

Network Protocols and Communication Standards for Wireless Networks

Module 1: Introduction to Network Protocols and Communication Standards

- Overview of network protocols and communication standards: history, evolution, and trends
- Wireless communication technologies and standards: WiFi, Bluetooth, cellular, satellite, and more
- Network protocol architecture and design principles: layers, protocols, and services
- Network communication standards: OSI model, TCP/IP model, and other models
- Hands-on practical: Analyzing network protocol headers and data using Wireshark.

Module 2: Wireless Network Protocols and Standards

- Wireless network protocols and standards: 802.11a/b/g/n/ac, Bluetooth, Zigbee, and cellular
- Wireless network protocol operation and features: frequency bands, data rates, and modulation schemes
- Wireless network protocol comparison: strengths, weaknesses, and tradeoffs
- Wireless network integration with wired networks: routers, gateways, and switches
- Hands-on practical: Configuring wireless network protocols and standards on routers and clients.

Module 3: Internet Protocol (IP) and Routing

- Internet Protocol (IP) basics: addressing, subnetting, and classes
- IP version 4 (IPv4) and version 6 (IPv6): features, differences, and migration
- Routing basics: routing protocols, static routing, and dynamic routing
- Routing protocols: RIP, OSPF, and BGP
- Hands-on practical: Configuring routing protocols on routers and verifying routing table entries.

Module 4: Transport Layer and Application Layer Protocols

- Transport Layer protocols: TCP and UDP
- TCP features: connection-oriented, reliable, and congestion control
- UDP features: connectionless, unreliable, and low overhead
- Application Layer protocols: HTTP, FTP, DNS, SMTP, and more
- Hands-on practical: Analyzing transport layer and application layer protocols using Wireshark.

Module 5: Security and Network Management

- Network security fundamentals: authentication, authorization, and encryption
- Virtual Private Network (VPN) and its protocols: IPSec, SSL/TLS, and OpenVPN
- Network management protocols: SNMP, NetFlow, and syslog
- Network monitoring tools and techniques: packet sniffers, intrusion detection systems, and network scanners
- Hands-on practical: Configuring VPNs and monitoring network traffic using various tools.

Module 6: Cloud Computing and Network Virtualization

- Cloud computing models: IaaS, PaaS, and SaaS
- Virtualization technologies: hypervisors, virtual machines, and containers
- Network virtualization and its protocols: VXLAN, GRE, and NVGRE
- Software-defined networking (SDN) and its components: controllers, switches, and applications
- Hands-on practical: Creating and managing virtual machines and configuring network virtualization.

Module 7: Emerging Trends in Network Protocols and Standards

- Internet of Things (IoT) protocols for wireless networks: MQTT, CoAP, and Thread
- 5G wireless networks and its protocols: NR, NG-RAN, and core network
- Network functions virtualization (NFV) and its role in network protocols and communication standards
- Artificial Intelligence (AI) and Machine Learning (ML) in network protocols and security
- Hands-on practical: Implementing an IoT protocol using a Raspberry Pi and a wireless sensor.