

CWTS™ Exam Objectives

Introduction

The Certified Wireless Technology Specialist (CWTS) certification, covering the current objectives, will certify that successful candidates know the fundamentals of RF behavior, can describe the features and functions of wireless components, and have the skills needed to install and configure wireless network hardware components. A typical candidate should have a basic understanding of data networking concepts.

The skills and knowledge measured by this examination are derived from a survey of wireless networking experts and professionals. The results of this survey were used in weighing the subject areas and ensuring that the weighting is representative of the relative importance of the content.

The following chart provides the breakdown of the CWTS exam as to the weight of each section of the exam.

Subject Area	% of Exam
Wi-Fi Technology, Standards, and Certifications	15%
Hardware and Software	25%
Radio Frequency (RF) Fundamentals	15%
Site Surveying and Installation	15%
Applications, Support, and Troubleshooting	15%
Security & Compliance	15%
Total	100%

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Please review this policy before beginning the study process for any CWNP exam. Candidates will be required to state that they understand and have abided by this policy at the time of exam delivery. If a candidate has a question as to whether study materials are considered "brain dumps", he/she should perform a search using CertGuard's engine, found here: <http://www.certguard.com/search.asp>

Wireless Technologies, Standards, and Certifications

1.1 Define the roles of the following organizations in providing direction and accountability within the wireless networking industry

- § IEEE
- § Wi-Fi Alliance
- § Regulatory Domain Governing Bodies

1.2 Define basic characteristics of Wi-Fi technology

- § Range, coverage, and capacity
- § Frequencies/channels used
- § Channel reuse and co-location
- § Active and passive scanning
- § Power saving operation
- § Data rates and throughput
- § Dynamic rate switching
- § Authentication and association
- § The distribution system and roaming
- § Infrastructure and ad hoc modes
- § BSSID, SSID, BSS, ESS
- § Protection Mechanisms

1.3 Summarize the basic attributes and advantages of the following WLAN standards, amendments, and product certifications

- § Wi-Fi certification
 - 802.11a
 - 802.11b
 - 802.11g
 - 802.11n
- § Wi-Fi Multimedia (WMM) certification
- § WMM Power Save (WMM-PS) certification
- § Wi-Fi Protected Setup (WPS) certification
 - Push-button
 - PIN-based
- § Wi-Fi Protected Access (WPA/WPA2) certification
 - Enterprise
 - Personal

Hardware and Software

2.1 Identify the purpose, features, and functions of the following wireless network components. Choose the appropriate installation or configuration steps in a given scenario.

- § Access Points
 - Lightweight
 - Autonomous
 - Mesh
- § Wireless LAN Routers
- § Wireless Bridges
- § Wireless Repeaters
- § WLAN Controller/Switch
 - Distributed AP connectivity

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- Direct AP connectivity
 - Layer-2 and Layer-3 AP connectivity
 - § Power over Ethernet (PoE) Devices
 - Midspan
 - Endpoint
- 2.2 Identify the purpose, features, and functions of the following client devices. Choose the appropriate installation or configuration steps in a given scenario.
- § PC Cards (ExpressCard, CardBus, and PCMCIA)
 - § USB2, CF, and SD Devices
 - § PCI, Mini-PCI, and Mini-PCIe Cards
 - § Workgroup Bridges
 - § Client utility software and drivers
- 2.3 Identify the purpose, features, and functions of and the appropriate installation or configuration steps for the following types of antennas.
- § Omni-directional / dipole
 - § Semi-directional
 - § Highly-directional

Radio Frequency (RF) Fundamentals

- 3.1 Define the basic units of RF measurements.
- § Milliwatt (mW)
 - § Decibel (dB)
 - § dBm
 - § dBi
- 3.2 Identify factors which affect the range and speed of RF transmissions
- § Line-of-sight requirements
 - § Interference (Baby monitors, spread spectrum phones, microwave ovens)
 - § Environmental factors
- 3.3 Define and differentiate between the following physical layer wireless technologies
- § HR/DSSS
 - § ERP
 - § OFDM
 - § MIMO
- 3.4 Define concepts which make up the functionality of RF and spread spectrum technology
- § OFDM & HR/DSSS channels
 - § Co-location of HR/DSSS and OFDM systems
 - § Adjacent-channel and co-channel interference
 - § WLAN / WPAN co-existence
 - § CSMA/CA operation – half duplex
- 3.5 Identify RF signal characteristics and the applications of basic RF antenna concepts
- § Passive Gain

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- § Beamwidths
- § Simple diversity
- § Polarization

3.6 Describe the proper locations and methods for installing RF antennas

- § Pole/mast mount
- § Ceiling mount
- § Wall mount

3.7 Identify the use of the following WLAN accessories and explain how to select and install them for optimal performance and regulatory domain compliance

- § RF cables
- § RF connectors
- § Lightning Arrestors and grounding rods

Site Surveying and Installation

4.1 Understand and describe the requirements to gather information prior to the site survey and do reporting after the site survey

- § Gathering business requirements
- § Interviewing managers and users
- § Defining physical and data security requirements
- § Gathering site-specific documentation
- § Documenting existing network characteristics
- § Identifying infrastructure connectivity and power requirements
- § Understanding RF coverage requirements
- § Client connectivity requirements
- § Antenna use considerations

4.2 Define and differentiate between the following WLAN system architectures and understand site survey concepts related to each architecture. Identify and explain best practices for access point placement and density.

- § Multiple Channel Architecture (MCA)
- § Single Channel Architecture (SCA)

4.3 Define the need for and the use of a manual site survey tool and differentiate between the following manual site survey types

- § Active surveys
- § Passive surveys

4.4 Differentiate between manual and predictive site surveys

- § Advantages and disadvantages of each site survey methodology

4.5 Define the need for and use of a protocol analyzer in a manual site survey as it relates to the following

- § Identifying, locating, and assessing nearby WLANs

4.6 Differentiate between site surveys involving networks with and without a mesh access layer

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4.7 Define the need for and use of a spectrum analyzer in a manual site survey

- § Identification and location of interference sources
- § Differentiation of Wi-Fi and non-Wi-Fi interference sources

4.8 Identify limitations on hardware placement

- § Areas where APs or antennas cannot be placed
- § Areas beyond Ethernet distance limitations

4.9 Understand industry best practices for optimal use of directional and omni-directional antennas in site surveys

Applications, Support, and Troubleshooting

5.1 Identify deployment scenarios for common WLAN network types

- § Small Office / Home Office (SOHO)
- § Extension of existing networks into remote locations
- § Building-to-building connectivity
- § Public wireless hotspots
- § Mobile office, classroom, industrial, and healthcare
- § Municipal and law-enforcement connectivity
- § Corporate data access and end-user mobility
- § Last-mile data delivery – Wireless ISP
- § Transportation networks (trains, planes, automobiles)

5.2 Recognize common problems associated with wireless networks and their symptoms, and identify steps to isolate and troubleshoot the problem. Given a problem situation, interpret the symptoms and the most likely cause. Problems may include:

- § Decreased throughput
- § Intermittent or no connectivity
- § Weak signal strength
- § Device upgrades

5.3 Identify procedures to optimize wireless networks in specific situations.

- § Infrastructure hardware selection and placement
- § Identifying, locating, and removing sources of interference
- § Client load-balancing
- § Analyzing infrastructure capacity and utilization
- § Multipath and hidden nodes

Security & Compliance

6.1 Identify and describe the following WLAN security techniques.

- § SSID Hiding
- § Legacy Security Mechanisms: WEP and MAC Filtering
- § User-based Security - 802.1X/EAP and RADIUS Authentication
- § Passphrase-based Security
- § Push-button or PIN-based Wireless Security
- § Encryption – TKIP/CCMP
- § Role Based Access Control (RBAC)

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- § Virtual Private Networking (VPN)
- § Wireless Intrusion Prevention Systems (WIPS)
- § Captive Portal

6.2 Regulatory Compliance

- § PCI Compliance
- § HIPAA Compliance
- § Enforcing compliance with WIPS

