

Security Goals

Information Security (44 U.S. Code § 3552)

(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

 *Despite its close relation to Integrity you can find Authenticity also used as part of an extended [CIAA quartet](#) occasionally.*

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. Which of the extended CIAA security goals could have been compromised in each of the [Motivation: Case Studies](#)?
2. In your work group, research the assigned case and ✓ all compromised goals
3. Reason or prove each ✓ briefly during the presentation to the plenum

| Case Study | Confidentiality | Integrity | Availability | Authenticity |
|---------------------------|-----------------|-----------|--------------|--------------|
| Peloton | | | | |
| Marriot | | | | |
| Equifax | | | | |
| CloudPets | | | | |

Exercise 2.3 (📝🏠)

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 | | |