

Computer Networks and Communication

Module Summary

We covered a wide range of topics related to network communication in this module, with a focus on the function of MAC protocols in Wi-Fi networks and address resolution in IP-based networks. To mimic the functioning of a wireless LAN (WLAN), which consists of a wireless access point and multiple linked devices, including laptops and smartwatches, the group performed a role-play. The focus was on how these devices interact with one another over a shared wireless medium and how the Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) protocol is used to control collisions, which happen when numerous devices attempt to transmit data at the same time. Through the optimal sharing of the wireless medium, this protocol reduces collisions and enhances overall performance among devices.

Also, we looked at the Address Resolution Protocol (ARP), which maps IP addresses to MAC addresses and is essential to network communication. We saw how ARP broadcasts let devices find each other's MAC addresses. We saw this process occurring between devices on the network through hands-on exercises in Cisco Packet Tracer. Our comprehension of how network devices store and utilize these mappings for effective communication has improved as a result of our analysis of the ARP tables in different devices.

The session also examined how switches maintain and store MAC addresses in their tables and how network device communication updates this data. By setting up a DHCP server to dynamically assign IP addresses to devices, we were able to examine how automated IP allocation can streamline network administration and further expand our understanding of this concept.

The final activity covered the security ramifications of ARP, namely flaws like ARP spoofing and the possibility of attacks like denial-of-service (DoS) and man-in-the-middle (MITM). In connection to ARP, this introduced the idea of network security and the necessity of mitigating measures for safeguarding network communication.

Reflecting on the content

My comprehension of network device coordination and communication in wired and wireless environments has been much enhanced by this program. My knowledge of network protocols was primarily theoretical before this assignment, however the practical exercises using ARP and CSMA/CA solidified how these protocols are used in everyday situations. Understanding how network devices detect collisions and recover from them was made easier by the role-play and simulations, which are especially crucial in shared wireless environments like Wi-Fi.

An enlightening glimpse into the fundamental mechanisms underlying device communication on local networks was given by the analysis of ARP. My understanding of how apparently straightforward protocols serve as the foundation of contemporary networking has grown as a result of witnessing how ARP functions at the network layer and how it dynamically creates tables to promote effective communication. The necessity of putting safe networking techniques into place is further highlighted by the examination of ARP's security flaws, which provided a critical viewpoint on how attackers can take advantage of these defences.

We were able to experience the inner workings of network protocols while also learning to recognize and fix potential vulnerabilities in network architecture because this activity was clearly meant to mix theoretical knowledge with practical application. The goal of the course team was probably to give us the knowledge and abilities needed to manage the difficulties of real-world network communication, from setting up devices to identifying and reducing security threats.