Introduction

Course Coordinator: Prof. Dong Xuan
Instructor: Dr. Adam C. Champion
Reading: Whitman and Mattord, Chaps. 1, 2

Outline

- Information Systems
- Security

Learning Objectives

Upon completion of this material, you should be able to:

- Understand the definition of information security
- Understand the key terms and critical concepts of information security
- Comprehend the history of computer security and how it evolved into information security

Administrative Matters

- Syllabus
- Class website: http://web.cse.ohio-state.edu/~champion.17/4471
- Semester group project involving programming mobile devices
- Textbook (5th ed. preferable, 4th ed. OK)

What is an Information System?

- Information System (IS): an entire set of
  - **Software**
  - **Hardware**
  - **Data**
  - **People**
  - **Procedures,** and
  - **Networks**

necessary to use information within an organization

Critical Characteristics of Information

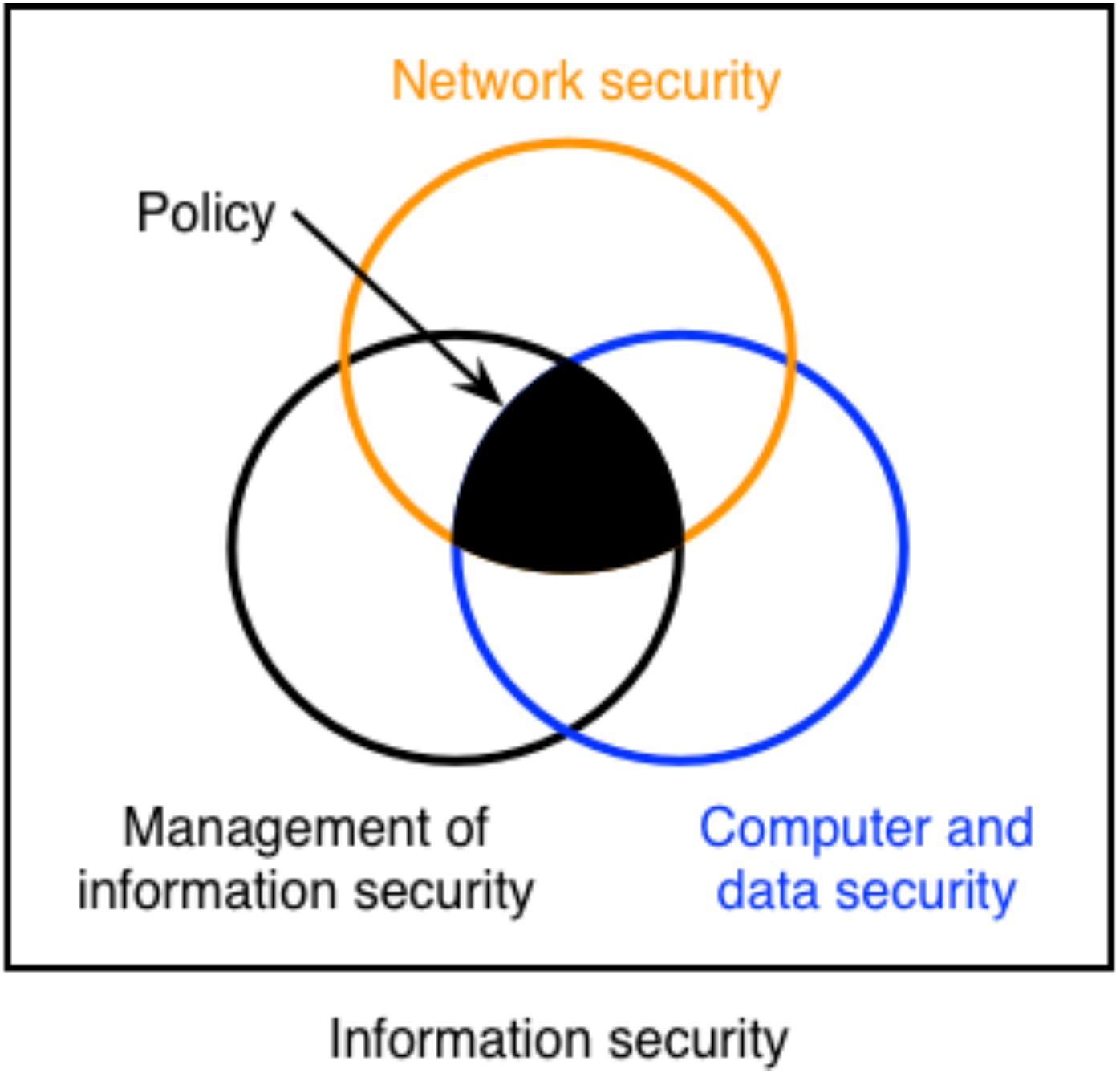
- The value of information comes from its characteristics:
  - **Confidentiality:** self-explanatory
  - **Integrity:** (Bitwise) identical to the original
  - **Availability:** of info, services, etc.
  - **Authenticity**: "it is what it claims to be"
  - **Accuracy:** free from mistakes and errors
  - **Utility:** self-explanatory
  - **Possession:** different from confidentiality
- Others:
  - User authentication: users are who they claim to be
  - Auditability: there's a record of who accessed what
  - Non-repudiation: one cannot claim "I didn't sign this"

What is Security?

- Definitions:
  - Book: "The quality or state of being secure—to be free from danger"
  - James Anderson, Inovant: "Well-informed sense that information risks and controls are in balance"
  - Rita Summers, *IBM Systems Journal*, 1984: "Includes concepts, techniques and measures that are used to protect computing systems and the information they maintain against deliberate or accidental threats"
- Successful companies should have multiple security "tiers":
  - Physical security
  - Personal security
  - Operations security
  - Communications security
  - Network security
  - ***Information security***

What is Information Security?

- Protection of information and its critical elements, including systems that use, store, and transmit that info
- Necessary tools:
  - ***Policy***
  - ***Awareness***
  - ***Training***
  - ***Education***
  - ***Technology***

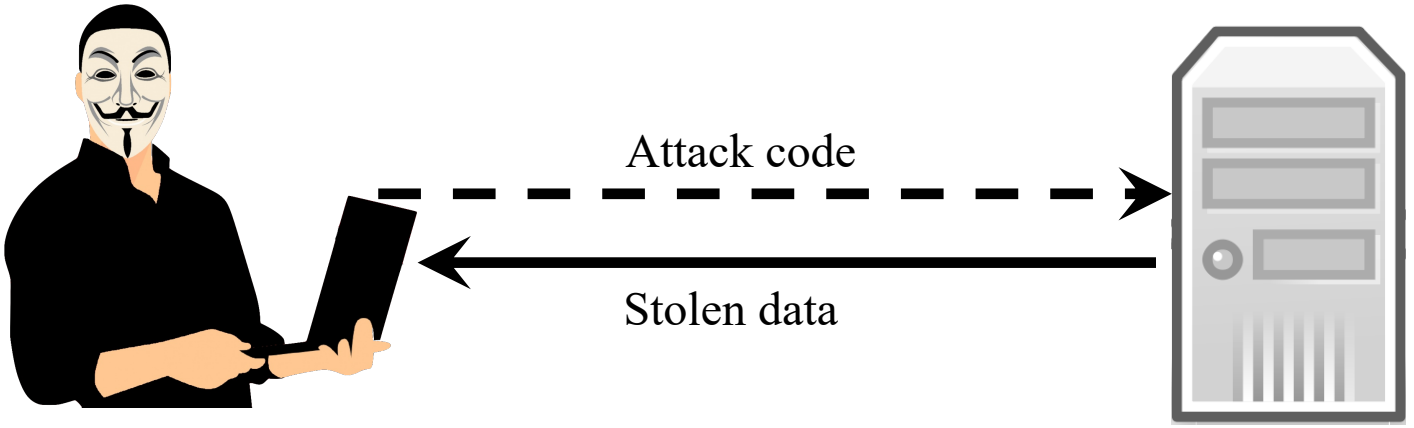


Aspects of Information Security (after Fig. 1.3 in book)

Securing Components in an Information System

- Computers (software and hardware): key components in an IS
- Computers can be subjects and/or objects of an attack:
  - Subject of an attack: attackers use computers actively to launch attacks against targets
  - Object of an attack: computers are what are under attack!

Computers: Subjects/Objects of Attack



Hacker using computer to conduct attack (*subject* of attack)

Server with private info (*object* of attack)

Computer as Subject/Object of Attack (after Fig. 1.6 in book).
Source: publicdomainpictures.net, Tango icon set

Balancing Information Security and Access

- Impossible to obtain perfect security: it's a process, not an absolute
- Security should be considered balance between protection and availability
- To achieve balance, level of security must allow reasonable access, yet protect against threats

Security vs. Access

Security

- CIO: Two-factor authentication is necessary to protect private data
- Auditor: We need to comply with laws/regulations

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Access

- Student 1: I forgot my authentication device
- Student 2: It's a hassle

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History of Information Security

- Began immediately after the first mainframes were developed
- Groups developing code-breaking computations during World War II created the first modern computers

The 1960s

- Advanced Research Procurement Agency (ARPA) began to examine feasibility of redundant networked communications
- Larry Roberts developed ARPANET from its inception

The 1970s and 1980s

- ARPANET grew in popularity as did its potential for misuse
- Fundamental problems with ARPANET security were identified
  - No safety procedures for dial-up connections to ARPANET
  - Non-existent user identification and authorization to system
- Late 1970s: microprocessor expanded computing capabilities and security threats

R-609

- Information security began with Rand Report R-609 (paper that started the study of computer security)
- Scope of computer security grew from physical security to include:
  - Safety of data
  - Limiting unauthorized access to data
  - Involvement of personnel from multiple levels of an organization

The 1990s

- Networks of computers became more common; so too did the need to interconnect networks
- Internet became first manifestation of a global network of networks
- In early Internet deployments, security was treated as a low priority

The Present

- The Internet brings millions of computer networks into communication with each other—many of them unsecured
- Ability to secure a computer's data influenced by the security of every computer to which it is connected
- The same problems apply for emerging networked computer systems (*e.g.*, smartphones, IoT devices)

Summary

- Information security is a “well-informed sense of assurance that the information risks and controls are in balance.”
- Security should be considered a balance between protection and availability.
- Computer security began immediately after first mainframes were developed