

NETWORK DEFENSE AND COUNTERMEASURES

Principles and Practices

Network Defense and Countermeasures

Principles and Practices

Fourth Edition

Dr. Chuck Easttom

PEARSON

Network Defense and Countermeasures: Principles and Practices

Table of Contents

```
Cover
Title Page
Copyright Page
Contents at a Glance
Table of Conents
Preface
Chapter 1: Introduction to Network Security
   Introduction
   The Basics of a Network
       Basic Network Structure
       Data Packets
       IP Addresses
       Uniform Resource Locators
       MAC Addresses
       Protocols
   Basic Network Utilities
       ipconfig
       ping
       tracert
       netstat
   The OSI Model
   What Does This Mean for Security?
```



Assessing Likely Threats to the Network

Classifications of Threats

Malware

Compromising System SecurityIntrusions

Denial of Service

Likely Attacks

Threat Assessment

Understanding Security Terminology

Hacking Terminology

Security Terminology

Choosing a Network Security Approach

Perimeter Security Approach

Layered Security Approach

Hybrid Security Approach

Zero Trust

Network Security and the Law

Using Security Resources

Summary

Endnotes

Chapter 2: Types of Attacks

Introduction

Understanding Denial of Service Attacks

DoS in Action

SYN Flood

Smurf Attack

Ping of Death

UDP Flood

ICMP Flood



DHCP Starvation

Billion Laughs Attack

ZIP Bomb

HTTP Post DoS

PDoS

Distributed Reflection Denial of Service

DoS Tools

Real-World Examples

Defending Against DoS Attacks

Defending Against Buffer Overflow Attacks

Defending Against IP Spoofing

Defending Against Session Hijacking

Blocking Virus and Trojan Horse Attacks

Viruses

Types of Viruses

Trojan Horses

Summary

Endnotes

Chapter 3: Fundamentals of Firewalls

Introduction

What Is a Firewall?

Types of Firewalls

Packet Filtering Firewall

Stateful Packet Inspection

Connection Tracking

Application Gateway

Hybrid Firewalls

Blacklisting/Whitelisting



Implementing Firewalls

Host-Based

Dual-Homed Hosts

Router-Based Firewall

Screened Hosts

Firewall Deployment

Selecting and Using a Firewall

Using a Firewall

Using Proxy Servers

The WinGate Proxy Server

NAT

Summary

Chapter 4: Firewall Practical Applications

Introduction

Using Single Machine Firewalls

Web Application Firewalls

Database Firewalls

Windows 10 Firewall

User Account Control

Linux Firewalls

Iptables

Symantec Norton Firewall

McAfee Personal Firewall

Windows Defender

Using Small Office/Home Office Firewalls

SonicWall

D-Link DFL-2560 Office Firewall

Using Medium-Sized Network Firewalls



Check Point Firewall Cisco Next-Generation Firewalls Juniper Next-Generation Firewalls Using Enterprise Firewalls Summary **Endnotes** Chapter 5: Intrusion-Detection Systems Introduction **Understanding IDS Concepts** Preemptive Blocking Signature Matching **Anomaly Detection IDS Components and Processes** SIEM Specific SIEM Products **Evasion Techniques** Understanding and Implementing IDSs Snort Cisco Intrusion Detection and Prevention Juniper IDS/IPS Other IDS/IPS Understanding and Implementing Honeypots Specter Symantec Decoy Server Intrusion Deflection Intrusion Deterrence

Chapter 6: Encryption Fundamentals



Summary

Introduction

The History of Encryption

The Caesar Cipher

ROT 13

Atbash Cipher

Multi-Alphabet Substitution

Rail Fence

Vigenère

Enigma

Binary Operations

Learning About Modern Encryption Methods

Symmetric Encryption

Symmetric Methods

Key Stretching

PRNG

Public Key Encryption

Digital Signatures

Identifying Good Encryption

Understanding Digital Signatures and Certificates

Digital Certificates

PGP Certificates

MD5

SHA

RIPEMD

Tiger

HAVAL

SWIFFT

MAC and HMAC

Understanding and Using Decryption



```
Cracking Passwords
       John the Ripper
       Using Rainbow Tables
       Using Other Password Crackers
       General Cryptanalysis
   Steganography
   Steganalysis
   Quantum Computing and Quantum Cryptography
   Summary
   Endnote
Chapter 7: Virtual Private Networks
   Introduction
   Basic VPN Technology
   Using VPN Protocols for VPN Encryption
       PPTP
       PPTP Authentication
       L2TP
       L2TP Authentication
       L2TP Compared to PPTP
   IPsec
   SSL/TLS
   Other VPN Protocols
       DTLS
       WireGuard
       SSTP
   Implementing VPN Solutions
       VPN Concentrator
       Cisco Solutions
```



Juniper Solutions

Huawei Solutions

Service Solutions

Openswan

SoftEther VPN

Other Solutions

Summary

Endnotes

Chapter 8: Operating System Hardening

Introduction

Configuring Windows Properly

Accounts, Users, Groups, and Passwords

Setting Security Policies

Registry Settings

Services

Encrypting File System

Security Templates

Configuring Windows Server 2019 Properly

Configuring Linux Properly

Patching the Operating System

Configuring Browsers

Securing Browser Settings for Microsoft Edge

Secure Settings for Firefox

Secure Settings for Chrome

Other Browsers

Summary

Chapter 9: Defending Against Virus Attacks

Introduction



Understanding Virus Attacks

What Is a Virus?

What Is a Worm?

How a Virus Spreads

The Virus Hoax

Types of Viruses

Malware Techniques

Virus Scanners

Virus Scanning Techniques

When Antivirus Causes a Problem

Commercial Antivirus Software

Antivirus Policies and Procedures

Additional Methods for Defending Your System

What to Do If Your System Is Infected by a Virus

Stopping the Spread of the Virus

Removing the Virus

Finding Out How the Infection Started

Machine Learning and Malware

Summary

Endnotes

Chapter 10: Defending Against Trojan Horses and Phishing

Introduction

Trojan Horses

Types of Trojan Horses

Identifying Trojan Horses

Symptoms of a Trojan Horse

Why So Many Trojan Horses?

Preventing Trojan Horses



Phishing

Phishing Examples

Defending Against Phishing

Threat Intelligence

Summary

Endnotes

Chapter 11: Security Policies

Introduction

ISO 27002

Security Policy

Organization of Information Security

Asset Management

Human Resources Security

Physical and Environmental Security

Communications and Operations Management

Access Control

Information Systems Acquisition, Development, and Maintenance

Information Security Incident Management

Business Continuity Management

Compliance

Important Standards

NIST SP 800-53

ISO 27001

ISO 27002

Defining User Policies

Passwords

Internet Use Policy

E-mail Attachments

Software Installation and Removal



Instant Messaging

Desktop Configuration

Final Thoughts on User Policies

Defining System Administration Policies

New Employees

Leaving Employees

Change Requests

Security Breaches

Defining Access Control

Defining Developmental Policies

Disaster Recovery

Summary

Chapter 12: Assessing System Security

Introduction

Risk Assessment Concepts

Evaluating the Security Risk

Conducting the Initial Assessment

Patches

Ports

Protect

Physical

Probing the Network

NetCop

NetBrute

Cerberus

Port Scanner for Unix: SATAN

SAINT

Nessus



NetStat Live Active Ports Other Port Scanners **NSAuditor** Nmap **OWASP ZAP** Shodan Kali Linux Vega **OpenVAS Vulnerabilities** CVE NIST **OWASP** Common Vulnerability Scoring System **OSSTMM** McCumber Cube Goals Information States Safeguards Security Documentation Physical Security Documentation Policy and Personnel Documentation **Probe Documents Network Protection Documents** Summary Chapter 13: Security Standards Introduction **COBIT**



ISO Standards

NIST Standards

NIST SP 800-14

NIST SP 800-35

NIST SP 800-30 Rev. 1

ISO 27002

Cloud Security Standards

Zero Trust Standards

U.S. DoD Standards

DoD 8500.2

RMF

DoD 8140.01 Cyberspace Workforce Management

Using the Common Criteria

Using Security Models

Bell-LaPadula Model

Biba Integrity Model

Clark-Wilson Model

Chinese Wall Model

State Machine Model

U.S. Federal Regulations, Guidelines, and Standards

The Health Insurance Portability & Accountability Act of 1996 (HIPAA)

HITECH

Sarbanes-Oxley (SOX)

Computer Fraud and Abuse Act (CFAA): 18 U.S. Code § 1030

Fraud and Related Activity in Connection with Access Devices: 18 U.S.

Code § 1029

General Data Protection Regulation (GDPR)

Summary

Endnotes



Chapter 14: Physical Security and Disaster Recovery

Introduction

Physical Security

Equipment Security

Securing Building Access

Monitoring

Biometrics

Fire Protection

General Premises Security

Disaster Recovery

Disaster Recovery Plan

Business Continuity Plan

Determining Impact on Business

Testing Disaster Recovery

Disaster Recovery Related Standards

Ensuring Fault Tolerance

Summary

Chapter 15: Techniques Used by Attackers

Introduction

Preparing to Hack

Passively Searching for Information

Active Scanning

NSAuditor

Enumerating

Nmap

Shodan.io

Manual Scanning

The Attack Phase



Physical Access Attacks

Remote Access Attacks

Session Hijacking

Wi-Fi Hacking

Bluetooth Hacking

Summary

Chapter 16: Introduction to Forensics

Introduction

General Forensics Guidelines

EU Evidence Gathering

Scientific Working Group on Digital Evidence

U.S. Secret Service Forensics Guidelines

Dont Touch the Suspect Drive

Leave a Document Trail

Secure the Evidence

FBI Forensics Guidelines

Imaging a Drive

Finding Evidence on the PC

In the Browser

In System Logs

Recovering Deleted Files

Open Source Forensic Tools

Operating System Utilities

The Windows Registry

The Scientific Method

Standards

Reports

Gathering Evidence from a Cell Phone



Logical Acquisition
Physical Acquisition

Chip-off and JTAG

Cellular Networks

Cell Phone Terms

iOS

Android

Forensic Tools to Use

AccessData Forensic Toolkit

EnCase

The Sleuth Kit

OSForensics

Forensic Science

To Certify or Not to Certify?

Expert Witnesses

Federal Rule 702

Daubert

Additional Types of Forensics

Network Forensics

Virtual Forensics

Summary

Endnote

Chapter 17: Cyber Warfare and Terrorism

Introduction

Defending Against Computer-Based Espionage

Defending Against Computer-Based Terrorism

Economic Attack

Compromising Defense



General Attacks Choosing Defense Strategies Defending Against Information Warfare Propaganda Information Control **Actual Cases Packet Sniffers** Summary **Endnotes** Appendix A: Answers Glossary Α В С D Ε F G Н I Κ L Μ Ν 0 Р



Q

R

S

Т

٧

W

Χ

Index