networks compared to wireless networks can be attributed to several key factors. While wireless networks offer a larger bandwidth capacity, the actual transmission speed is lower due to various limitations.

1. **Interference and Signal Loss:** Wireless networks are susceptible to interference from other devices, physical obstacles, and environmental factors like electromagnetic radiation. This interference and signal loss degrade the signal quality, resulting in lower transmission speeds.
2. **Shared Medium:** Wireless networks operate in a shared medium, meaning multiple devices share the available bandwidth. As the number of devices increases, the available bandwidth per device decreases, leading to reduced transmission speeds. In contrast, wired networks provide dedicated connections, allowing for higher speeds.
3. **Protocol Overheads:** Wireless networks have additional protocol overheads compared to wired networks. These overheads include managing wireless signal transmission, error correction, and handling retransmissions due to signal interference or packet loss. These processes consume network resources and contribute to lower transmission speeds.
4. **Physical Limitations:** Wireless networks are subject to physical constraints like signal attenuation over distance. As the distance between devices and access points increases, the signal strength decreases, impacting transmission speeds. In contrast, wired networks have a more direct and stable connection, minimizing signal degradation.
5. **Latency and Reliability:** Wired networks offer lower latency and higher reliability compared to wireless networks. This is crucial for applications requiring real-time data transfer or sensitive data transmission. The overheads and potential disruptions in

wireless networks can result in increased latency and reduced reliability, affecting overall transmission speeds.

While wireless networks have made significant advancements, including the adoption of faster standards like Wi-Fi 6, the inherent limitations mentioned above continue to impact their transmission speeds. Wired networks, on the other hand, provide a more consistent and reliable connection, resulting in higher transmission speeds.

Understanding these factors is essential for network administrators and stakeholders to optimize wireless network performance, minimize interference, and leverage technological advancements to narrow the transmission speed gap between wireless and wired networks.

In summary, the higher transmission speed in wired networks compared to wireless networks can be attributed to factors such as interference, shared medium characteristics, protocol overheads, physical limitations, latency, and reliability.

The End.

Special Thanks to Dr. Tajbakhsh for all his efforts.