

L1: Computer Security Overview



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Acknowledgement

- ❑ Many slides are or are revised from the slides of the author of the textbook
 - Matt Bishop, Introduction to Computer Security, Addison-Wesley Professional, October, 2004, ISBN-13: 978-0-321-24774-5. [Introduction to Computer Security @ VSU's Safari Book Online subscription](#)
 - <http://nob.cs.ucdavis.edu/book/book-intro/slides/>
- ❑ Many labs used in this classes are from the SEED Labs
 - <http://www.cis.syr.edu/~wedu/seed/labs.html>

Outline

- ❑ Experimental environment preparation
 - Creating virtual machines (Lab 1)
- ❑ Basic concepts

Course Overview

- ❑ Matt Bishop, Introduction to Computer Security, Addison-Wesley Professional, October, 2004, ISBN-13: 978-0-321-24774-5. [Introduction to Computer Security @ VSU's Safari Book Online subscription](#)

Course Overview

- ❑ Introduction: Chapter 1
- ❑ Access Control Matrix: Sections 2.1 – 2.3
- ❑ Security Policies
 - Sections 4.1 – 4.4
 - Selected sections from Chapter 5, 6, 7
- ❑ Cryptography:
 - Basics: Chapter 8
 - Key distributions: Sections 9.1– 9.2
 - Public Key Infrastructure: Section 9.3
 - Common Errors: Section 10.1
 - Cryptography in networks: Sections 10.3 – 10.4
- ❑ Noncryptographic mechanism
 - Identify: Sections 13.1 – 13.4
 - Identity and anonymity : 13.6
 - Controlling access to files: 14.1 – 14.2
 - Ring-based mechanism: 14.4
- ❑ Assurance
 - Chapter 18
- ❑ Design Principles
 - Chapter 12

Learning Environment

❑ Virtual machines

- Use one computer system to emulate another
- Host (host system, host OS, host ...)
- Guest (guest system, guest OS, guest ...)

❑ Advantage

- Portability
 - ❑ You can take the virtual machine with you
- Isolation
 - ❑ Easier to prevent from interfering other systems

Common Virtualization Software

❑ VMware

- VMware player is free for non-commercial use
 - ❑ Available for Linux and Windows
- Feature-richer version are available from the department's VMWare/MSDNAA web store
 - ❑ Available for Linux, Windows, and Mac OS X

❑ Oracle VirtualBox

- Free and available for Linux, Windows, and Mac OS X
- Installed in classroom computers in HM 14S, 201S, and 210S

❑

Operating System

- ❑ Mostly we use Linux
 - Open-source
 - No need to get license when install on virtual machines

Basic Concepts

- **C**onfidentiality
- **I**ntegrity
- **A**vailability

Confidentiality

- ❑ Concealment of information or resources
 - Data: encryption (cryptography)
 - Existence of data: steganography
 - Resource hiding
 - Identity (anonymity)

Integrity

- ❑ Trustworthiness of data or resources
 - Data integrity
 - Program integrity
 - System integrity
 - Identity integrity (non-repudiation)
 - Origin (location) integrity

Availability

- ❑ Ability to use the information or resource desired
- ❑ Threat
 - Denial of service
- ❑ Tradeoff
 - Confidentiality
 - Integrity
 - Availability

Threats

- Threat: *potential* violation of security

- What may be the threats?
 - When using computer systems?
 - When setting up computer systems and networks?
 - When developing computer programs and systems?

Classes of Threats

- ❑ Disclosure: unauthorized access to information
 - Snooping
- ❑ Deception: acceptance of false data
 - Modification, spoofing, repudiation of origin, denial of receipt
- ❑ Disruption: interruption or prevention of correct operation
 - Modification
- ❑ Usurpation: unauthorized control of a system
 - Modification, spoofing, delay, denial of service

Policies and Mechanisms

- ❑ Policy says *what is, and is not, allowed*
 - It defines “security” for a system, a network, or a site
- ❑ Mechanisms enforce policies
- ❑ Composition of policies
 - Example: two different systems communicate or cooperate
 - ❑ The policy of the network consists of the two are based on the security policies of the two systems
 - If policies conflict, discrepancies may create security vulnerabilities

Goals of Security

- ❑ Prevention: prevent attackers from violating security policy
 - Make it impossible (prevention)
 - Make it harder (deterrence)
 - Make other targets more attractive (deflection)
- ❑ Detection: detect attackers' violation of security policy
 - Monitoring
 - Intrusion detection
- ❑ Recovery
 - Identify damage
 - Recover data
 - Find the cause (individuals, bugs, misconfiguration ...)
 - Continue to function if attack succeeds

Trust and Assumptions

- ❑ Underlie *all* aspects of security
- ❑ Policies
 - Unambiguously partition system states
 - Correctly capture security requirements
- ❑ Mechanisms
 - Assumed to enforce policy
 - Support mechanisms work correctly

Assurance

□ Specification

- Requirements analysis
- Statement of desired functionality

□ Design

- How system will meet specification

□ Implementation

- Programs/systems that carry out design

Operational Issues

- ❑ Cost-Benefit Analysis
 - Is it cheaper *to prevent* or *to recover*?
- ❑ Risk Analysis
 - Should we protect something?
 - How much should we protect this thing?
- ❑ Laws and Customs
 - Are desired security measures illegal?
 - Will people do them?

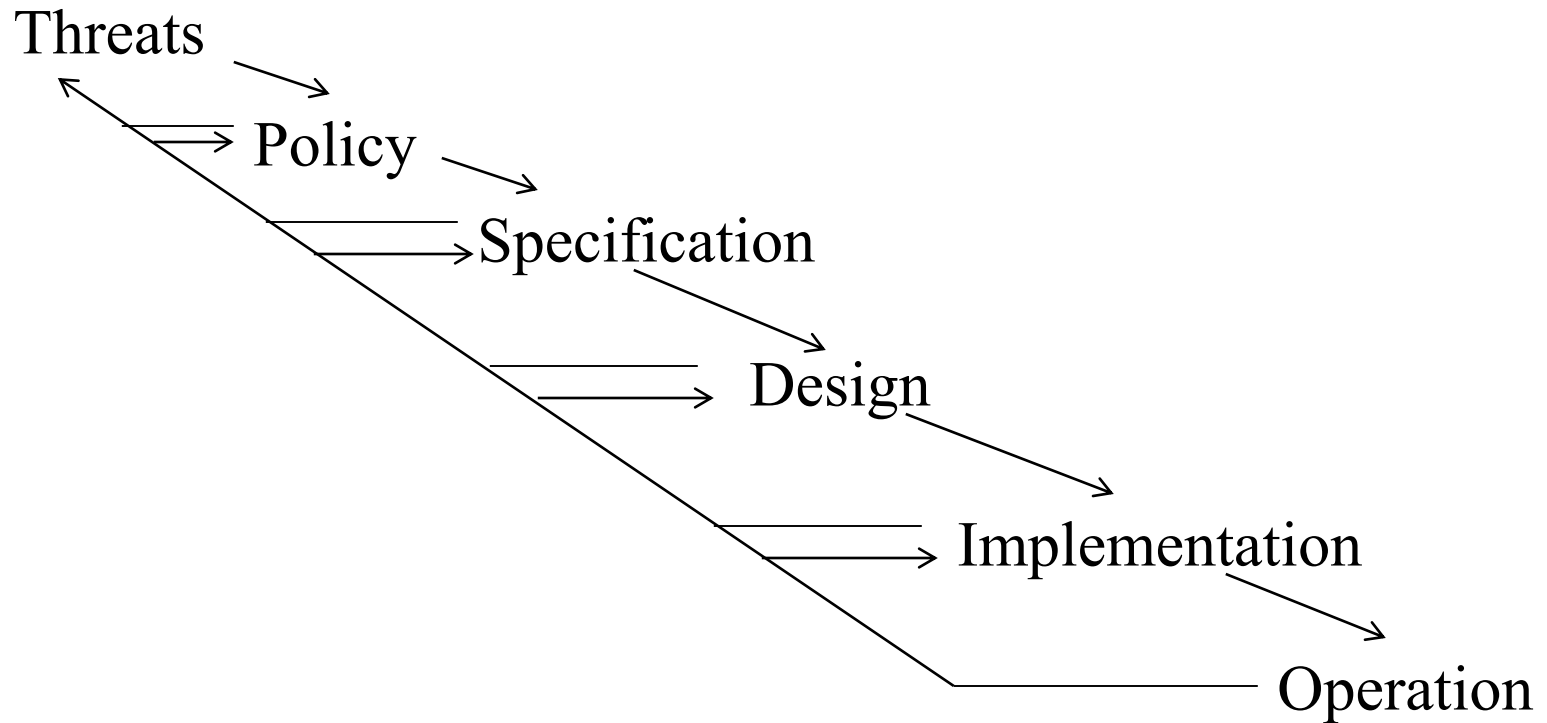
Human Issues

- ❑ Organizational Problems
 - Power and responsibility
 - Financial benefits
- ❑ People problems
 - Outsiders and insiders
 - *Social engineering*



Excerpt from <https://www.fbi.gov>

Tying Together



Lab 1

- ❑ Preparing Virtual-Machine based learning environment
- ❑ Demonstrate that you can run and log in your virtual machine in the class of Monday, August 22, 2016
 - No points for late work

Reading Assignment

❑ In Class Website

- <http://sest.vsu.edu/~hchen/course/CSCI451/>

❑ Paper reading and presentation

- Two student team makes an oral presentation using PowerPoint (or the similar) in the class of Monday, August 24, 2015
- The rest of class must prepare and ask questions
- The instructor grades students' presentation and participation

Summary

- ❑ Virtual machine based learning environment
- ❑ Policy defines security, and mechanisms enforce security
 - Confidentiality
 - Integrity
 - Availability
- ❑ Trust and knowing assumptions
- ❑ Importance of assurance
- ❑ The human factor