Cybersecurity Fundamentals & Terminology

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Objective:
The objective of this document is to build a strong conceptual foundation in cybersecurity fundamentals. This report is designed for a Cybersecurity Analyst Intern and explains key security principles, terminology, and distinctions in a detailed and industry-aligned manner.

1. Introduction to Cybersecurity

Cybersecurity is the practice of protecting systems, networks, applications, and data from digital attacks. These attacks are typically aimed at accessing, altering, or destroying sensitive information, extorting money from users, or disrupting normal business operations. As organizations increasingly rely on digital infrastructure, cybersecurity has become a critical business function.

2. CIA Triad (Confidentiality, Integrity, Availability)

The CIA Triad is a core model used in cybersecurity to guide the development of security policies and controls. Every security measure implemented within an organization should support one or more components of this triad.

2.1 Confidentiality

Confidentiality ensures that information is accessible only to authorized individuals, systems, or processes. The primary goal is to prevent unauthorized disclosure of sensitive data such as personal information, financial records, intellectual property, and credentials.

Common controls used to maintain confidentiality include:
- Authentication mechanisms (passwords, biometrics, multi-factor authentication)
- Authorization and access control models (RBAC, ABAC)
- Encryption (data at rest and data in transit)
- Network security controls such as firewalls and VPNs

A breach of confidentiality can result in data leaks, identity theft, legal penalties, and reputational damage.

2.2 Integrity

Integrity ensures that data remains accurate, complete, and trustworthy throughout its lifecycle. It protects information from unauthorized modification, deletion, or corruption.

Integrity is maintained through:
- Hashing algorithms (SHA-256, SHA-512)
- Digital signatures
- Checksums and error-detection mechanisms
- Version control systems and audit logs

Loss of integrity can lead to incorrect decision-making, financial loss, and operational failures.

2.3 Availability

Availability ensures that systems, applications, and data are accessible to authorized users when needed. Even if confidentiality and integrity are preserved, a system that is unavailable fails to meet business requirements.

Availability is ensured through:
- Redundant systems and failover mechanisms
- Regular data backups
- Disaster recovery and business continuity planning
- Protection against Denial-of-Service (DoS/DDoS) attacks

Availability failures can halt business operations and cause significant financial and reputational damage.

3. Threat vs Vulnerability vs Risk

Understanding the relationship between threats, vulnerabilities, and risk is essential for effective risk management and security decision-making.

3.1 Threat

A threat is any potential cause of an unwanted incident that may harm a system or organization. Threats can be intentional or unintentional.

Examples include:
- Cybercriminals and hackers
- Malware and ransomware attacks
- Insider threats (malicious or negligent employees)
- Natural disasters such as floods or fires

3.2 Vulnerability

A vulnerability is a weakness in a system, application, network, or process that can be exploited by a threat.

Examples include:

- Unpatched or outdated software
- Weak or reused passwords
- Misconfigured servers or cloud resources
- Lack of security awareness among employees

3.3 Risk

Risk is the potential impact or damage that occurs when a threat successfully exploits a vulnerability.

Risk is often expressed as:
Risk = Threat × Vulnerability × Impact

Organizations aim to reduce risk by mitigating vulnerabilities, reducing threat exposure, or minimizing impact.

4. Malware Types

Malware (malicious software) is designed to damage, disrupt, or gain unauthorized access to systems and data.

4.1 Virus

A virus is malware that attaches itself to legitimate files or programs and spreads when the infected file is executed. Viruses typically require user action to propagate.

4.2 Worm

A worm is a self-replicating type of malware that spreads across networks without human interaction, often exploiting network vulnerabilities.

4.3 Trojan

A Trojan disguises itself as legitimate software to trick users into installing it. Once installed, it can create backdoors, steal data, or download additional malware.

4.4 Ransomware

Ransomware encrypts files or entire systems and demands a ransom for decryption. It is one of the most financially damaging forms of malware.

5. Cybersecurity vs Information Security

Cybersecurity focuses specifically on protecting digital assets such as networks, systems, and data from cyber threats.

Information Security is a broader discipline that protects information in all forms—digital, physical, and verbal. Cybersecurity is a subset of information security.

6. Conclusion

This report establishes foundational cybersecurity knowledge essential for a Cybersecurity Analyst Intern. A strong understanding of these principles enables effective learning of advanced topics such as network security, incident response, penetration testing, and security governance.

7. References

1. NIST Cybersecurity Framework – https://www.nist.gov/cyberframework
2. ISO/IEC 27001 Information Security Management Standard
3. IBM Cybersecurity Basics – https://www.ibm.com/topics/cybersecurity
4. Cisco Networking Academy – Introduction to Cybersecurity