

CWNA Certification

(EECT 2031)

Syllabus

Course: (EECT 2031)- CWNA Certification 60 hours

Course Description:

The CWNA® (Certified Wireless Network Administrator) certification is a foundation level wireless LAN certification for the CWNP Program. The CWNA certification prepares students with the skills to successfully administer enterprise-class wireless LANs. Topics covered include: Radio Technologies, Antenna Concepts, Wireless LAN Hardware and Software, Network Design, Installation, and Management, Wireless Standards and Organizations 802.11 Network Architecture, Wireless LAN Security, Troubleshooting, Performance Tuning and How to Perform Site Surveys.

Prerequisite:

CompTIA A+ & Network+ certification or equivalent knowledge

Course Objectives:

- Utilize Radio Frequency (RF) Technologies
- Evaluate 802.11 Regulations and Standards
- Deploy 802.11 Protocols and Devices
- Design 802.11 Network Implementation
- Ensure 802.11 Network Security
- Provide 802.11 RF Site Surveying

Rationale:

A vendor and product neutral course which will earn the student an established industry credential that validates their network and server expertise. Will serve as a jumping off point for higher level certifications.

Evaluation:

Those who participate in class discussions, complete class labs and miss no more than three class meetings will be awarded 6.0 continuing education units. Ultimate evaluation of the student will be their successfully passing the Planet 3 CWNA examination.

Books Required: (Only available at Rio Grande book store)

CWNA Self-Study, Exam PW0-100 (3rd Edition); McGraw-Hill Osborne

Proposed Schedule

These are the actual labs taught in the course:

Infrastructure Mode Throughput Analysis

This lab is built around measuring WLAN throughput under various circumstances that are broken into three separate areas:

- Pure mode throughput (802.11b vs. 802.11g vs. 802.11a vs. 802.11n)
- Mixed mode throughput
- Adjacent and co-channel interference

Understanding the "speeds and feeds" of all Wi-Fi technologies is crucial to optimizing WLAN installations, applications, and good network design. This lab demonstrates the varying throughputs for Wi-Fi connectivity standards by using FTP to transfer large files from client devices to servers. You will see and compare actual throughputs of each different technology, and the impact of using mixed technologies within the same radio spectrum.

These comparisons are done using four different network architectures:

- Autonomous APs and client devices in pure mode
- Autonomous APs and client devices in mixed mode
- WLAN Controller with Lightweight APs and client devices in pure mode
- WLAN Controller with Lightweight APs and client devices in mixed mode

Co-channel and adjacent channel interference affects throughput of Wi-Fi systems dramatically. Proper network design eliminates most channel interference. The affects of channel interference are demonstrated in this exercise.

Wireless LAN Security

The Wi-Fi Alliance has standardized security mechanisms for SOHO and SMB/enterprise environments. Two distinct classes of security mechanisms exist:

- WPA compliant
- WPA2 compliant

Wi-Fi Alliance security mechanisms are only applicable at Layer 2 of the OSI model. Each of these mechanisms will be configured and tested in this lab exercise.

Other security mechanisms for WLANs exists such as VPNs (PPTP, IPSec) and secure applications (FTP/SSH, HTTPS, POP3/SSL). This lab exercise will demonstrate VPN technology using Microsoft's PPTP/MS-CHAPv2/MPPE-128 (RC4).

Site Surveying

Two specific classes of site survey methodology exist and are used in the WLAN market today:

- Manual site surveys (often called the "walkabout")
- Predictive analysis (often hailed as "the site survey method of the future")

Within each class exist two distinct categories. Manual site surveying can be categorized as either active mode or passive mode, and one or both modes can be used at any given time.

Predictive analysis software tools are based on a mathematical model of a facility blueprint and can be performed in two distinct ways. First, importing and AutoCAD (vectorized graphic) drawing allows the predictive analysis software tool to understand detailed complex layers of a facility's construction, including wall attenuation, attenuation between floors, and channel interference. Second, importing of raster graphics, such as .jpg or .bmp, allows for faster but less accurate modeling.

Neither methodology is 100% accurate, since each has its own individual weaknesses. Used together, the surveyor can create a more complete RF snapshot of any facility.

In this exercise, students will conduct both manual and predictive analysis surveying, using software and hardware tools (determined by the instructor or specific class needs).

Course Outline

The following list contains the materials covered in the lecture portion of the course:

Introduction to 802.11 WLANs

- Discuss the standards organizations responsible for shaping the 802.11 Wireless LAN protocol
- Learn how standards compliance is enforced for 802.11 WLAN vendors
- Examine the 802.11 standard and various amendments
- Discuss additional networking standards that are commonly used to enhance 802.11 WLANs

Radio Frequency Fundamentals

- Physical aspects of RF propagation
- Types of losses and attenuation that affect RF

RF Power Output Regulations

- Understand international, regional, and local RF spectrum management organizations
- Understand RF channels in the unlicensed 2.4 GHz and 5 GHz frequency ranges
- How power output limitations are enforced by the FCC for Point-to-Multipoint (PtMP) and Point-to-Point (PtP) wireless connections

Power over Ethernet

- Recognize the two types of devices used in Power over Ethernet (PoE)
- Recognize the differences between the two types of Power Sourcing Equipment (PSE)

802.11 Analysis and Troubleshooting

- Introduction to 802.11 Protocol Analysis
- 802.11 Data Frames
- 802.11 Control Frames
- 802.11 Management Frames
- Frame Fragmentation
- Power Saving operations
- Transmission Rates

Coordinating 802.11 Frame Transmissions

- Differences between CSMA/CD and CSMA/CA
- Distributed Coordination Function (DCF)
- Quality of Service in 802.11 WLANS

communications

- Types of modulation used for wireless communications
- How channels and bandwidth are related to each other in wireless networks
- Three types of Spread Spectrum used in wireless networking

RF Math and System Operating Margin

- RF units of measure
- Basic RF mathematics
- RF signal measurements
- Understand link budgets
- Define and calculate System Operating Margin (SOM)

802.11 Service Sets

- Explain three types of service sets defined for use within 802.11 WLANs
- Roaming within a WLAN
- Load-balancing as a method to improve congestion in WLANs

- Understand the two ways in which power can be delivered using PoE
- Understand the importance of planning to maximize the efficiency of Power over Ethernet

Wireless LAN Operation

- Ad Hoc networks
- Infrastructure networks
- Bridged networks
- Repeater networks
- Mesh networks
- WLAN switched networks
- Enterprise Wireless Gateway networks
- Enterprise Encryption Gateway networks
- Virtual AP networks
- Evolution of WLAN architectures
- WLAN Management

WLAN Security

- Security Policy and Procedures
- Legacy 802.11 Security Components
- 802.11i Security Components
- WPA-Personal
- WPA-Enterprise

Antennas

- Antenna characteristics and behaviors
- Types of antennas commonly used with WLANs
- Advanced antenna systems
- Antenna placement and mounting
- Antenna safety
- Types of antenna cables, connectors, and accessories

Site Surveying

- Understanding the need for a site survey
- Defining business requirements and justification
- Facility analysis
- Interviewing network management and users
- Identifying bandwidth requirements
- Determining contours of RF coverage
- Documenting installation problems
- Locating interference
- Reporting methodology and procedures
- Understanding specifics of each vertical market
- Understanding the

- WPA2-Personal
 - WPA2-Enterprise
 - Baseline Security Practices (SOHO, SMB, Enterprise)
- customer's network topology
 - Creating appropriate documentation during and after the site survey
 - Understanding safety hazards
 - Using appropriate hardware and software to perform the survey
 - Understanding the need for spectrum analysis
 - Manual RF site surveys
 - Predictive site surveys
 - Dense AP deployment