

# THE ART OF SOFTWARE SECURITY ASSESSMENT

Identifying and Avoiding Software Vulnerabilities



MARK DOWD John McDonald

# THE ART OF

# SOFTWARE SECURITY ASSESSMENT

# Art of Software Security Assessment, The: Identifying and Preventing Software Vulnerabilities

# **Table of Contents**

TABLE OF CONTENTS
ABOUT THE AUTHORS
PREFACE
ACKNOWLEDGMENTS

I: Introduction to Software Security Assessment

#### 1 SOFTWARE VULNERABILITY FUNDAMENTALS

Introduction

**Vulnerabilities** 

The Necessity of Auditing

Classifying Vulnerabilities

Common Threads

Summary

#### 2 DESIGN REVIEW

Introduction

Software Design Fundamentals

**Enforcing Security Policy** 

Threat Modeling

Summary

#### 3 OPERATIONAL REVIEW

Introduction



Exposure

Web-Specific Considerations

Protective Measures

Summary

#### **4 APPLICATION REVIEW PROCESS**

Introduction

Overview of the Application Review Process

Preassessment

Application Review

Documentation and Analysis

Reporting and Remediation Support

Code Navigation

Code-Auditing Strategies

**Code-Auditing Techniques** 

Code Auditors Toolbox

Case Study: OpenSSH

Summary

# II: Software Vulnerabilities

# **5 MEMORY CORRUPTION**

Introduction

**Buffer Overflows** 

Shellcode

Protection Mechanisms

Assessing Memory Corruption Impact

Summary

#### **6 C LANGUAGE ISSUES**

Introduction

C Language Background



**Data Storage Overview** 

Arithmetic Boundary Conditions

Type Conversions

Type Conversion Vulnerabilities

Operators

Pointer Arithmetic

Other C Nuances

Summary

#### 7 PROGRAM BUILDING BLOCKS

Introduction

Auditing Variable Use

**Auditing Control Flow** 

**Auditing Functions** 

**Auditing Memory Management** 

Summary

# 8 STRINGS AND METACHARACTERS

Introduction

C String Handling

Metacharacters

Common Metacharacter Formats

Metacharacter Filtering

Character Sets and Unicode

Summary

# 9 UNIX I: PRIVILEGES AND FILES

Introduction

**UNIX 101** 

Privilege Model

Privilege Vulnerabilities



File Security

File Internals

Links

Race Conditions

**Temporary Files** 

The Stdio File Interface

Summary

## 10 UNIX II: PROCESSES

Introduction

**Processes** 

Program Invocation

Process Attributes

Interprocess Communication

Remote Procedure Calls

Summary

# 11 WINDOWS I: OBJECTS AND THE FILE SYSTEM

Introduction

Background

Objects

Sessions

Security Descriptors

Processes and Threads

File Access

The Registry

Summary

# 12 WINDOWS II: INTERPROCESS COMMUNICATION

Introduction

Windows IPC Security



Window Messaging

**Pipes** 

Mailslots

Remote Procedure Calls

COM

Summary

# 13 SYNCHRONIZATION AND STATE

Introduction

Synchronization Problems

**Process Synchronization** 

Signals

**Threads** 

Summary

# III: Software Vulnerabilities in Practice

# 14 NETWORK PROTOCOLS

Introduction

Internet Protocol

User Datagram Protocol

Transmission Control Protocol

Summary

#### 15 FIREWALLS

Introduction

Overview of Firewalls

Stateless Firewalls

Simple Stateful Firewalls

Stateful Inspection Firewalls

Spoofing Attacks

Summary



#### 16 NETWORK APPLICATION PROTOCOLS

Introduction

**Auditing Application Protocols** 

Hypertext Transfer Protocol

Internet Security Association and Key Management Protocol

Abstract Syntax Notation (ASN.1)

Domain Name System

Summary

#### 17 WEB APPLICATIONS

Introduction

Web Technology Overview

**HTTP** 

State and HTTP Authentication

Architecture

Web Tier: Model-View-Controller

**Problem Areas** 

Common Vulnerabilities

Harsh Realities of the Web

**Auditing Strategy** 

Summary

## 18 WEB TECHNOLOGIES

Introduction

Web Services and Service-Oriented Architecture

Web Application Platforms

CGI

Perl

PHP

Java



ASP ASP.NET Summary BIBLIOGRAPHY INDEX

