

Security Goals

Information Security (44 U.S. Code § 3542)

- (1) The term “information security” means protecting information and information systems from unauthorized access, use, disclosure, disruption, modification, or destruction in order to provide—
- (A) integrity, which means guarding against improper information modification or destruction, and includes ensuring information nonrepudiation and authenticity;
 - (B) confidentiality, which means preserving authorized restrictions on access and disclosure, including means for protecting personal privacy and proprietary information; and
 - (C) availability, which means ensuring timely and reliable access to and use of information.

Information Security Triad: CIA





Confidentiality

- Protecting information from disclosure to unauthorized parties
- Access to information should be granted only on a **need-to-know basis**
- **Data categorization** according to the amount and type of possible damage should it fall into wrong hands

Supporting Principles (🔒)

- Authentication, Authorization, Encryption, Anonymity, Secrecy

Integrity

- Protecting information from being modified by unauthorized parties
- Being correct or **consistent with the intended state** of information
- Ensuring that the **information is not tampered** whenever it travels from source to destination or even stored at rest

Supporting Principles ()

- Hashing, Digital Signatures, Non-repudiation, Tamper-evident packaging



Availability

- Ensuring that authorized parties are **able to access information** when needed
- Ensuring that the services of an organization are available

Supporting Principles ()

- Accessibility, Fault Tolerance, Redundancy, Backup, Testing

Exercise 2.1 (📌)

1. Which security goals are at risk by the following threats?

| Threat | C | I | A |
|-----------------------------|---|---|---|
| Network Sniffing | | | |
| DDoS Attack | | | |
| Rogue WiFi Access Point | | | |
| Electromagnetic Pulse (EMP) | | | |
| Whistleblower | | | |
| Social Engineering | | | |

Attacker Behavior vs. Security Goals

| | Active | Passive | Threatened Security Goals |
|-----------|--------|---------|--|
| Observing | (✓) | ✓ | Confidentiality |
| Altering | ✓ | ✗ | Confidentiality, Integrity, Availability |

Extended CIA Models

Parkerian Hexad (1998)

- Confidentiality
- Possession / Control (NEW)
- Integrity
- Authenticity (NEW)
- Availability
- Utility (NEW)

Possession / Control

- Protecting against the idea that **confidential data can be possessed/controlled by an unauthorized individual or party**
- Loss of control or possession of information should not automatically lead to the breach of confidentiality

Supporting Principles ()

- Encryption, Authentication

Authenticity

- Assurance that a message or transaction is from the source it claims to be from

Supporting Principles ()

- Identification, Digital Certificates

Utility

- Usefulness of data or information

Supporting Principles ()

- Compatibility, Accessibility

Information may be available and therefore usable but it doesn't necessarily have to be in a useful form to be defined as available. [¹]

CIA³ (2016)

- Confidentiality
- Integrity
- Availability
- Accountability (NEW)
- Assurance (NEW)



Accountability

- Allowing to answer questions like "*Who did it?*" or "*Who is accountable?*"
- Considering **legal consequences** and contractual obligations
- Encompassing **segregation of duties** and awareness training

Supporting Principles ()

- **Integrity**, Non-repudiation, Authenticity, Design, Governance, Policy

Assurance

- Introduces **control activities** for the aforementioned security goals
- Periodic controls **assuring that all security measures** (both technical and operational) **work as intended**

Supporting Principles ()

- Auditing, Measuring, Monitoring, Continuous Improvement

Dependency Model of CIA³



Exercise 2.2 (📌)

1. Define at least three supporting measures for each CIA³ security goal, distinguishing between technical and organizational measures

| Security Goal | Technical Measures | Organizational Measures |
|-----------------|--------------------|-------------------------|
| Confidentiality | | |
| Integrity | | |
| Availability | | |
| Accountability | | |
| Assurance | | |

Exercise 2.3 (🏠)

1. Which of the "classic" CIA security goals could have been compromised in each of the [Motivation: Case Studies](#)?
2. Explain each ✓ briefly

| Case Study | C | I | A |
|---------------------------|---|---|---|
| Marriot | | | |
| Equifax | | | |
| VTech | | | |
| CloudPets | | | |