CWISE Bootcamp – Expert Level

Certified Wireless IoT Solutions Expert (CWISE) Bootcamp Objectives and Sub-Objectives

Introduction

This bootcamp is unique because it is an 80 hours program and covers the entire curriculum CWNP Certified Wireless IoT Solutions Expert (CWISE), is fully didactic and consists of in person or online Live Expert Sessions, where you interact with a CWISE also senior instructor (CWNT). Online possible in your own familiar home (or work) environment.

After this CWISE bootcamp it will demonstrate that you have mastered all relevant skills to administer, install, configure, troubleshoot, and design wireless network systems. In addition, aspiring CWISE candidates will need to demonstrate deep understanding of protocol analysis, intrusion detection and prevention, performance and QoS analysis, spectrum analysis and management and advanced design.

The CWISE Bootcamp is a two week course of in total 10 days, separated by a weekend.

Each training module of the CWNP CWISE track will be covered out of their highlights so the list is as follows:

Training Modules	*Course Length*
1.0 Certified Wireless IoT Solutions Administrator (CWISA) - Broaden Level	2 Days
2.0 Certified Wireless IoT Connectivity Professional (CWICP) - Connect Level	2 Days
3.0 Certified Wireless IoT Integration Professional (CWIIP) - Integrate Level	2 Days
4.0 Certified Wireless IoT Design Professional (CWIDP) - Design Level	2 Days
5.0 Certified Wireless Network Administrator (CWNA) - Broaden Level	2 Days

WORLD WIDE WIFI EXPERTS

Course Outline

1.0 Certified Wireless IoT Solutions Administrator (CWISA) - Broaden Level

1.1 Wireless Technologies

- 1.1.1 Maintain continued awareness of wireless IoT technologies and applications of those technologies
- 1.1.2 Understand industry standard, certification and regulatory organizations and standards development processes
- 1.1.3 Define wireless network types (WLAN, WPAN, WBAN, WMAN, WWAN, WSN, IoT
- 1.1.4 Understand hardware and software components of IoT end devices and gateways (processors, memory, radios, storage, sensors, network connections, operating systems/firmware, application/service software, off-the-shelf devices, custom devices)

1.2 Radio Frequency Communications

- 1.2.1 Explain the basic RF wave characteristics, behaviors and measurements used for wireless communications
- 1.2.2 Describe the fundamentals of modulation techniques used in wireless communications (ASK, FSK, PSK, APSK, QAM, OFDM, OFDMA, Frequency Hopping, CSS, AM, FM, CW)
- 1.2.3 Explain the basic capabilities of components used in RF communications
- 1.2.4 Describe the basic use and capabilities of the RF bands

1.3 Planning, Implementing and Supporting Wireless Solutions

- 1.3.1 Identify and use the wireless IoT system requirements
- 1.3.2 Identify and comply with system constraints
- 1.3.3 Select appropriate wireless IoT solutions based on requirements and constraints
- 1.3.4 Plan for the technical requirements of the wireless IoT solution
- 1.3.5 Understand the basic features and capabilities of common wireless IoT solutions and plan for their implementation
- 1.3.6 Understand the wireless IoT solution and consider key issues related to automation, integration, monitoring, and management
- 1.3.7 Use best practices in wireless IoT solution implementations

1.3.8 Validate wireless solution implementations including RF communications and application functionality

1.3.9 Understand and implement basic installation procedures

1.3.10 Implement best practices in knowledge transfer and hand-off

1.3.11 Administer the wireless solution while considering the implications of various vertical markets

1.3.12 Troubleshoot common problems in wireless IoT solutions

1.3.13 Understand and determine the best use of scripting and programming solutions for wireless IoT implementations

1.3.14 Understand application architectures and their impact on wireless IoT solutions

2.0 Certified Wireless IoT Connectivity Professional (CWICP) - Connect Level

2.1 Wireless IoT Technologies and Solutions

- 2.1.1 Understand wireless IoT architectures
- 2.1.2 Identify the benefits and constraints of various wireless IoT architectures and technologies
- 2.1.3 Understand and apply knowledge of the benefits and constraints/limitations of discrete IoT related features for the purpose of making recommendations on technologies that will meet a requirement, such as battery life/time, distance, etc.
- 2.1.4 Understand wireless IoT components
- 2.1.5 Differentiate between component interactions and architectures of specific wireless IoT technologies

2.2 Wireless IoT RF Characteristics and Security

- 2.2.1 Understand frequency band characteristics
- 2.2.2 Understand the characteristics of commonly used IoT frequency bands, specifically 400MHz, 800/900MHz, 2.4GHz
- 2.2.3 Concepts and relationships of frequencies to FSPL
- 2.2.4 Effect of receive sensitivity on RSSI across various bands (Friis Transmission Equation)
- 2.2.5 Incumbents in the airspace
- 2.2.6 Propagation characteristics
- 2.2.7 Explain channel widths, SNR and other power considerations
- 2.2.8 Understand the characteristics of commonly used IoT RF bands
- 2.2.9 Relationship of channel widths to SNR (SNR as a function of channel width)
- 2.2.10 Rx/Tx power considerations
- 2.2.11 Causes and effects of dynamic range compression and desense

- 2.2.12 Understand and apply IoT privacy and integrity concepts
- 2.2.13 Understand and apply secure provisioning & access control in IoT
- 2.2.14 Implement IoT technology against a defined security policy
- 2.2.15 Implement network segmentation as required including
- 2.2.16 Understand the different security requirements of data-centric vs. action-centric IoT solutions

2.3 Wireless IoT PHY Structure and Operations

2.3.1 Understand 802.15.4 PHY structure and operations used in IoT
2.3.2 Understand LoRa PHY structure and operations
2.3.3 Understand Sigfox PHY structure
2.3.4 Understand Z-Wave PHY structure
2.3.5 Understand Bluetooth PHY structure and operations used in IoT
2.3.6 Understand Bluetooth Low Energy (BLE) PHY structure and operations used in IoT

2.4 Wireless IoT MAC Layer Structure and Operations

2.4.1 Understand 802.15.4 MAC layer structure and operations for IoT
2.4.2 Understand LoRaWAN MAC layer structure and operations for IoT
2.4.3 Understand Bluetooth Low Energy (BLE) MAC layer structure and operations for IoT

3.0 Certified Wireless IoT Integration Professional (CWIIP) - Integrate Level

3.1 Explain, Use and Perform Integration Protocols

- 3.1.1 Demonstrate proficiency in selecting the best use of integration solutions for wireless IoT implementations
- 3.1.2 Compare and contrast streaming and polling methods
- 3.1.3 Identify business requirements and constraints
- 3.1.4 Identify technical requirements and constraints
- 3.1.5 dentify extract, transform, and load (ETL) requirements

3.2 Develop and Implement IoT Integration Solutions

- 3.2.1 Demonstrate proficiency with Python
- 3.2.2 Process data contained in commonly used IoT data structures
- 3.2.3 Understand and interact with database systems
- 3.2.4 Understand and implement security methods
- 3.2.5 Troubleshoot problem scenarios

- 3.2.6 Implement a method to display, monitor, and provide alerts
- 3.2.7 Implement automation to provision, configure, and interact with IoT devices

4.0 Certified Wireless IoT Design Professional (CWIDP) - Design Level

4.1 Explain, Use and Perform Integration Protocols

- 4.1.1 Gather business requirements and constraints
- 4.1.2 Gather technical requirements and constraints

4.2 Design a Wireless IoT Solution to Meet Requirements

- 4.2.1 Design for the selected topologies
- 4.2.2 Design for appropriate channel configuration
- 4.2.3 Design based on RF requirements and capabilities
- 4.2.4 Use wireless IoT tools to create and validate the design
- 4.2.5 Produce or recommend designs and configuration parameters for the IoT-related network infrastructure requirements
- 4.2.6 Produce design documentation

5.0 Certified Wireless Network Administrator (CWNA) - Foundational Level

5.1 Radio Frequency (RF) Technologies

5.1.1	Wavelength, frequency, amplitude, phase, sine waves
5.1.2	RF propagation and coverage
5.1.3	Reflection, refraction, diffraction and scattering
5.1.4	Multipath and RF interference
5.1.5	Gain and loss
5.1.6	Amplification
5.1.7	Attenuation
5.1.8	Absorption
5.1.9	Voltage Standing Wave Ratio (VSWR)
5.1.10	Return Loss
5.1.11	Free Space Path Loss (FSPL)
5.1.12	Watt and milliwatt
5.1.13	Decibel (dB)
5.1.14	dBm and dBi
5.1.15	Noise floor
5.1.16	SNR
5.1.17	RSSI
5.1.18	dBm to mW conversion rules of 10 and 3
5.1.19	Equivalent Isotropically Radiated Power (EIRP)
5.1.20	RF and physical line of sight and Fresnel zone clearance
5.1.21	Beamwidths
5.1.22	Passive gain
5.1.23	Polarization
5.1.24	Antenna diversity types
5.1.25	Radio chains
5.1.26	Spatial multiplexing (SM)
5.1.27	Transmit Beamforming (TxBF)
5.1.28	Maximal Ratio Combining (MRC)
5.1.29	MIMO
5.1.30	Omni-directional antennas

5.1.31 Semi-directional antennas
5.1.32 Highly directional antennas
5.1.33 Reading Azimuth and Elevation charts for different antenna types
5.1.34 Antenna orientation
5.1.35 RF cables and connectors
5.1.36 Lightning arrestors and grounding rods/wires

5.2 Radio Frequency (RF) Validation

5.1.37 Identify RF disruption from 802.11 wireless devices including contention vs. interference and causes/sources of both including co-channel contention (CCC), overlapping channels, and 802.11 wireless device proximity
5.1.38 Identify sources of RF interference from non-802.11 wireless devices based on the investigation of airtime and frequency utilization
5.1.39 Understand interference mitigation options including removal of interference source or change of wireless channel usage
5.1.40 Network and service availability
5.1.41 VoIP testing
5.1.42 Real-time application testing
5.1.43 Throughput testing
5.1.44 Use of throughput testers for validation tasks
5.1.45 Use of wireless validation software (specifically survey software and wireless scanners)
5.1.46 Use of protocol analyzers for validation tasks
5.1.47 Use of spectrum analyzers for validation tasks

5.3 WLAN Regulations, Standards, Protocols, Devices, Networks Architecture and Design Concepts

5.3.1 IEEE
5.3.2 Wi-Fi Alliance
5.3.3 IETF
5.3.4 Regulatory domains and agencies

5.3.5 DSSS – 802.11
5.3.6 HR-DSSS – 802.11b
5.3.7 OFDM – 802.11a
5.3.8 ERP – 802.11g
5.3.9 Wi-Fi 4 - HT – 802.11n

5.3.10 Wi-Fi 5 - VHT – 802.11ac
5.3.11 Wi-Fi 6 - HE - 802.11ax

5.3.12 DSSS
5.3.13 OFDM
5.3.14 OFDMA and Resource Units
5.3.15 BPSK
5.3.16 QPSK
5.3.17 QAM (16, 64, 256,1024)

5.3.18 Primary channels
5.3.19 Adjacent overlapping and non-overlapping channels
5.3.20 Throughput vs. data rate
5.3.21 Bandwidth
5.3.22 Guard Interval

5.3.23 Frequency bands used by the 802.11 PHYs
5.3.24 Available channels
5.3.25 Regulatory power constraints
5.3.26 Dynamic Frequency Selection (DFS)
5.3.27 Transmit Power Control (TPC)

5.3.28 Wireless LAN (WLAN) – BSS and ESS
5.3.29 Wireless bridging
5.3.30 Wireless Ad-Hoc (IBSS)
5.3.31 Wireless Mesh

5.3.32 Stations (STAs)
5.3.33 Basic Service Set (BSS) (Infrastructure mode)
5.3.34 SSID
5.3.35 BSSID
5.3.36 Extended Service Set (ESS)
5.3.37 IBSS (Ad-Hoc)
5.3.38 Distribution System (DS)
5.3.39 Distribution System Media (DSM)

5.3.40 MSDU, MPDU, PSDU, and PPDU
5.3.41 A-MSDU and A-MPDU
5.3.42 PHY preamble and header

5.3.43 MAC frame format
5.3.44 MAC addressing

5.3.45 Management
5.3.46 Control
5.3.47 Data

5.3.48 Scanning (active and passive)
5.3.49 Authentication
5.3.50 Association
5.3.51 Open System Authentication and Shared Key authentication
5.3.52 Connecting to 802.1X/EAP and Pre-Shared Key authentication networks
5.3.53 BSS selection
5.3.54 Connecting to hidden SSIDs

5.3.55 DCF
5.3.56 EDCA
5.3.57 RTS/CTS
5.3.58 CTS-to-Self
5.3.60 Interframe spaces (SIFS, DIFS, EIFS, AIFS)
5.3.61 Physical carrier sense and virtual carrier sense
5.3.62 Hidden node

5.3.63 Roaming
5.3.64 Power save modes and frame buffering
5.3.65 Protection mechanisms

5.3.66 Access Points (APs)
5.3.67 WLAN controllers
5.3.68 Wireless network management systems
5.3.69 Wireless bridge and mesh APs
5.3.70 Client devices

5.3.71 Power Source Equipment
5.3.72 Powered Device
5.3.73 Midspan and endpoint PSEs
5.3.74 Power classes to include power differences between PSE and PD
5.3.75 Power budgets and powered port density

5.3.76 Centralized data forwarding
5.3.77 Distributed data forwarding
5.3.78 Control, Management and Data planes
5.3.79 Scalability and availability solutions
5.3.80 Tunneling, QoS and VLANs

5.3.81 Design considerations for data
5.3.82 Design considerations for voice
5.3.83 Design considerations for video
5.3.84 Design considerations for location services including Real-Time Location Services (RTLS)
5.3.85 Design considerations for highly mobile devices (e.g. tablets and smartphones)
5.3.86 Capacity planning for high and very high-density environments
5.3.87 Design considerations for guest access/BYOD
5.3.88 Design considerations for supporting legacy 802.11 devices

5.3.89 AirTime Fairness
5.3.90 Band steering
5.3.91 Dynamic power and channel management features

5.3.92 DHCP for client addressing, AP addressing and/or controller discovery
5.3.93 DNS for address resolution for clients and APs
5.3.94 Time synchronization protocols (e.g. NTP, SNTP)
5.3.95 VLANs for segmentation
5.3.96 Authentication services (e.g. RADIUS, LDAP)
5.3.97 Access Control Lists for segmentation
5.3.98 Wired network capacity requirements