Designing Cisco Enterprise Wireless Networks (300-425 ENWLSD) Study Guide Exam 300-425

Contents at a Glance

Part I Wireless Design (ENWLSD)

Chapter 1 Wireless Design Requirements

Chapter 2 Conducting an Offsite Site Survey

Chapter 3 Conducting an Onsite Site Survey

Chapter 4 Physical and Logical Infrastructure Requirements

Chapter 5 Applying Wireless Design Requirements

Chapter 6 Designing Radio Management

Chapter 7 Designing Wireless Mesh Networks

Chapter 8 Designing for Client Mobility

Chapter 9 Designing High Availability

Part II Wireless Implementation (ENWLSI)

Chapter 10 Implementing FlexConnect Chapter 11 Implementing Quality of Service on a Wireless Network Chapter 12 Implementing Multicast Chapter 13 Location Services Deployment Chapter 14 Advanced Location Services Implementation Chapter 15 Security for Wireless Client Connectivity Chapter 16 Monitoring and Troubleshooting WLAN Components Chapter 17 Device Hardening

Appendix A 802.11ax

Appendix B Software-Defined Access with Wireless

Appendix C RRM TPC Algorithm Example

Appendix D Answers Appendix

Appendix E CCNP Enterprise Wireless Design ENWLSD 300-425 and Implementation ENWLSI 300-430 Exam Updates

Glossary

Appendix F Study Planner (online)

Contents

Part I Wireless Design (ENWLSD)

Chapter 1 Wireless Design Requirements "Do I Know This Already?" Quiz **Foundation Topics** Following a Design Process **Evaluating Customer Requirements Evaluating Client Requirements** Examining Client 802.11 Capabilities Examining Client RF Capabilities Examining Client Security Capabilities Examining Client Density Choosing AP Types **Evaluating Security Requirements AP Deployment Models** Data Deployment Model Voice/Video Deployment Model **Location Deployment Model** AP Deployment Model Summary Summary Exam Preparation Tasks **Review All Key Topics Define Key Terms**

Chapter 2 Conducting an Offsite Site Survey

"Do I Know This Already?" Quiz Foundation Topics The Effect of Material Attenuation on Wireless Design Common Deployment Models for Different Industries

Enterprise Office

Small or Home Offices

Healthcare

Hospitality and Hotels

Hotspots

Education

Retail

Warehousing

Manufacturing

Designing with Regulations in Mind Choosing the Right Survey Type A Survey of Wireless Planning Tools Conducting a Predictive Site Survey Summary References Exam Preparation Tasks Review All Key Topics Define Key Terms

Chapter 3 Conducting an Onsite Site Survey

"Do I Know This Already?" Quiz Foundation Topics Performing a Walkthrough Survey Performing a Layer 1 Survey L1 Sweep Tool Essentials Interferer Types and Effects

Surveying for Interferers Performing a Layer 2 Survey The Site Survey Process Data vs. Voice vs. Location Deployments Performing a Post-Deployment Onsite Survey Summary References Exam Preparation Tasks Review All Key Topics Define Key Terms

Chapter 4 Physical and Logical Infrastructure Requirements

"Do I Know This Already?" Quiz Foundation Topics Physical Infrastructure Requirements

PoE and PoE+
UPOE and UPOE+
Power Injectors
MultiGigabit
Mounting Access Points
Ceiling and Wall Mounting Access Points
Ceiling and Wall Mounting Access Points
Mounting Access Points Below a Suspended Ceiling
Mounting Access Points Above the Ceiling Tiles
Grounding and Securing Access Points
LogEcal Infrastructure Requirements
CAPWAP Flow
AAA and DHCP Services Logical Path
Licensing Overview

Right to Use Licensing

Smart Licensing

Summary References Exam Preparation Tasks Review All Key Topics Define Key Terms

Chapter 5 Applying Wireless Design Requirements

"Do I Know This Already?" Quiz Foundation Topics Defining AP Coverage

Considering Receive Sensitivity

Considering the Signal-to-Noise Ratio

Further AP Cell Considerations

Expanding Coverage with Additional APs Designing a Wireless Network for Data Designing a Wireless Network for High Density

Limiting the Transmit Power Level

Leveraging APs and Antennas

Designing a Wireless Network for Voice and Video Designing a Wireless Network for Location Summary Exam Preparation Tasks Review All Key Topics

Define Key Terms

Chapter 6 Designing Radio Management

"Do I Know This Already?" Quiz Foundation Topics Understanding RRM Discovering the RF Neighborhood with NDP

RF Groups Transmit Power Control (TPC) Dynamic Channel Assignment (DCA) Coverage Hole Detection Flexible Radio Assignment (FRA) Localizing RRM with RF Profiles Optimizing AP Cell Sensitivity with RxSOP Summary Exam Preparation Tasks Review All Key Topics Define Key Terms

Chapter 7 Designing Wireless Mesh Networks

"Do I Know This Already?" Quiz **Foundation Topics** Mesh Network Architecture and Components **Mesh Access Points** Access Point Roles in a Mesh Network Mesh Network Architecture Overview Site Preparation and Planning **Supported Frequency Bands Dynamic Frequency Selection** Antenna and Mounting Considerations for Outdoor Mesh Mesh Convergence and Traffic Flows Adaptive Wireless Path Protocol Traffic Flow Through the Mesh **Ethernet Bridging** Cisco Wi-Fi Mesh Configuration **Daisy-Chaining Wireless Mesh Links**

Workgroup Bridges Workgroup Bridging Overview Configuring Workgroup Bridges Summary References Exam Preparation Tasks Review All Key Topics Define Key Terms

Chapter 8 Designing for Client Mobility

"Do I Know This Already?" Quiz **Foundation Topics Roaming Review** Autonomous APs Intra-Controller (Layer 2) Roam Inter-Controller (Layer 2) Roam Inter-Controller (Layer 3) Roam **Organizing Roaming Behavior with Mobility Groups Defining the Mobility Hierarchy Exploring Mobility Operations** Validating the Mobility Hierarchy and Tunneling **Optimizing AP Selection for Client Roaming Optimizing the AP Scanning Process** Optimizing with CCX Assistance Optimizing with 802.11k Assistance Optimizing with 802.11v Assistance **Optimizing Security Processes for Roaming RSN** in a Nutshell **PMKID Caching or SKC Caching**

Opportunistic Key Caching (OKC) Preauthentication CCKM 802.11r: Fast BSS Transition (FT) Fast Secure Roaming Review

Summary Exam Preparation Tasks Review All Key Topics Define Key Terms

Chapter 9 Designing High Availability

"Do I Know This Already?" Quiz
Foundation Topics
Making Controller Connectivity More Resilient
Designing High Availability for APs
AP Prioritization
Detecting a Controller Failure
AP Fallback
Designing High Availability for Controllers
N+1 Redundancy
N+N+1 Redundancy
SSO Redundancy
Summary
Exam Preparation Tasks
Review All Key Topics

Define Key Terms

Part II Wireless Implementation (ENWLSI)

Chapter 10 Implementing FlexConnect

"Do I Know This Already?" Quiz **Foundation Topics Remote Office Wireless Deployment Modes** FlexConnect Overview and Requirements Modes of Operation WAN Requirements for FlexConnect Implementing FlexConnect with AireOS Convert the AP to FlexConnect Mode Configure the Locally Switched WLANs Configure the Native VLAN and WLAN-to-VLAN Mapping Implementing FlexConnect Groups FlexConnect High Availability and Resiliency **FlexConnect Resiliency Scenarios AAA** Survivability Configuring AAA Survivability **CAPWAP** Message Aggregation FlexConnect ACLs **VLAN ACLs** FlexConnect Split Tunneling (Using the Split ACL Mapping Feature) FlexConnect Smart AP Image Upgrades Implementing FlexConnect with IOS-XE Controllers A Summary of FlexConnect Best Practices Recommendations Office Extend **Summary** References **Exam Preparation Tasks Review All Key Topics Define Key Terms**

Chapter 11 Implementing Quality of Service on a Wireless Network

"Do I Know This Already?" Quiz **Foundation Topics** An Overview of Wireless QoS Principles The Distributed Coordination Function **Retrofitting DCF—Enhanced Distributed Channel** Access (EDCA) **Access Categories** Arbitrated Interframe Space Number (AIFSN) **Contention Window Enhancements** Transmission Opportunity (TXOP) 802.11 Transmission Specification (TSpec) Implementing QoS Policies on the Wireless Controller QoS Mapping and Marking Schemes Between the Client and Controller Handling QoS Marking in the WLAN Implementing QoS on the AireOS Controller Implementing QoS on the IOS-XE Controller **Implementing QoS for Wireless Clients Implementing Client QoS Marking Schemes** Mapping DSCP to UP in the Client Implementing Application Visibility and Control Implementing AVC on a Cisco Wireless Controller Implementing AutoQoS with Fastlane Summary References **Exam Preparation Tasks Review All Key Topics**

Define Key Terms

Chapter 12 Implementing Multicast

"Do I Know This Already?" Quiz
Foundation Topics
Multicast Overview
Multicast Delivery in a Wireless Network
IGMP Snooping
Implementing Wireless Multicast
Implementing mDNS
Implementing Multicast Direct
Summary
References
Exam Preparation Tasks
Review All Key Topics
Define Key Terms

Chapter 13 Location Services Deployment

"Do I Know This Already?" Quiz Foundation Topics Indoor Location Indoor Location Protocols Infrastructure and 802.11-Based Location *Cell of Origin Techniques RSSI Trilateration Techniques Angle of Arrival (AoA) Techniques 802.11 Frames Used for Location Precision vs. Accuracy* Deploying Location Services Location Engines and Services

Configuring APs and WLCs for Location Support Deploying DNA Spaces, MSE, and CMX Initial Installation CMX Deployment Configuration **DNA Spaces Deployment Configuration** Tracking Clients, RFID Tags, Rogues, and Interferers Tracking Mobile Devices with CMX Tracking Mobile Devices with DNA Spaces Customizing Location Services **Customizing CMX Location Services Customizing DNA Spaces Location Services Summary** References **Exam Preparation Tasks Review All Key Topics Define Key Terms**

Chapter 14 Advanced Location Services Implementation

"Do I Know This Already?" Quiz Foundation Topics CMX and DNA Spaces Services and Licenses CMX Services and Licenses DNA Spaces Services and Licenses Implementing Analytics Implementing CMX Analytics Defining Zones Configuring Analytics Widgets Implementing DNA Spaces Analytics Initial Setup

Managing DNA Spaces Analytics **Implementing Guest Portals** Implementing CMX Connect Service **Connect Service Overview** *Configuring the WLC for Guest Portal Services* AireOS vs. C9800 ACLs Configuring a Portal on CMX **Implementing DNA Spaces Connect Service** Creating a New Portal from Scratch Creating a New Portal from a Template Implementing WIPS on MSE **AP Deployment for WIPS CMX WIPS Configuration Ensuring Location Operational Efficiency Deploying MSE High Availability** Managing Location Accuracy Location Requirements Verifying AP Settings Verifying Location Accuracy on MSE Customizing RF Calibration Model on PI Verifying Hyperlocation Configuration **Summary** References **Exam Preparation Tasks Review All Key Topics Define Key Terms**

Chapter 15 Security for Wireless Client Connectivity "Do I Know This Already?" Quiz

Foundation Topics Implementing 802.1X and AAA on Wireless Architectures Wireless Network Authentication Framework Extensible Authentication Protocol (EAP) Implementing Client Security on the Wireless Controller and ISE **Implementing Client Profiling** Wireless Client Profiling Principles Configuring Local Client Profiling on the Wireless Controller Implementing BYOD and Guest **Implementing BYOD and Guest** Local Web Authentication (LWA) with the Wireless Controller Local Web Authentication on an IOS-XE Controller Local Web Authentication with an Anchor Controller Certificate Provisioning on the Wireless Controller LWA and Self-Registration Central Web Authentication (CWA) with ISE Native Supplicant Provisioning Using ISE **Summary** References **Exam Preparation Tasks Review All Key Topics Define Key Terms**

Chapter 16 Monitoring and Troubleshooting WLAN Components

"Do I Know This Already?" Quiz Foundation Topics Using Reports on Cisco Prime Infrastructure and DNAC

Reports on Cisco Prime Infrastructure Report Types Scheduling and Managing Reports **Reports on Cisco DNA Center** Managing Dashboards **Trends and Insights** Managing Alarms on Cisco Prime Infrastructure and DNAC Alarms in Cisco Prime Infrastructure Rogues Alarms in DNAC Troubleshooting Client Connectivity **Building a Troubleshooting Method RF** Coverage Validation WLC, PI, and DNAC Client Troubleshooting Tools *Client Troubleshooting on the WLC* Client Troubleshooting in Cisco Prime Infrastructure *Client Troubleshooting in Cisco DNA Center* **Troubleshooting and Managing RF Interferences** WLC Interference Management Tools Interferers on Cisco PI and DNAC Summary References **Exam Preparation Tasks Review All Key Topics Define Key Terms**

Chapter 17 Device Hardening

"Do I Know This Already?" Quiz Foundation Topics

Implementing Device Access Controls

AAA Design Overview
AAA Configuration Overview on the Wireless Controller
Implementing TACACS+ Profiles and Command
Authorization

Implementing Access Point Authentication
Implementing CPU ACLs on the Wireless Controller
Summary
References
Exam Preparation Tasks
Review All Key Topics
Define Key Terms

Appendix A 802.11ax

Efficiency New Scheduling Method IoT Improvements

Appendix B Software-Defined Access with Wireless

SDA Network Architecture—Underlay and Overlay Networks Fabric Control, Data, and Security Planes Wireless Capabilities of SDA

Appendix C RRM TPC Algorithm Example

Viewing an NDP Neighbor List Neighbor Lists for the Example Scenario Performing the TPC Algorithm

Appendix D Answers Appendix

Appendix E CCNP Enterprise Wireless Design ENWLSD 300-425 and Implementation ENWLSI 300-430 Exam Updates

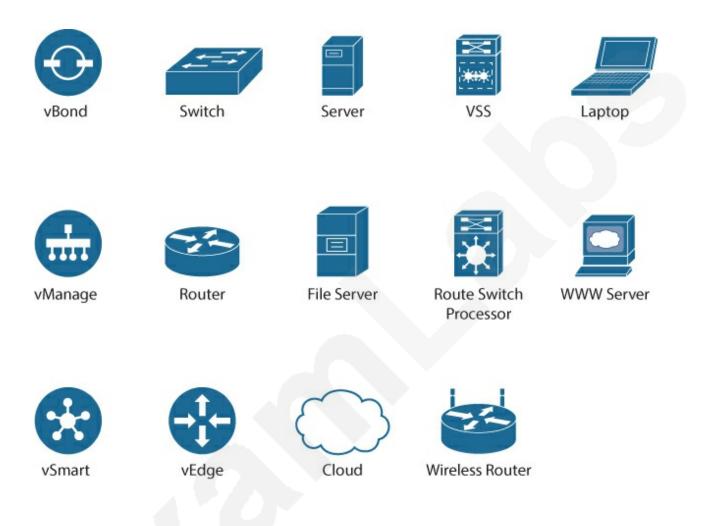
Always Get the Latest at the Book's Product Page Technical Content

Glossary

Index

Appendix F Study Planner (online)

Icons Used in This Book



Command Syntax Conventions

The conventions used to present command syntax in this book are the same conventions used in the IOS Command Reference. The Command Reference describes these conventions as follows:

- Boldface indicates commands and keywords that are entered literally as shown. In actual configuration examples and output (not general command syntax), boldface indicates commands that are manually input by the user (such as a show command).
- *Italic* indicates arguments for which you supply actual values.
- Vertical bars () separate alternative, mutually exclusive elements.
- Square brackets ([]) indicate an optional element.
- Braces ({ }) indicate a required choice.
- Braces within brackets ([{ }]) indicate a required choice within an optional element.

Introduction

Congratulations! If you are reading this Introduction, then you have probably decided to obtain a Cisco certification. Obtaining a Cisco certification will ensure that you have a solid understanding of common industry protocols along with Cisco's device architecture and configuration. Cisco has a high market share of network infrastructure of routers, switches, and firewalls, with a global footprint.

Professional certifications have been an important part of the computing industry for many years and will continue to become more important. Many reasons exist for these certifications, but the most popularly cited reason is credibility. All other factors being equal, a certified employee/consultant/job candidate is considered more valuable than one who is not certified.

Cisco provides three levels of certifications: Cisco Certified Network Associate (CCNA), Cisco Certified Network Professional (CCNP), and Cisco Certified Internetwork Expert (CCIE). Cisco made changes to all three certifications, effective February 2020. The following are the most notable of the many changes:

- The exams will include additional topics, such as programming.
- The CCNA certification is not a prerequisite for obtaining the CCNP certification.
- CCNA specializations will not be offered anymore.
- The exams will test a candidate's ability to configure and troubleshoot network devices in addition to answering multiple-choice questions.
- The CCNP is obtained by taking and passing a Core exam and a Concentration exam.
- The CCIE certification requires candidates to pass the Core written exam before the CCIE lab can be scheduled.

CCNP Enterprise candidates need to take and pass the Implementing and

Operating Cisco Enterprise Network Core Technologies ENCOR 350-401 examination. Then they need to take and pass one of the following Concentration exams to obtain their CCNP Enterprise:

- 300-410 ENARSI: Implementing Cisco Enterprise Advanced Routing and Services (ENARSI)
- 300-415 ENSDWI: Implementing Cisco SD-WAN Solutions (ENSDWI)
- 300-420 ENSLD: Designing Cisco Enterprise Networks (ENSLD)
- 300-425 ENWLSD: Designing Cisco Enterprise Wireless Networks (ENWLSD)
- 300-430 ENWLSI: Implementing Cisco Enterprise Wireless Networks (ENWLSI)
- 300-435 ENAUTO: Automating and Programming Cisco Enterprise Solutions (ENAUTO)

This book helps you study for the CCNP ENWLSD 300-425 and ENWLSI 300-430 exams. The time allowed to take each test is 90 minutes to complete about 60 questions. Testing is done at Pearson VUE testing centers.

Goals and Methods

The most important and somewhat obvious goal of this book is to help you pass the Designing Cisco Enterprise Wireless Networks ENWLSD 300-425 and Implementing Cisco Enterprise Wireless Networks ENWLSI 300-430 exams. In fact, if the primary objective of this book was different, then the book's title would be misleading; however, the methods used in this book to help you pass the ENWLSD 300-425 and ENWLSI 300-430 exams are designed to also make you much more knowledgeable about how to do your job. While this book and the companion website together have more than enough questions to help you prepare for the actual exam, the method in