CCNA Wireless 640-722 IUWNE Quick Reference

Jerome Henry

Cisco Press

CCNA Wireless (640-722 IUWNE) Quick Reference

Jerome Henry

ciscopress.com

Table of Contents

About the Author

Jerome Henry is technical leader at Fast Lane. Jerome has more than 10 years of experience teaching technical Cisco courses in more than 15 countries and four different languages to audiences ranging from bachelor degree students to networking professionals and Cisco internal system engineers. Jerome joined Fast Lane in 2006. Before then, he consulted and taught heterogeneous networks and wireless integration with the European Airespace team, which was later acquired by Cisco and became its main wireless solution. He is a certified wireless networking expert (CWNE #45), CCIE Wireless (#24750), and CCNP Wireless, and has developed several Cisco courses focusing on wireless topics, including CUWSS, IAUWS, IUWNE, IUWMS, IUWVN, CWLBS, and CWMN lab guide. With more than 20 IT industry certifications and more than 10,000 hours in the classroom, Jerome was awarded the IT Training Award Best Instructor silver medal in 2009. He is based in Cary, North Carolina.

About the Technical Reviewer

Denise Papier is senior technical instructor at Fast Lane. Denise has more than 11 years experience teaching technical Cisco courses in more than 15 different countries to audiences ranging from bachelor degree students to networking professionals and Cisco internal system engineers. Focusing on her wireless experience, Denise joined Fast Lane in 2004. Before then, she taught the Cisco Academy Program and lectured BSc (Hons) Information Security at various universities. She is CCNP Wireless and developed several Cisco courses focusing on wireless topics (IUWNE, IAUWS, ACS, ISE, and lab guides). With more than 15 IT industry certifications (from Cisco CCNP R & S, CCIP to Microsoft Certified System Engineer and Security Specialist, CICSP - Cisco IronPort Certified Security Professional) and more than 5000 hours in the classroom, Denise is a fellow member of the learning and performance institute (LPI). She is based in the United Kingdom.

 Please see page 118 for more details.

Chapter 1
WLAN Fundamentals

Wireless networks are not a new concept. The first wireless transmission occurred in 1870. During the 20th century, analog communication became digital and proprietary solutions blossomed to transmit information over RF. To organize the use of the spectrum, an international agreement allowed several portions of the spectrum to be used without license for industrial, scientific, and medical (ISM) purposes. Local regulations were created that forbade most segments of the RF spectrum for private use. Proprietary solutions moved to controlled bands (paying a fee for the right to use the spectrum segment) or to the ISM bands (free, but with risks of interferences from other networks). It was only in 1997 that the IEEE defined the first IEEE 802.11 standard, describing how a signal would be sent over the 2.4 GHz ISM band to carry digital information. Most of the protocols used today in wireless networks were defined after 1997. The wireless field is evolving every day, but its terminology and fundamental concepts are well established.

Wireless Networks and Topologies

Wireless Network Types

Wireless networks use different technologies depending on the distance to achieve, the number of devices to connect, and the amount of information to transmit. The technologies include

- **Wireless personal-area networks (WPAN):** Have a short range (up to 20–30 feet/7–10 meters), commonly use the 802.15 family of specifications to connect two or a few devices with low power consumption. Bluetooth is an example of WPAN protocol.
- **Wireless local-area networks (WLAN):** Consume more power but extend the connection to about 300 feet (100 meters). WLANs are the main topic of this book.

 Please see page 118 for more details.

- **Wireless metropolitan-area network (WMAN):** Extend the range to a larger geographic area, such as a city or suburb. Applications vary from point-to-point or point-to-multipoint links to multiuser coverage. WMANs typically use licensed frequencies (a fee has to be paid for permission to use the frequency), although implementations in the ISM bands can also be found. WiMAX is an example of WMAN protocol (most WiMAX implementations use licensed bands).
- **Wireless wide-area network (WWAN):** Provide connectivity over a wide geographical area. Usually, WWANs are networks used for mobile phone and data service and are operated by carriers. WWANs typically use licensed frequencies.

Wireless Topologies

Two wireless devices in range of each other just need to share a common set of simple parameters (frequency and so on) to be able to communicate and establish a WLAN. A first station defines the radio parameters and a connection name; the other stations just need to detect the connection and adjust their own parameters to connect to the first station and to each other. This is called an *ad hoc network*.

As soon as wireless devices (called "stations" in the 802.11 standard) connect to each other over a wireless network, a Basic Service Set (BSS) is formed. Because ad-hoc networks do not rely on any device other than the stations themselves, the wireless network they form is called an Independent Basic Service Set (IBSS). They are sometimes called *peer-to-peer* (wireless) networks.

Ad-hoc networks are limited in functionality because no central device is present to decide common rules (radio parameters, priority, range, what happens if the first station disappears, and so on). To organize the communication, most networks use a central device that defines common sets of parameters: the access point (AP, also called AP-station in the 802.11 standard). The AP organizes the BSS. Wireless devices send their signal to the AP, which relays the signal to the destination wireless station or the wired network. As such, the AP is a hybrid device, close to an Ethernet hub in concept: All stations share the same frequency, and only one station can send at any given time, forming a half-duplex network. An AP is more than a hub because it performs complex functions (generates or relays frames, for example). Like stations in an ad hoc network, an AP offers a BSS but not an IBSS, because the AP is a device dedicated to connecting stations. The area covered by the radio of this AP is called *basic service area* (BSA), or *cell*. Because the client stations connect to a central device, this type of network is said to use an infrastructure mode as opposed to an ad-hoc mode.

 Please see page 118 for more details.

Note
Ad-hoc mode was described in the original 802.11 protocol and the 802.11b amendment. But ad hoc mode does not scale well, and later amendments (802.11g, 802.11a, 802.11i) do not describe this mode anymore. A consequence is that if you configure an ad-hoc network on a standard Wi-Fi certified laptop, your setup will limit your ad-hoc network to 2.4 GHz, 802.11 or 802.11 data rates (1, 2, 5.5, or 11 Mbps), with no authentication and no encryption, or with WEP security (shared key).

The wired section of the network that can be reached through the AP is called, from the perspective of the wireless side, the *Distribution System* (DS). When the distribution system links two APs, or two cells, the group is called an *Extended Service Set* (ESS). An ESS can be reached only through an AP BSS (not through an IBSS client also connected to the wired network). When a station moves, leaves the coverage area of the AP it was originally connected to, and gets to the BSA of another AP, the station is said to roam between cells. Neighboring cells are usually on different channels to avoid interferences. Wireless networks are designed to make neighboring cell detection and roaming seamless from the station standpoint. For the station to detect that the neighboring AP offers the same connection as the previous AP, wireless network administrators use names to identify wireless connections. Neighboring APs offering the same connection type and parameters use the same name, or service set identifier (SSID, which is a simple ASCII string providing a name to the connection). Neighboring APs offering the same connection use the same SSID, but each AP identifies itself by associating its radio MAC address to the SSID string. This associated MAC address is called the *basic service set identifier* (BSSID), and it enables stations to know which AP offers which SSID.

 Please see page 118 for more details.

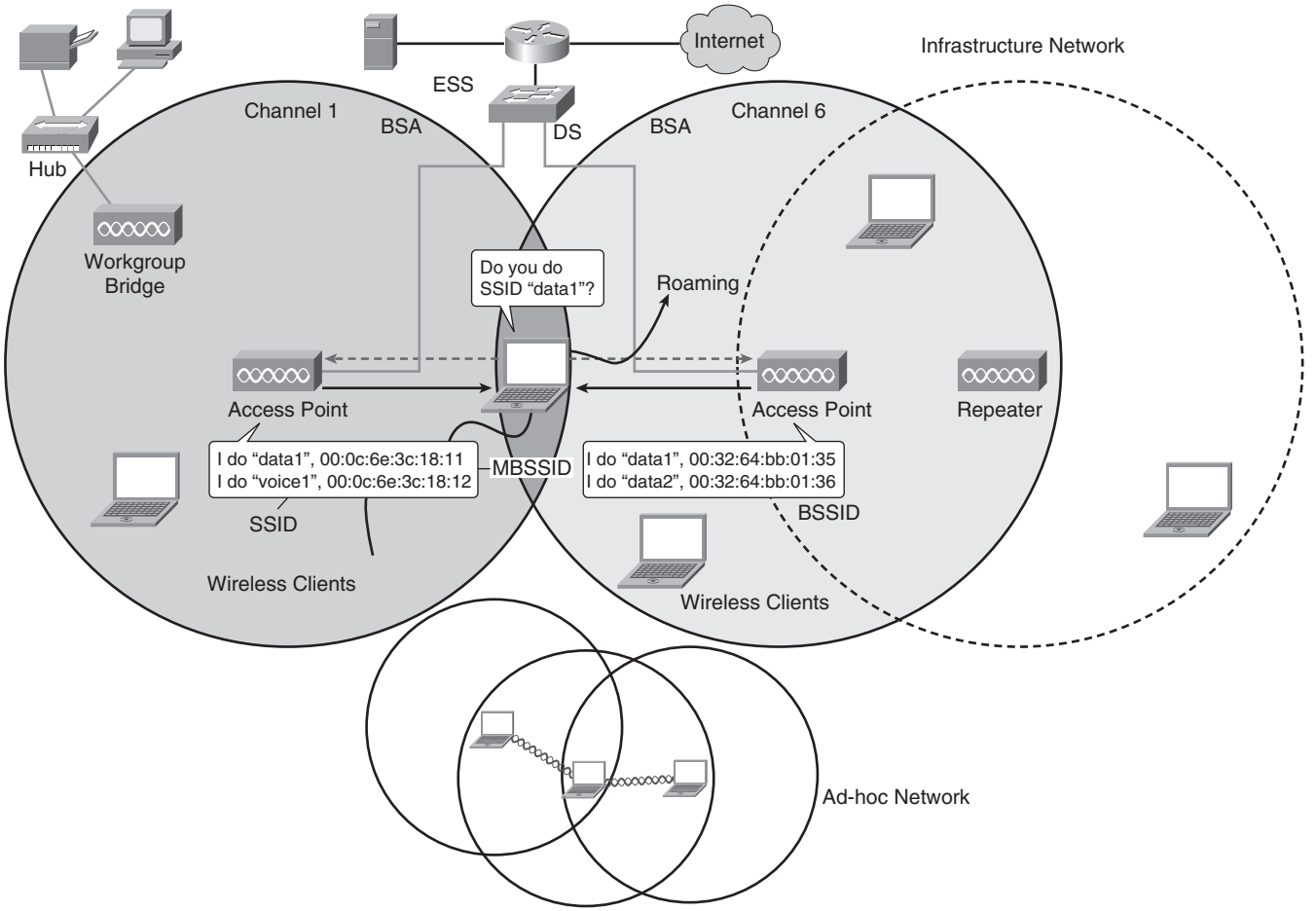

Figure 1-1 Wireless Topologies and Devices

Some APs can offer only one SSID per radio. Other APs have a slot of MAC addresses available and can support several SSIDs per radio, using Multiple BSSIDs (MBSSID). MBSSIDs basically are virtual APs that still share the same physical device, which has a half-duplex radio. MBSSIDs are a way to differentiate the traffic reaching the AP, not a way to increase the capacity of the AP. Only

CCNA Wireless (640-722 IUWNE) Quick Reference

Jerome Henry

Published by:
Cisco Press
800 East 96th Street
Indianapolis, IN 46240 USA

First Release: April 2012

ISBN-10: 1-58714-308-9

ISBN-13: 978-1-58714-308-3

Warning and Disclaimer

This book is designed to provide information about CCNA Wireless. Every effort has been made to make this book as complete and as accurate as possible, but no warranty or fitness is implied.

The information is provided on an "as is" basis. The authors, Cisco Press, and Cisco Systems, Inc. shall have neither liability nor responsibility to any person or entity with respect to any loss or damages arising from the information contained in this ebook or from the use of the discs or programs that may accompany it.

The opinions expressed in this ebook belong to the authors and are not necessarily those of Cisco Systems, Inc.

Trademark Acknowledgments

All terms mentioned in this book that are known to be trademarks or service marks have been appropriately capitalized. Cisco Press or Cisco Systems, Inc. cannot attest to the accuracy of this information. Use of a term in this book should not be regarded as affecting the validity of any trademark or service mark.

Feedback Information

At Cisco Press, our goal is to create in-depth technical books of the highest quality and value. Each book is crafted with care and precision, undergoing rigorous development that involves the unique expertise of members from the professional technical community.

Readers' feedback is a natural continuation of this process. If you have any comments regarding how we could improve the quality of this book, or otherwise alter it to better suit your needs, you can contact us through email at feedback@ciscopress.com. Please make sure to include the book title and ISBN in your message.

We greatly appreciate your assistance.

Corporate and Government Sales

Cisco Press offers excellent discounts on this book when ordered in quantity for bulk purchases or special-sales. For more information, please contact:

U.S. Corporate and Government Sales
1-800-382-3419
corpsales@pearsontechgroup.com

For sales outside the United States, please contact:

International Sales
international@pearsoned.com

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV
Amsterdam, The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.