



# INFORMATION SECURITY

## PRINCIPLES AND PRACTICES

SECOND EDITION

MARK S. MERKOW • JIM BREITHAUPT

# **Information Security: Principles and Practices**

*Second Edition*

Mark S. Merkow  
Jim Breithaupt

**PEARSON**

800 East 96th Street, Indianapolis, Indiana 46240 USA

# Information Security: Principles and Practices

## Table of Contents

### Table of Contents

#### Preface

#### Chapter 1: Why Study Information Security?

##### Introduction

##### The Growing Importance of IT Security and New Career Opportunities

##### An Increase in Demand by Government and Private Industry

##### Becoming an Information Security Specialist

##### Schools Are Responding to Demands

##### The Importance of a Multidisciplinary Approach

##### Contextualizing Information Security

##### Information Security Careers Meet the Needs of Business

##### Summary

##### Test Your Skills

#### Chapter 2: Information Security Principles of Success

##### Introduction

##### Principle 1: There Is No Such Thing As Absolute Security

##### Principle 2: The Three Security Goals Are Confidentiality, Integrity, and Availability

##### Integrity Models

##### Availability Models

##### Principle 3: Defense in Depth as Strategy

# **Table of Contents**

Principle 4: When Left on Their Own, People Tend to Make the Worst Security Decisions

Principle 5: Computer Security Depends on Two Types of Requirements: Functional and Assurance

Principle 6: Security Through Obscurity Is Not an Answer

Principle 7: Security = Risk Management

Principle 8: The Three Types of Security Controls Are Preventative, Detective, and Responsive

Principle 9: Complexity Is the Enemy of Security

Principle 10: Fear, Uncertainty, and Doubt Do Not Work in Selling Security

Principle 11: People, Process, and Technology Are All Needed to Adequately Secure a System or Facility

Principle 12: Open Disclosure of Vulnerabilities Is Good for Security!

Summary

Test Your Skills

## **Chapter 3: Certification Programs and the Common Body of Knowledge**

Introduction

Certification and Information Security

International Information Systems Security Certifications Consortium (ISC)([Sup2])

The Information Security Common Body of Knowledge

Information Security Governance and Risk Management

Security Architecture and Design

Business Continuity and Disaster Recovery Planning

Legal Regulations, Investigations, and Compliance

# **Table of Contents**

Physical (Environmental) Security

Operations Security

Access Control

Cryptography

Telecommunications and Network Security

Software Development Security

## **Other Certificate Programs in the IT Security Industry**

Certified Information Systems Auditor

Certified Information Security Manager

Certified in Risk and Information Systems Control

Global Information Assurance Certifications

(ISC) ([Sup2]) Specialization Certificates

CCFP: Certified Cyber Forensics Professional

HCISPP: HealthCare Information Security and Privacy Practitioner

Vendor-Specific and Other Certification Programs

Summary

Test Your Skills

## **Chapter 4: Governance and Risk Management**

Introduction

Security Policies Set the Stage for Success

Understanding the Four Types of Policies

Programme-Level Policies

Programme-Framework Policies

Issue-Specific Policies

System-Specific Policies

Developing and Managing Security Policies

Security Objectives

Operational Security

Policy Implementation

# **Table of Contents**

## Providing Policy Support Documents

- Regulations

- Standards and Baselines

- Guidelines

- Procedures

## Suggested Standards Taxonomy

- Asset and Data Classification

- Separation of Duties

- Employment Hiring Practices

- Risk Analysis and Management

- Education, Training, and Awareness

## Who Is Responsible for Security?

- Summary

- Test Your Skills

## Chapter 5: Security Architecture and Design

- Introduction

- Defining the Trusted Computing Base

  - Rings of Trust

- Protection Mechanisms in a TCB

- System Security Assurance Concepts

  - Goals of Security Testing

  - Formal Security Testing Models

- The Trusted Computer Security Evaluation Criteria

  - Division D: Minimal Protection

  - Division C: Discretionary Protection

  - Division B: Mandatory Protection

  - Division A: Verified Protection

  - The Trusted Network Interpretation of the TCSEC

# **Table of Contents**

The Information Technology Security Evaluation Criteria

Comparing ITSEC to TCSEC

ITSEC Assurance Classes

The Canadian Trusted Computer Product Evaluation Criteria

The Federal Criteria for Information Technology Security

The Common Criteria

Protection Profile Organization

Security Functional Requirements

Evaluation Assurance Levels

The Common Evaluation Methodology

Confidentiality and Integrity Models

Bell-LaPadula Model

Biba Integrity Model

Advanced Models

Summary

Test Your Skills

## **Chapter 6: Business Continuity Planning and Disaster Recovery Planning**

Introduction

Overview of the Business Continuity Plan and Disaster

Recovery Plan

Why the BCP Is So Important

Types of Disruptive Events

Defining the Scope of the BCP

Creating the Business Impact Analysis

Disaster Recovery Planning

Identifying Recovery Strategies

Understanding Shared-Site Agreements

# **Table of Contents**

Using Alternate Sites

Making Additional Arrangements

Testing the DRP

Summary

Test Your Skills

## **Chapter 7: Law, Investigations, and Ethics**

Introduction

Types of Computer Crime

How Cybercriminals Commit Crimes

The Computer and the Law

Legislative Branch of the Legal System

Administrative Branch of the Legal System

Judicial Branch of the Legal System

Intellectual Property Law

Patent Law

Trademarks

Trade Secrets

Privacy and the Law

International Privacy Issues

Privacy Laws in the United States

Computer Forensics

The Information Security Professionals Code of Ethics

Other Ethics Standards

Computer Ethics Institute

Internet Activities Board: Ethics and the Internet

Code of Fair Information Practices

Summary

Test Your Skills



# **Table of Contents**

## **Chapter 8: Physical Security Control**

Introduction

Understanding the Physical Security Domain

Physical Security Threats

Providing Physical Security

Summary

Test Your Skills

## **Chapter 9: Operations Security**

Introduction

Operations Security Principles

Operations Security Process Controls

Operations Security Controls in Action

Software Support

Configuration and Change Management

Backups

Media Controls

Documentation

Maintenance

Interdependencies

Summary

Test Your Skills

## **Chapter 10: Access Control Systems and Methodology**

Introduction

Terms and Concepts

Identification

Authentication

Least Privilege (Need to Know)

Information Owner

# **Table of Contents**

Discretionary Access Control

Access Control Lists

User Provisioning

Mandatory Access Control

Role-Based Access Control

## **Principles of Authentication**

The Problems with Passwords

Multifactor Authentication

## **Biometrics**

## **Single Sign-On**

Kerberos

Federated Identities

## **Remote User Access and Authentication**

Remote Access Dial-In User Service

Virtual Private Networks

## **Summary**

## **Test Your Skills**

## **Chapter 11: Cryptography**

### **Introduction**

### **Applying Cryptography to Information Systems**

### **Basic Terms and Concepts**

### **Strength of Cryptosystems**

Cryptosystems Answer the Needs of Today's E-Commerce

The Role of Keys in Cryptosystems

### **Putting the Pieces to Work**

Digesting Data

Digital Certificates

### **Examining Digital Cryptography**

# **Table of Contents**

Hashing Functions

Block Ciphers

Implementations of PPK Cryptography

Summary

Test Your Skills

## **Chapter 12: Telecommunications, Network, and Internet Security**

Introduction

An Overview of Network and Telecommunications Security

Network Security in Context

The Open Systems Interconnection Reference Model

The Protocol Stack

The OSI Reference Model and TCP/IP

The OSI Model and Security

Data Network Types

Local Area Networks

Wide Area Networks

Internet

Intranet

Extranet

Protecting TCP/IP Networks

Basic Security Infrastructures

Routers

Firewalls

Intrusion Detection Systems

Intrusion Prevention Systems

Virtual Private Networks

IPSec

# **Table of Contents**

Encapsulating Security Protocol

Security Association

Internet Security Association and Key Management Protocol

Security Policies

IPSec Key Management

Applied VPNs

Cloud Computing

Summary

Test Your Skills

## **Chapter 13: Software Development Security**

Introduction

The Practice of Software Engineering

Software Development Life Cycles

Dont Bolt Security OnBuild It In

Catch Problems Sooner Rather Than Later

Requirements Gathering and Analysis

Systems Design and Detailed Design

Design Reviews

Development (Coding) Phase

Testing

Deployment

Security Training

Measuring the Secure Development Program

Open Software Assurance Maturity Model (OpenSAMM)

Building Security in Maturity Model (BSIMM)

Summary

Test Your Skills

## **Chapter 14: Securing the Future**

# **Table of Contents**

Introduction

Operation Eligible Receiver

Carters, Account Takeover, and Identity Theft

Some Definitions

Zeus Banking Trojan

Phishing and Spear Phishing

Other Trends in Internet (In)Security

The Year (Decade?) of the Breach

The Rosy Future for InfoSec Specialists

Summary

Test Your Skills

## **Appendix A: Common Body of Knowledge**

Access Control

Telecommunications and Network Security

Information Security Governance and Risk Management

Software Development Security

Cryptography

Security Architecture and Design

Operations Security

Business Continuity and Disaster Recovery Planning

Legal Regulations, Investigations, and Compliance

Physical (Environmental) Security

## **Appendix B: Security Policy and Standards Taxonomy**

## **Appendix C: Sample Policies**

Sample Computer Acceptable Use Policy

1.0.0 Acceptable Use Policy

Sample Email Use Policy

# **Table of Contents**

1.0.0 Email Use Policy

Sample Password Policy

1.0.0 Password Policy

Sample Wireless (WiFi) Use Policy

1.0.0 Wireless Communication Policy

## **Appendix D: HIPAA Security Rule Standards**

HIPAA Security Standards

Administrative Procedures

Physical Safeguards

Technical Security Services

Technical Security Mechanisms

Index