Wireless Connectivity : Insights and Techniques

Module 1: Introduction to Wireless Networking and RF Fundamentals

Introduction to Wireless Communication

Evolution of Wireless Technologies

RF Characteristics: Frequency, Amplitude, Phase

Electromagnetic Spectrum and Frequency Allocation

Basics of RF Propagation

Module 2: RF Measurements and Mathematics

RF Signal Measurement Techniques

Analyzing Signal Strength and Quality

Understanding Signal-to-Noise Ratio (SNR)

Power Conversion: dBm to mW and vice versa

Calculating Link Budget and Path Loss

Module 3: Wireless Networks and Spread Spectrum Technologies

Wireless Network Fundamentals and Topologies

Types of Wireless Communication

FHSS vs. DSSS vs. OFDM

Impact of Spread Spectrum Techniques on Interference

Dynamic Channel Allocation and Frequency Hopping

Module 4: MIMO Technology: HT and VHT

MIMO Principles and Benefits

Understanding Antenna Diversity

MIMO in 802.11n (HT) and 802.11ac (VHT)

Spatial Multiplexing and Beamforming

Real-World Applications of MIMO in WLANs

Module 5: WLAN Architectures and 802.11 Frame Types

Autonomous vs. Controller-Based WLAN Architectures

Overview of CAPWAP and LWAPP Protocols

Understanding Beacon Frame and its Components

Control Frame Subtypes: RTS and CTS

In-Depth Analysis of QoS Data and Management Frames

Module 6: Configuring and Managing WLANs

Site Survey: Coverage and Capacity Planning

Configuring SSIDs: Broadcast vs. Hidden SSIDs

Implementing VLANs for Segmentation and Security

Role of DHCP and IP Assignment in WLANs

Utilizing RADIUS Servers for Enhanced Authentication

Module 7: Merging Wireless Controllers into the Network

Introduction to Wireless Controllers

Controller Deployment Models: Centralized vs. Distributed

Configuring WLAN Profiles and Policies

Wireless Controller Redundancy and Failover

Network Segmentation and WLAN Design Considerations

Module 8: Understanding Wireless Clients and Implementing Guest Networks

Analysis of Client Roaming Behaviors and Challenges

Implementing Fast B SS Transition (802.11r)

Isolation Modes: Client, SSID, VLAN

Designing Secure Guest Networks with Captive Portals

Authentication Methods: Open, WPA3-SAE, EAP-TLS

Module 9: Maintaining and Troubleshooting Wireless Networks

WLAN Monitoring: Tools and Techniques

Identifying and Resolving Connectivity and Performance Issues

Managing RF Interference: Wi-Fi and Non-Wi-Fi Sources

Firmware Management: Best Practices and Rollback Strategies

Security Auditing and Compliance in Wireless Networks