

## DEVELOPING CYBERSECURITY PROGRAMS AND POLICIES IN AN

**AI-DRIVEN WORLD** 

**OMAR SANTOS** 

# Developing Cybersecurity Programs and Policies in an Al-Driven World

**Fourth Edition** 

**Omar Santos** 



Hoboken, New Jersey

## Developing Cybersecurity Programs and Policies in an Al-Driven World

#### **Table of Contents**

$\frown$	_		. ~	_
U	O	ν	Ҽ	ſ

Title Page

Copyright Page

Contents at a Glance

**Table of Contents** 

Introduction

Chapter 1: Understanding Cybersecurity Policy and

Governance

Information Security vs. Cybersecurity Policies

Looking at Policy Through the Ages

Policy in Ancient Times

The U.S. Constitution as a Policy Revolution

Policy Today

#### Cybersecurity Policy

What Are Assets?

Characteristics of Successful Policy

What Is the Role of Government?

The Challenges of Global Policies

#### Cybersecurity Policy Life Cycle

Policy Development

Policy Publication

**Policy Adoption** 



Policy Review

Summary

## Chapter 2: Cybersecurity Policy Organization, Format, and Styles

#### Policy Hierarchy

Standards

**Baselines** 

Guidelines

**Procedures** 

Plans and Programs

#### Writing Style and Technique

Using Plain Language

The Plain Language Movement

Plain Language Techniques for Policy Writing

#### **Policy Format**

**Understand Your Audience** 

Policy Format Types

**Policy Components** 

Summary

#### Chapter 3: Cybersecurity Frameworks

Confidentiality, Integrity, and Availability (CIA)

What Is Confidentiality?

What Is Integrity?

What Is Availability?

Who Is Responsible for CIA?

#### What Is a Cybersecurity Framework?

What Is NISTs Function?

So, What About ISO?



The Importance of ISO Standards for Cybersecurity

#### NIST Cybersecurity Framework

The Objective of the NIST Cybersecurity Framework

The Scope of the CSF

The NIST Framework Core Components

Implementation Examples and Informative References

The NIST Cybersecurity Framework and the NIST Privacy Framework

#### Summary

#### Chapter 4: Cloud Security

#### Why Cloud Computing?

Scalability vs. Elasticity

CostBenefit Analysis of Cloud Computing

#### **Cloud Computing Models**

Software as a Service (SaaS)

Infrastructure as a Service (laaS)

Platform as a Service (PaaS)

Function as a Service (FaaS)

The Cloud Shared Responsibility Model

#### Cloud Governance

Centralized Control and Coordination

Standardization and Compliance

Preventing Shadow IT

The Role of Cloud Governance

Transferring Regulatory Responsibility and Costs to the Cloud

#### Multitenancy

Core Components of the Cloud Computing Reference Architecture

Key Concepts and Functional Layers of Cloud Computing

The Importance of the Reference Architecture



#### Understanding Top Cybersecurity Risks in Cloud Computing

Data Breaches and Loss

Inadequate Identity and Access Management (IAM)

Leveraging Identity Federation

Automating the IAM Processes and Mitigating Associated Risks

Misconfiguration and Inadequate Change Control

Lack of Visibility and Control Over Data

**Insider Threats** 

Advanced Persistent Threats (APTs) and Sophisticated Malware Against Cloud-Based Solutions

Al and the Cloud: Revolutionizing the Future of Computing Summary

#### Chapter 5: Governance and Risk Management

#### **Understanding Cybersecurity Policies**

What Is Governance?

What Is Meant by Strategic Alignment?

Regulatory Requirements

User-Level Cybersecurity Policies

Vendor Cybersecurity Policies

Cybersecurity Vulnerability Disclosure Policies

Client Synopsis of Cybersecurity Policies

Who Authorizes Cybersecurity Policy?

What Is a Distributed Governance Model?

**Evaluating Cybersecurity Policies** 

Revising Cybersecurity Policies: Change Drivers

NIST Cybersecurity Framework Governance Subcategories and Informative References

Regulatory Requirements

The European Union Cyber Resilience Act



#### Cybersecurity Risk

Is Risk Bad?

**Understanding Risk Management** 

Risk Appetite and Tolerance

What Is a Risk Assessment?

Risk Assessment Methodologies

#### Summary

#### Chapter 6: Asset Management and Data Loss Prevention

#### Information Assets and Systems

Who Is Responsible for Information Assets?

#### Information Classification

How Does the Federal Government Classify Data?

Why Is National Security Information Classified Differently?

Who Decides How National Security Data Is Classified?

How Does the Private Sector Classify Data?

Can Information Be Reclassified or Even Declassified?

#### Labeling and Handling Standards

Why Label?

Why Handling Standards?

#### Information Systems Inventory

Why an Inventory Is Necessary and What Should Be Inventoried

Understanding Data Loss Prevention Technologies Summary

#### Chapter 7: Human Resources Security and Education

#### The Employee Life Cycle

What Does Recruitment Have to Do with Security?

What Happens in the Onboarding Phase?

What Is User Provisioning?



What Should an Employee Learn During Orientation?

Why Is Termination Considered the Most Dangerous Phase?

#### The Importance of Employee Agreements

What Are Confidentiality, or Nondisclosure, Agreements?

What Is an Acceptable Use Agreement?

#### The Importance of Security Education and Training

NICE Work Roles and Categories

NICE Insider Threat Analysis

Influencing Behavior with Security Awareness

Teaching a Skill with Security Training

Security Education Is Knowledge Driven

#### Summary

#### Chapter 8: Physical and Environmental Security

#### Understanding the Secure Facility Layered Defense Model

How Do We Secure the Site?

How Is Physical Access Controlled?

#### **Protecting Equipment**

The Importance of Power to Processing

How Dangerous Is Fire?

What About Disposal of Devices Containing Data?

Stop, Thief!

#### **Environmental Sustainability**

Summary

## Chapter 9: Cybersecurity Operations (CyberOps), Incident Response, Digital Forensics, and Threat Hunting

#### Incident Response

What Is an Incident?

How Are Incidents Reported?



What Is an Incident Response Program?

The Incident Response Process

Tabletop Exercises and Playbooks

Information Sharing and Coordination

Operationalizing Threat Intelligence

Computer Security Incident Response Teams (CSIRTs)

Product Security Incident Response Teams (PSIRTs)

Incident Response Training and Exercises

#### What Happened? Investigation and Evidence Handling

**Documenting Incidents** 

Working with Law Enforcement

#### **Understanding Threat Hunting**

Objectives of Threat Hunting

The Threat Hunting Process

Best Practices for Threat Hunting

Using SIGMA for Incident Response and Threat Hunting

#### Understanding Digital Forensic Analysis

#### **Data Breach Notification Requirements**

Is There a Federal Breach Notification Law?

Does Notification Work?

#### Summary

#### Chapter 10: Access Control Management

#### Access Control Fundamentals

What Is a Security Posture?

How Is Identity Verified?

What Is Authorization?

Accounting

Infrastructure Access Controls



Why Segment a Network?

What Is Layered Border Security?

Remote Access Security

#### **User Access Controls**

Why Manage User Access?

What Types of Access Should Be Monitored?

#### Summary

## Chapter 11: Supply Chain Security, Information Systems Acquisition, Development, and Maintenance

#### Strengthening the Links: A Deep Dive into Supply Chain Security

**Emerging Threats to Supply Chains** 

Strategies for Enhancing Supply Chain Security

The Critical Role of SBOMs in Enhancing Supply Chain Security

Artificial Intelligence Bill of Materials (AI BOM)

#### System Security Requirements

What Is SDLC?

NISTs Secure Software Development Framework (SSDF)

What About Commercially Available or Open Source Software?

The Testing Environment

**Protecting Test Data** 

#### Secure Code

The Open Worldwide Application Security Project (OWASP)

#### Cryptography

Why Encrypt?

Regulatory Requirements

What Is a Key?

What Is PKI?

Why Protect Cryptographic Keys?

Digital Certificate Compromise



Post-Quantum	Cryptography:	Securing the Future	of Digital Security
--------------	---------------	---------------------	---------------------

#### Summary

#### Chapter 12: Business Continuity Management

#### **Emergency Preparedness**

What Is a Resilient Organization?

Regulatory Requirements

#### **Business Continuity Risk Management**

What Is a Business Continuity Threat Assessment?

What Is a Business Continuity Risk Assessment?

What Is a Business Impact Assessment?

#### The Business Continuity Plan

Roles and Responsibilities

Disaster Response Plans

#### Business Continuity and Disaster Recovery in Cloud Services

Key Components of BC/DR in Cloud Computing

Best Practices for BC/DR in Cloud Services

Business Continuity and Disaster Recovery Strategies in Cloud Computing vs. Traditional Data Centers

Operational Contingency Plans

The Disaster Recovery Phase

The Resumption Phase

#### Plan Testing and Maintenance

Why Is Testing Important?

Plan Maintenance

Summary

#### Chapter 13: Regulatory Compliance for Financial Institutions

The Gramm-Leach-Bliley Act

What Is a Financial Institution?



Regulatory Oversight

What Are the Interagency Guidelines?

New Yorks Department of Financial Services Cybersecurity Regulation

What Is a Regulatory Examination?

**Examination Process** 

**Examination Ratings** 

Personal and Corporate Identity Theft

What Is Required by the Interagency Guidelines Supplement A?

Authentication in an Internet Banking Environment

Regulation of Fintech, Digital Assets, and Cryptocurrencies

The Rise of Fintech and Digital Assets

Regulatory Responses

Summary

#### Chapter 14: Regulatory Compliance for the Health-care Sector

The HIPAA Security Rule

What Is the Objective of the HIPAA Security Rule?

How Is the HIPAA Security Rule Organized?

What Are the Administrative Safeguards?

What Are the Physical Safeguards?

What Are the Technical Safeguards?

What Are the Organizational Requirements?

What Are the Policies and Procedures Standards?

Mapping the HIPAA Security Rule to the NIST Cybersecurity Framework

The HITECH Act and the Omnibus Rule

What Changed for Business Associates?

What Are the Breach Notification Requirements?

Understanding the HIPAA Compliance Enforcement Process



Sι	ım	m	а	rγ

#### Chapter 15: PCI Compliance for Merchants

#### Protecting Cardholder Data

What Is the PAN?

The Luhn Algorithm

What Is the PCI DDS Framework?

Business-as-Usual Approach

What Are the PCI Requirements?

#### **PCI** Compliance

Who Is Required to Comply with PCI DSS?

What Is a Data Security Compliance Assessment?

What Is the PCI DSS Self-Assessment Questionnaire (SAQ)?

Are There Penalties for Noncompliance?

#### Summary

#### Chapter 16: Privacy in an Al-Driven Landscape

Defining Privacy in the Digital Context

The Interplay Between AI and Privacy

Al as a Privacy Protector and Challenger

Privacy Concerns in Al Applications

Privacy-Preserving Techniques in AI

#### General Data Protection Regulation (GDPR)

**GDPR Key Principles** 

Impact on Businesses

Rights for Individuals

#### California Consumer Privacy Act (CCPA)

Key Provisions and Compliance Requirements of CCPA

CCPA vs. GDPR

Personal Information Protection and Electronic Documents Act



Data Protection Act 2018 in the United Kingdom Comparing GDPR, CCPA, PIPEDA, and DPA 2018 Leveraging AI to Enhance Privacy Protections Summary

Chapter 17: Artificial Intelligence Governance and Regulations

The Al Double-Edged Sword

Generative AI, LLMs, and Traditional Machine Learning Implementations

Introduction to Al Governance

The U.S. Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence

The Blueprint for an Al Bill of Rights

The Foundation of Al Governance: Guiding Principles from the Executive Order

NISTs AI Risk Management Framework

Implementing the AI RMF

The Importance of High Accuracy and Precision in Al Systems

Explainable AI (XAI): Building Trust and Understanding

Tools for XAI

Government and Society-wide Approaches to Al Governance

The U.S. National Al Advisory Committee

The European Artificial Intelligence Board

A Society-wide Approach to Al Governance

The EU AI Act

Comparing U.S. Executive Order 14110 and the EU AI Act

Guidelines for Secure Al System Development

Key Guidelines from CISA and NCSC



Provider and User Responsibility

Al Supply Chain Security

#### OWASP Top 10 Risks for LLM

**Prompt Injection Attacks** 

Insecure Output Handling

Training Data Poisoning

Model Denial of Service

Supply Chain Vulnerabilities

Sensitive Information Disclosure

Insecure Plugin Design

**Excessive Agency** 

Overreliance

Model Theft

Model Inversion and Extraction

**Backdoor Attacks** 

MITRE ATLAS Framework

Summary

Appendix A: Answers to the Multiple Choice Questions Index

