

EFFECTIVE CYBERSECURITY

A Guide to Using Best Practices and Standards



Effective Cybersecurity

Effective Cybersecurity: A Guide to Using Best Practices and Standards

Table of Contents

\sim		_		_	
ι.	. ^	١.	,,	2	r
u	•	·v	•	_	

Half Title

Title Page

Copyright Page

Dedication

Contents

Preface

Chapter 1: Best Practices, Standards, and a Plan of Action

- 1.1 Defining Cyberspace and Cybersecurity
- 1.2 The Value of Standards and Best Practices Documents
- 1.3 The Standard of Good Practice for Information Security
- 1.4 The ISO/IEC 27000 Suite of Information Security StandardsISO 27001ISO 27002
- 1.5 Mapping the ISO 27000 Series to the ISF SGP
- 1.6 NIST Cybersecurity Framework and Security Documents NIST Cybersecurity Framework NIST Security Documents
- 1.7 The CIS Critical Security Controls for Effective Cyber Defense
- 1.8 COBIT 5 for Information Security
- 1.9 Payment Card Industry Data Security Standard (PCI DSS)



1.10 ITU-T Security Documents

1.11 Effective Cybersecurity

The Cybersecurity Management Process

Using Best Practices and Standards Documents

1.12 Key Terms and Review Questions

Key Terms

Review Questions

1.13 References

Part I: Planning for Cybersecurity

Chapter 2: Security Governance

- 2.1 Security Governance and Security Management
- 2.2 Security Governance Principles and Desired Outcomes

Principles

Desired Outcomes

2.3 Security Governance Components

Strategic Planning

Organizational Structure

Roles and Responsibilities

Integration with Enterprise Architecture

Policies and Guidance

2.4 Security Governance Approach

Security Governance Framework

Security Direction

Responsible, Accountable, Consulted, and Informed (RACI) Charts

- 2.5 Security Governance Evaluation
- 2.6 Security Governance Best Practices
- 2.7 Key Terms and Review Questions

Key Terms

Review Questions

2.8 References



Chapter 3: Information Risk Assessment

3.1 Risk Assessment Concepts

Risk Assessment Challenges

Risk Management

Structure of This Chapter

3.2 Asset Identification

Hardware Assets

Software Assets

Information Assets

Business Assets

Asset Register

3.3 Threat Identification

The STRIDE Threat Model

Threat Types

Sources of Information

3.4 Control Identification

3.5 Vulnerability Identification

Vulnerability Categories

National Vulnerability Database and Common Vulnerability Scoring System

3.6 Risk Assessment Approaches

Quantitative Versus Qualitative Risk Assessment

Simple Risk Analysis Worksheet

Factor Analysis of Information Risk

3.7 Likelihood Assessment

Estimating Threat Event Frequency

Estimating Vulnerability

Loss Event Frequency

3.8 Impact Assessment

Estimating the Primary Loss

Estimating the Secondary Loss

Business Impact Reference Table

3.9 Risk Determination



3.10 Risk Evaluation

3.11 Risk Treatment

Risk Reduction

Risk Retention

Risk Avoidance

Risk Transfer

3.12 Risk Assessment Best Practices

3.13 Key Terms and Review Questions

Key Terms

Review Questions

3.14 References

Chapter 4: Security Management

4.1 The Security Management Function

Security Planning

Capital Planning

4.2 Security Policy

Security Policy Categories

Security Policy Document Content

Management Guidelines for Security Policies

Monitoring the Policy

- 4.3 Acceptable Use Policy
- 4.4 Security Management Best Practices
- 4.5 Key Terms and Review Questions

Key Terms

Review Questions

4.6 References

PART II: Managing the Cybersecurity Function

Chapter 5: People Management

5.1 Human Resource Security

Security in the Hiring Process

During Employment



Termination of Employment

5.2 Security Awareness and Education

Security Awareness

Cybersecurity Essentials Program

Role-Based Training

Education and Certification

5.3 People Management Best Practices

5.4 Key Terms and Review Questions

Key Terms

Review Questions

5.5 References

Chapter 6: Information Management

6.1 Information Classification and Handling

Information Classification

Information Labeling

Information Handling

6.2 Privacy

Privacy Threats

Privacy Principles and Policies

Privacy Controls

6.3 Document and Records Management

Document Management

Records Management

- 6.4 Sensitive Physical Information
- 6.5 Information Management Best Practices
- 6.6 Key Terms and Review Questions

Key Terms

Review Questions

6.7 References

Chapter 7: Physical Asset Management

7.1 Hardware Life Cycle Management



Planning

Acquisition

Deployment

Management

Disposition

7.2 Office Equipment

Threats and Vulnerabilities

Security Controls

Equipment Disposal

7.3 Industrial Control Systems

Differences Between IT Systems and Industrial Control Systems

ICS Security

7.4 Mobile Device Security

Mobile Device Technology

Mobile Ecosystem

Vulnerabilities

Mobile Device Security Strategy

Resources for Mobile Device Security

7.5 Physical Asset Management Best Practices

7.6 Key Terms and Review Questions

Key Terms

Review Questions

7.7 References

Chapter 8: System Development

8.1 System Development Life Cycle

NIST SDLC Model

The SGPs SDLC Model

DevOps

8.2 Incorporating Security into the SDLC

Initiation Phase

Development/Acquisition Phase

Implementation/Assessment Phase



Operations and Maintenance Phase

Disposal Phase

8.3 System Development Management

System Development Methodology

System Development Environments

Quality Assurance

8.4 System Development Best Practices

8.5 Key Terms and Review Questions

Key Terms

Review Questions

8.6 References

Chapter 9: Business Application Management

9.1 Application Management Concepts

Application Life Cycle Management

Application Portfolio Management

Application Performance Management

9.2 Corporate Business Application Security

Business Application Register

Business Application Protection

Browser-Based Application Protection

9.3 End User-Developed Applications (EUDAs)

Benefits of EUDAs

Risks of EUDAs

EUDA Security Framework

9.4 Business Application Management Best Practices

9.5 Key Terms and Review Questions

Key Terms

Review Questions

9.6 References

Chapter 10: System Access

10.1 System Access Concepts



Authorization

10.2 User Authentication

A Model for Electronic User Authentication

Means of Authentication

Multifactor Authentication

10.3 Password-Based Authentication

The Vulnerability of Passwords

The Use of Hashed Passwords

Password Cracking of User-Chosen Passwords

Password File Access Control

Password Selection

10.4 Possession-Based Authentication

Memory Cards

Smart Cards

Electronic Identity Cards

One-Time Password Device

Threats to Possession-Based Authentication

Security Controls for Possession-Based Authentication

10.5 Biometric Authentication

Criteria for Biometric Characteristics

Physical Characteristics Used in Biometric Applications

Operation of a Biometric Authentication System

Biometric Accuracy

Threats to Biometric Authentication

Security Controls for Biometric Authentication

10.6 Risk Assessment for User Authentication

Authenticator Assurance Levels

Selecting an AAL

Choosing an Authentication Method

10.7 Access Control

Subjects, Objects, and Access Rights

Access Control Policies

Discretionary Access Control



Role-Based Access Control

Attribute-Based Access Control

Access Control Metrics

10.8 Customer Access

Customer Access Arrangements

Customer Contracts

Customer Connections

Protecting Customer Data

10.9 System Access Best Practices

10.10 Key Terms and Review Questions

Key Terms

Review Questions

10.11 References

Chapter 11: System Management

11.1 Server Configuration

Threats to Servers

Requirements for Server Security

11.2 Virtual Servers

Virtualization Alternatives

Virtualization Security Issues

Securing Virtualization Systems

11.3 Network Storage Systems

11.4 Service Level Agreements

Network Providers

Computer Security Incident Response Team

Cloud Service Providers

11.5 Performance and Capacity Management

- 11.6 Backup
- 11.7 Change Management
- 11.8 System Management Best Practices
- 11.9 Key Terms and Review Questions



Key Terms

Review Questions

11.10 References

Chapter 12: Networks and Communications

12.1 Network Management Concepts

Network Management Functions

Network Management Systems

Network Management Architecture

12.2 Firewalls

Firewall Characteristics

Types of Firewalls

Next-Generation Firewalls

DMZ Networks

The Modern IT Perimeter

12.3 Virtual Private Networks and IP Security

Virtual Private Networks

IPsec

Firewall-Based VPNs

12.4 Security Considerations for Network Management

Network Device Configuration

Physical Network Management

Wireless Access

External Network Connections

Firewalls

Remote Maintenance

12.5 Electronic Communications

Email

Instant Messaging

Voice over IP (VoIP) Networks

Telephony and Conferencing

12.6 Networks and Communications Best Practices

12.7 Key Terms and Review Questions



Key Terms

Review Questions

12.8 References

Chapter 13: Supply Chain Management and Cloud Security

13.1 Supply Chain Management Concepts

The Supply Chain

Supply Chain Management

13.2 Supply Chain Risk Management

Supply Chain Threats

Supply Chain Vulnerabilities

Supply Chain Security Controls

SCRM Best Practices

13.3 Cloud Computing

Cloud Computing Elements

Cloud Computing Reference Architecture

13.4 Cloud Security

Security Considerations for Cloud Computing

Threats for Cloud Service Users

Risk Evaluation

Best Practices

Cloud Service Agreement

13.5 Supply Chain Best Practices

13.6 Key Terms and Review Questions

Key Terms

Review Questions

13.7 References

Chapter 14: Technical Security Management

14.1 Security Architecture

14.2 Malware Protection Activities

Types of Malware

The Nature of the Malware Threat

Practical Malware Protection



14.3 Malware Protection Software

Capabilities of Malware Protection Software

Managing Malware Protection Software

14.4 Identity and Access Management

IAM Architecture

Federated Identity Management

IAM Planning

IAM Best Practices

14.5 Intrusion Detection

Basic Principles

Approaches to Intrusion Detection

Host-Based Intrusion Detection Techniques

Network-Based Intrusion Detection Systems

IDS Best Practices

14.6 Data Loss Prevention

Data Classification and Identification

Data States

14.7 Digital Rights Management

DRM Structure and Components

DRM Best Practices

14.8 Cryptographic Solutions

Uses of Cryptography

Cryptographic Algorithms

Selection of Cryptographic Algorithms and Lengths

Cryptography Implementation Considerations

14.9 Cryptographic Key Management

Key Types

Cryptoperiod

Key Life Cycle

14.10 Public Key Infrastructure

Public Key Certificates

PKI Architecture



Management Issues

14.11 Technical Security Management Best Practices

14.12 Key Terms and Review Questions

Key Terms

Review Questions

14.13 References

Chapter 15: Threat and Incident Management

15.1 Technical Vulnerability Management

Plan Vulnerability Management

Discover Known Vulnerabilities

Scan for Vulnerabilities

Log and Report

Remediate Vulnerabilities

15.2 Security Event Logging

Security Event Logging Objective

Potential Security Log Sources

What to Log

Protection of Log Data

Log Management Policy

15.3 Security Event Management

SEM Functions

SEM Best Practices

15.4 Threat Intelligence

Threat Taxonomy

The Importance of Threat Intelligence

Gathering Threat Intelligence

Threat Analysis

15.5 Cyber Attack Protection

Cyber Attack Kill Chain

Protection and Response Measures

Non-Malware Attacks

15.6 Security Incident Management Framework



Objectives of Incident Management

Relationship to Information Security Management System

Incident Management Policy

Roles and Responsibilities

Incident Management Information

Incident Management Tools

15.7 Security Incident Management Process

Preparing for Incident Response

Detection and Analysis

Containment, Eradication, and Recovery

Post-Incident Activity

15.8 Emergency Fixes

15.9 Forensic Investigations

Prepare

Identify

Collect

Preserve

Analyze

Report

15.10 Threat and Incident Management Best Practices

15.11 Key Terms and Review Questions

Key Terms

Review Questions

15.12 References

Chapter 16: Local Environment Management

16.1 Local Environment Security

Local Environment Profile

Local Security Coordination

16.2 Physical Security

Physical Security Threats

Physical Security Officer

Defense in Depth



Physical Security: Prevention and Mitigation Measures

Physical Security Controls

16.3 Local Environment Management Best Practices

16.4 Key Terms and Review Questions

Key Terms

Review Questions

16.5 References

Chapter 17: Business Continuity

17.1 Business Continuity Concepts

Threats

Business Continuity in Operation

Business Continuity Objectives

Essential Components for Maintaining Business Continuity

17.2 Business Continuity Program

Governance

Business Impact Analysis

Risk Assessment

Business Continuity Strategy

17.3 Business Continuity Readiness

Awareness

Training

Resilience

Control Selection

Business Continuity Plan

Exercising and Testing

Performance Evaluation

17.4 Business Continuity Operations

Emergency Response

Crisis Management

Business Recovery/Restoration

17.5 Business Continuity Best Practices

17.6 Key Terms and Review Questions



Key Terms

Review Questions

17.7 References

Part III: Security Assessment

Chapter 18: Security Monitoring and Improvement

18.1 Security Audit

Security Audit and Alarms Model

Data to Collect for Auditing

Internal and External Audit

Security Audit Controls

18.2 Security Performance

Security Performance Measurement

Security Monitoring and Reporting

Information Risk Reporting

Information Security Compliance Monitoring

18.3 Security Monitoring and Improvement Best Practices

18.4 Key Terms and Review Questions

Key Terms

Review Questions

18.5 References

Appendix A: References and Standards

Appendix B: Glossary

Index

Appendix C: Answers to Review Questions

