

Wireless Attacks

Offensive Security





Copyright © 2021 Offensive Security Ltd.

All rights reserved. No part of this publication, in whole or in part, may be reproduced, copied, transferred or any other right reserved to its copyright owner, including photocopying and all other copying, any transfer or transmission using any network or other means of communication, any broadcast for distant learning, in any form or by any means such as any information storage, transmission or retrieval system, without prior written permission from the author.



Table of Contents

- 1 IEEE 802.11
 - 1.1 IEEE
 - 1.2 802.11 Standards and Amendments
 - 1.2.1 IEEE 802.11
 - 1.2.2 IEEE 802.11b
 - 1.2.3 IEEE 802.11a
 - 1.2.4 IEEE 802.11g
 - 1.2.5 IEEE 802.11n
 - 1.2.6 IEEE 802.11ac
 - 1.2.7 IEEE 802.11ad
 - 1.2.8 IEEE 802.11ax
 - 1.2.9 IEEE 802.11h
 - 1.2.10 802.11 Standard and Amendments Overview
 - 1.3 Antenna Diversity vs MIMO
 - 1.3.1 Antenna Diversity
 - 1.3.2 MIMO
 - 1.4 Wrapping Up
- 2 Wireless Networks
 - 2.1 Overview
 - 2.2 Infrastructure
 - 2.3 Wireless Distribution Systems
 - 2.4 Ad-Hoc Networks
 - 2.4.1 Ad-Hoc Demo
 - 2.5 Mesh Networks
 - 2.6 Wi-Fi Direct
 - 2.7 Monitor Mode
 - 2.8 Wrapping Up
- 3 Wi-Fi Encryption
 - 3.1 Open Wireless Networks
 - 3.2 Wired Equivalent Privacy
 - 3.2.1 RC4
 - 3.2.2 WEP Authentication
 - 3.3 Wi-Fi Protected Access
 - 3.3.1 WPA Ciphers



- 3.3.2 WPA Network Connection
- 3.3.3 WPA Authentication
- 3.4 Wi-Fi Protected Access 3
- 3.5 Opportunistic Wireless Encryption
- 3.6 Wireless Protected Setup
 - 3.6.1 WPS Architecture
 - 3.6.2 WPS Configuration Methods
 - 3.6.3 WPS Protocol
 - 3.6.4 WPS Registration Protocol Messages
- 3.7 802.11w
 - 3.7.1 Connection
 - 3.7.2 Security Association Teardown Protection
- 3.8 Wrapping Up
- 4 Linux Wireless Tools, Drivers, and Stacks
 - 4.1 Loading and Unloading Wireless Drivers
 - 4.2 Wireless Tools
 - 4.2.1 iwconfig and Other Utilities
 - 4.2.2 The iw Utility
 - 4.2.3 The rfkill Utility
 - 4.3 Wireless Stacks and Drivers
 - 4.3.1 The ieee80211 Wireless Subsystem
 - 4.3.2 The mac80211 Wireless Framework
 - 4.4 Wrapping Up
- 5 Wireshark Essentials
 - 5.1 Getting Started
 - 5.1.1 Welcome Screen
 - 5.1.2 Packet Display
 - 5.1.3 Wireless Toolbar
 - 5.1.4 Saving and Exporting Packets
 - 5.2 Wireshark Filters
 - 5.2.1 Wireshark Display Filters
 - 5.2.2 Wireshark Capture Filters
 - 5.3 Wireshark at the Command Line
 - 5.4 Remote Packet Capture
 - 5.4.1 Remote Packet Capture Setup



- 5.4.2 Built-in Wireshark
- 5.5 Advanced Preferences
 - 5.5.1 Coloring Rules
 - 5.5.2 Wireshark Columns
 - 5.5.3 Capture snaplen
 - 5.5.4 IEEE 802.11 Preferences
 - 5.5.5 WEP and WPA1/2 Decryption
 - 5.5.6 WLAN Statistics
- 5.6 Wrapping Up
- 6 Frames and Network Interaction
 - 6.1 Packets vs Frames
 - 6.2 802.11 MAC Frames
 - 6.2.1 MAC Header
 - 6.3 Frame Types
 - 6.3.1 Management Frames
 - 6.3.2 Control Frames
 - 6.3.3 Data Frames
 - 6.4 Interacting with Networks
 - 6.4.1 Open Network
 - 6.4.2 WEP
 - 6.4.3 EAPoL
 - 6.5 Wrapping Up
- 7 Aircrack-ng Essentials
 - 7.1 Airmon-ng
 - 7.1.1 Airmon-ng check
 - 7.1.2 Airmon-ng start
 - 7.1.3 Airmon-ng stop
 - 7.2 Airodump-ng
 - 7.2.1 Airodump-ng Usage
 - 7.2.2 Sniffing with Airodump-ng
 - 7.2.3 Precision Sniffing
 - 7.2.4 Airodump-ng Output Files
 - 7.2.5 Airodump-ng Interactive Mode
 - 7.2.6 Airodump-ng Troubleshooting
 - 7.3 Aireplay-ng



- 7.3.1 Aireplay-ng Replay Options
- 7.3.2 Aireplay-ng Injection Test
- 7.3.3 Aireplay-ng Troubleshooting
- 7.4 Aircrack-ng
 - 7.4.1 Aircrack-ng Benchmark
- 7.5 Airdecap-ng
 - 7.5.1 Removing Wireless Headers
- 7.6 Airgraph-ng
 - 7.6.1 Clients to AP Relationship Graph
 - 7.6.2 Clients Probe Graph
- 7.7 Wrapping Up
- 8 Cracking Authentication Hashes
 - 8.1 Aircrack-ng Suite
 - 8.2 Custom Wordlists with Aircrack-ng
 - 8.2.1 Using Aircrack-ng with John the Ripper
 - 8.2.2 Editing John the Ripper Rules
 - 8.2.3 Using Aircrack-ng with JTR
 - 8.2.4 Using Aircrack-ng with Crunch
 - 8.2.5 Using Aircrack-ng with RSMangler
 - 8.3 Hashcat
 - 8.3.1 OpenCL for GPUs
 - 8.3.2 Device Properties
 - 8.3.3 Hashcat Benchmark
 - 8.3.4 Hashcat Utilities
 - 8.3.5 Passphrase Cracking with Hashcat
 - 8.4 Airolib-ng
 - 8.4.1 Using Airolib-ng
 - 8.5 coWPAtty
 - 8.5.1 Rainbow Table Mode
 - 8.6 Wrapping Up
- 9 Attacking WPS Networks
 - 9.1 WPS Technology Details
 - 9.2 WPS Vulnerabilities
 - 9.3 WPS Attack
 - 9.3.1 Implementation Variations



- 9.3.2 Overcoming Unexpected Errors
- 9.4 Wrapping Up
- 10 Rogue Access Points
 - 10.1 The Basics of Rogue APs
 - 10.2 Discovery
 - 10.3 Creating a Rogue AP
 - 10.3.1 Building the hostapd-mana Configuration
 - 10.3.2 Capturing Handshakes
 - 10.4 Wrapping Up
- 11 Attacking WPA Enterprise
 - 11.1 Basics
 - 11.2 PEAP Exchange
 - 11.3 Attack
 - 11.4 Wrapping Up
- 12 Attacking Captive Portals
 - 12.1 Basic Functionality
 - 12.2 The Captive Portal Attack
 - 12.2.1 Discovery
 - 12.2.2 Building the Captive Portal
 - 12.2.3 Networking Setup
 - 12.2.4 Setting Up and Running the Rogue AP
 - 12.3 Additional Behaviors Surrounding Captive Portals
 - 12.4 Wrapping Up
- 13 bettercap Essentials
 - 13.1 Installation and Executing
 - 13.2 Modules vs. Commands
 - 13.3 Wi-Fi Module
 - 13.3.1 Discovering APs
 - 13.3.2 Deauthenticating a Client
 - 13.4 Additional Methods of Interacting with Bettercap
 - 13.4.1 Caplets
 - 13.4.2 Web Interface
 - 13.5 Wrapping Up
- 14 Kismet Essentials
 - 14.1 Installation



- 14.2 Configuration Files
 - 14.2.1 Output Files
 - 14.2.2 Data Sources
- 14.3 Starting Kismet
- 14.4 Web Interface
 - 14.4.1 Securing the Web Interface
- 14.5 Remote Capture
- 14.6 Log Files
 - 14.6.1 Reading Log Files
- 14.7 Exporting Data
 - 14.7.1 Pcap
 - 14.7.2 JSON
- 14.8 Wrapping Up
- 15 Determining Chipsets and Drivers
 - 15.1 Determining the Wireless Chipset
 - 15.2 Determining the Wireless Driver
 - 15.3 Example: Alfa AWUS036AC
- 16 Manual Network Connections
 - 16.1 Connecting to an Access Point
 - 16.2 Setting up an Access Point
 - 16.2.1 Internet Access
 - 16.2.2 Static IP on Access Point Wireless Interface
 - 16.2.3 DHCP Server
 - 16.2.4 Routing
 - 16.2.5 Access Point Mode