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CYSE 200T

The CIA Triad of Confidentiality, Integrity, and Availability defines the foundation of cybersecurity, while authentication and authorization determine identity and access. Together, they safeguard data by controlling who can access it, ensuring its accuracy, and keeping it available.

The CIA Triad

Confidentiality

Confidentiality protects sensitive information from unauthorized access. Organizations often use encryption, access control, and training to ensure data privacy. For example, banks require account numbers, passwords, and two-factor authentication to protect users' financial data (Chai, 2022). In practice, breaches of confidentiality often occur through phishing, malware, or man-in-the-middle attacks (SailPoint, 2025).

Integrity

Integrity ensures data remains accurate and trustworthy throughout its lifecycle. This is achieved with methods such as checksums, digital signatures, and file permissions (Chai, 2022). NIST emphasizes the importance of controls that prevent unauthorized changes and maintain trust in stored and transmitted data (National Institute of Standards and Technology [NIST], 2017). Attacks like ransomware and SQL injection directly threaten integrity (SailPoint, 2025).

Availability

Availability guarantees reliable access to information for authorized users. Techniques include redundancy, failover, RAID, and comprehensive disaster recovery plans (Chai, 2022). Failures such as DDoS attacks, hardware breakdowns, or misconfigurations are common threats to availability (SailPoint, 2025). Maintaining availability requires proactive system monitoring and up-to-date patching to reduce downtime.

Authentication vs. Authorization

Authentication

Authentication verifies identity. According to NIST SP 800-63-3, authentication requires proving control of a valid "authenticator," such as a password, token, or biometric factor (NIST, 2017). A simple example is logging into a university portal using a student ID and password.

Authorization

Authorization defines what an authenticated user can do. After login, systems apply access control models such as role-based access control (RBAC) to enforce least privilege (Heimdal Security, 2023). For example, an employee may authenticate successfully but only be authorized to view, not edit, sensitive financial records.

Key Difference

Authentication answers "Who are you?" while authorization answers "What are you allowed to do?". Authentication always precedes authorization: only once a user's identity is confirmed can the system determine what resources they can access (Heimdal Security, 2023).

Conclusion

The CIA Triad provides a clear framework for protecting confidentiality, integrity, and availability in information systems. Authentication and authorization add layers of identity management and access control to secure systems against misuse. Together, these concepts underpin modern cybersecurity practices, balancing protection, trust, and access.

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