1. Certified Information Systems Security Professional (CISSP):

This document is based on contents from Google Cyber Security)

The following are CISSP's eight security domains for Cyber Analyst

- **D 1: Security and risk management**
- **D 2: Asset security**
- **D 3: Security architecture and engineering**
- **D 4: Communication and network security**
- **D 5: Identity and access management**
- **D 6: Security assessment and testing**
- **D 7: Security operations**
- **D 8: Software development security**

D1: Security and risk management

All organizations must develop their **security posture**. **Security posture is defined as an organization's ability to manage its defense of critical assets and data and react to change.** Elements of the security and risk management domain that impact an organization's security posture include:

- Security goals and objectives
- Risk mitigation processes
- Compliance
- Business continuity plans
- Legal regulations
- Professional and organizational ethics

Information security, or **InfoSec**, is also related to this domain and **refers to a set of processes established to secure information.** An organization may use **playbooks** (**i.e., playbook is A manual that provides details about any operational action**) and implement training as a part of their security and risk management program, based on their needs and perceived risk. There are many InfoSec design processes, such as:

- Incident response
  - **An organization's quick attempt to identify an attack, contain the damage, and correct the effects of a security breach**
- Vulnerability management
  - **The process of finding and patching vulnerabilities**
- Application security
- Cloud security
  - **The process of ensuring that assets stored in the cloud are properly configured and access to those assets is limited to authorized users.**
- Infrastructure security

- **The practice of keeping an organization's infrastructure secure from unauthorized access**

As an example, a security team may need to alter how personally identifiable information (PII) is treated in order to adhere to the European Union's General Data Protection Regulation (GDPR).

D 2: Asset security

An Asset can be defined as an item perceived as having value to an organization.

Asset security involves managing the cybersecurity processes of organizational assets, including the storage, maintenance, retention, and destruction of physical and virtual data. Because the loss or theft of assets can expose an organization and increase the level of risk, keeping track of assets and the data they hold is essential. Conducting a security impact analysis, establishing a recovery plan, and managing data exposure will depend on the level of risk associated with each asset. Security analysts may need to store, maintain, and retain data by creating backups to ensure they are able to restore the environment if a security incident places the organization's data at risk.

D 3: Security architecture and engineering

Security architecture is a type of security design composed of multiple components, such as tools and processes, that are used to protect an organization from risks and external threats.

This domain focuses on managing data security. Ensuring effective tools, systems, and processes are in place helps protect an organization's assets and data. Security architects and engineers create these processes.

One important aspect of this domain is the concept of shared responsibility. Shared responsibility means all individuals involved take an active role in lowering risk during the design of a security system. Additional design principles related to this domain, which are discussed later in the program, include:

- Threat modeling
  - The process of identifying assets, their vulnerabilities, and how each is exposed to threats.
- Least privilege
  - The concept of granting only the minimal access and authorization required to complete a task or function.
- Defense in depth
  - A layered approach to vulnerability management that reduces risk.
- Fail securely
- Separation of duties
  - The principle that users should not be given levels of authorization that would allow them to misuse a system.
- Keep it simple

- Zero trust
- Trust but verify

An example of managing data is the use of a security information and event management (SIEM) tool to monitor for flags related to unusual login or user activity that could indicate a threat actor is attempting to access private data.

D 4: Communication and network security

This domain focuses on managing and securing physical networks and wireless communications. This includes on-site, remote, and cloud communications.

Organizations with remote, hybrid, and on-site work environments must ensure data remains secure, but managing external connections to make certain that remote workers are securely accessing an organization's networks is a challenge. Designing network security controls—such as restricted network access—can help protect users and ensure an organization's network remains secure when employees travel or work outside of the main office.

D 5: Identity and access management

The identity and access management (IAM) is a collection of processes and technologies that helps organizations manage digital identities in their environment.

IAM domain focuses on keeping data secure. It does this by ensuring user identities are trusted and authenticated and that access to physical and logical assets is authorized. This helps prevent unauthorized users, while allowing authorized users to perform their tasks.

Essentially, IAM uses what is referred to as the principle of least privilege, which is the concept of granting only the minimal access and authorization required to complete a task. As an example, a cybersecurity analyst might be asked to ensure that customer service representatives can only view the private data of a customer, such as their phone number, while working to resolve the customer's issue; then remove access when the customer's issue is resolved.

D 6: Security assessment and testing

The security assessment and testing domain focuses on identifying and mitigating risks, threats, and vulnerabilities. Security assessments help organizations determine whether their internal systems are secure or at risk. Organizations might employ penetration testers, often referred to as "pen testers," to find vulnerabilities that could be exploited by a threat actor.

This domain suggests that organizations conduct security control testing, as well as collect and analyze data. Additionally, it emphasizes the importance of conducting security audits to monitor for and reduce the probability of a data breach. To contribute to these types of tasks, cybersecurity professionals may be tasked with auditing user permissions to validate that users have the correct levels of access to internal systems.

D 7: Security operations

The security operations domain focuses on the investigation of a potential data breach and the implementation of preventative measures after a security incident has occurred. This includes using strategies, processes, and tools such as:

- Training and awareness
- Reporting and documentation
- Intrusion detection and prevention
    - Intrusion detection system (IDS) is an application that monitors system activity and alerts on possible intrusions
    - Intrusion prevention system (IPS) is an application that monitors system activity for intrusive activity and takes action to stop the activity
- SIEM tools (**Security information and event management)**
    - An application that collects and analyzes log data to monitor critical activities in an organization.
- Log Management
    - The process of collecting, storing, analyzing, and disposing of log data
- Incident management
- Playbooks
    - A manual that provides details about any operational action
- Post-breach forensics
    - The practice of collecting and analyzing data to determine what has happened after an attack
- Reflecting on lessons learned

The cybersecurity professionals involved in this domain work as a team to manage, prevent, and investigate threats, risks, and vulnerabilities. These individuals are trained to handle active attacks, such as large amounts of data being accessed from an organization's internal network, outside of normal working hours. Once a threat is identified, the team works diligently to keep private data and information safe from threat actors.

D 8: Software development security

The software development security domain is focused on using secure programming practices and guidelines to create secure applications. Having secure applications helps deliver secure and reliable services, which helps protect organizations and their users.

Security must be incorporated into each element of the software development life cycle, from design and development to testing and release. To achieve security, the software development process must have security in mind at each step. Security cannot be an afterthought.

Performing application security tests can help ensure vulnerabilities are identified and mitigated accordingly. Having a system in place to test the programming conventions, software executables, and security measures embedded in the software is necessary. Having quality assurance and pen tester professionals ensure the software has met security and performance standards is also an essential part of the software development process. For example, an entry-level analyst working for a pharmaceutical company might be asked to make sure encryption is properly configured for a new medical device that will store private patient data.

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2. Manage common threats, risks, and vulnerabilities

Risk Management

A primary goal of organizations is to protect assets. An **asset** is an item perceived as having value to an organization. Assets can be digital or physical. Examples of digital assets include the personal information of employees, clients, or vendors, such as:

- Social Security Numbers (SSNs), or unique national identification numbers assigned to individuals
- Dates of birth
- Bank account numbers
- Mailing addresses

Examples of physical assets include:

- Payment kiosks
- Servers
- Desktop computers
- Office spaces

Some common strategies used to manage risks include:

- **Acceptance**: Accepting a risk to avoid disrupting business continuity
- **Avoidance**: Creating a plan to avoid the risk altogether
- **Transference**: Transferring risk to a third party to manage
- **Mitigation**: Lessening the impact of a known risk

Additionally, organizations implement risk management processes based on widely accepted frameworks to help protect digital and physical assets from various threats, risks, and vulnerabilities. Examples of frameworks commonly used in the cybersecurity industry include the National Institute of Standards and Technology Risk Management Framework (NIST RMF) and Health Information Trust Alliance (HITRUST).

Following are some common types of threats, risks, and vulnerabilities you'll help organizations manage as a security professional.

Today's most common threats, risks, and vulnerabilities

Threats

A **threat** is any circumstance or event that can negatively impact assets. As an entry-level security analyst, your job is to help defend the organization's assets from inside and outside threats. Therefore, understanding common types of threats is important to an analyst's daily work. As a reminder, common threats include:

- **Insider threats:** Staff members or vendors abuse their authorized access to obtain data that may harm an organization.
- **Advanced persistent threats (APTs):** A threat actor maintains unauthorized access to a system for an extended period of time.

Risks

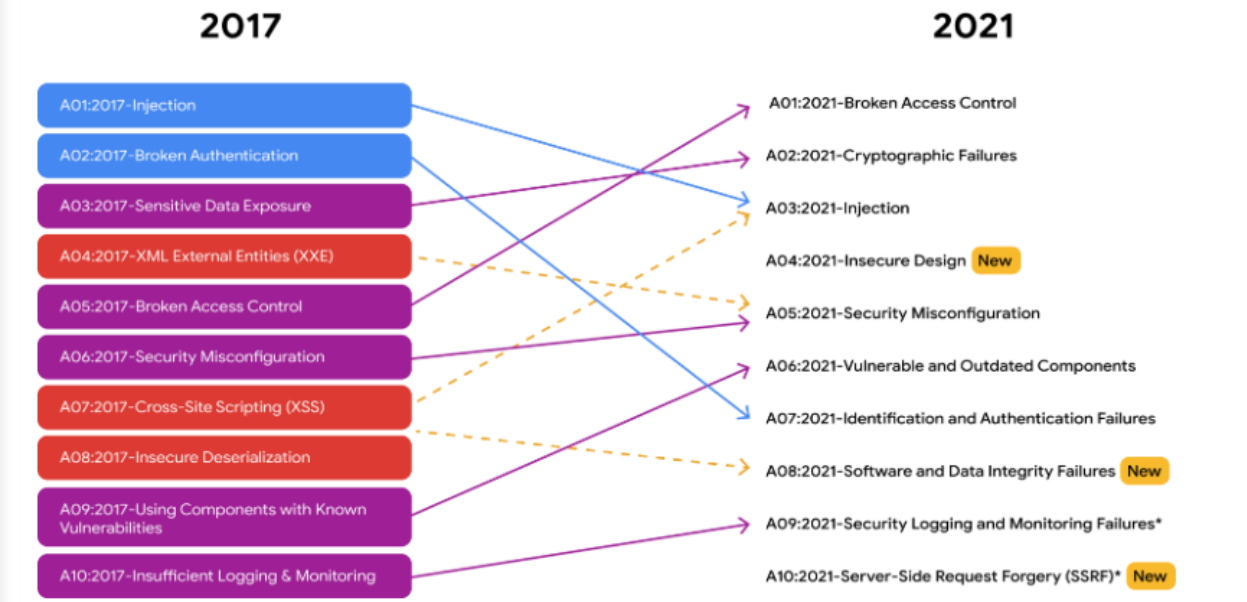
A **risk** is anything that can impact the confidentiality, integrity, or availability of an asset. A basic formula for determining the level of risk is that risk equals the likelihood of a threat. One way to think about this is that a risk is being late to work and threats are traffic, an accident, a flat tire, etc.

There are different factors that can affect the likelihood of a risk to an organization's assets, including:

- **External risk:** Anything outside the organization that has the potential to harm organizational assets, such as threat actors attempting to gain access to private information
- **Internal risk:** A current or former employee, vendor, or trusted partner who poses a security risk
- **Legacy systems:** Old systems that might not be accounted for or updated, but can still impact assets, such as workstations or old mainframe systems. For example, an organization might have an old vending machine that takes credit card payments or a workstation that is still connected to the legacy accounting system.
- **Multiparty risk:** Outsourcing work to third-party vendors can give them access to intellectual property, such as trade secrets, software designs, and inventions.
- **Software compliance/licensing:** Software that is not updated or in compliance, or patches that are not installed in a timely manner

There are many resources, such as the NIST, that provide lists of cybersecurity risks. Additionally, the Open Web Application Security Project (OWASP) publishes a standard awareness document about the top 10 most critical security risks to web applications, which is updated regularly.

Note: The OWASP's common attack types list contains three new risks for the years 2017 to 2021: insecure design, software and data integrity failures, and server-side request forgery. This update emphasizes the fact that security is a constantly evolving field. It also demonstrates the importance of staying up to date on current threat actor tactics and techniques, so you can be better prepared to manage these types of risks.



Vulnerabilities

A **vulnerability** is a weakness that can be exploited by a threat. Therefore, organizations need to regularly inspect for vulnerabilities within their systems. Some vulnerabilities include:

- **ProxyLogon:** A pre-authenticated vulnerability that affects the Microsoft Exchange server. This means a threat actor can complete a user authentication process to deploy malicious code from a remote location.
- **ZeroLogon:** A vulnerability in Microsoft's Netlogon authentication protocol. An authentication protocol is a way to verify a person's identity. Netlogon is a service that ensures a user's identity before allowing access to a website's location.
- **Log4Shell:** Allows attackers to run Java code on someone else's computer or leak sensitive information. It does this by enabling a remote attacker to take control of devices connected to the internet and run malicious code.
- **PetitPotam:** Affects Windows New Technology Local Area Network (LAN) Manager (NTLM). It is a theft technique that allows a LAN-based attacker to initiate an authentication request.
- **Security logging and monitoring failures:** Insufficient logging and monitoring capabilities that result in attackers exploiting vulnerabilities without the organization knowing it
- **Server-side request forgery:** Allows attackers to manipulate a server-side application into accessing and updating backend resources. It can also allow threat actors to steal data.

As an entry-level security analyst, you might work in vulnerability management, which is monitoring a system to identify and mitigate vulnerabilities. Although patches and updates may exist, if they are not applied, intrusions can still occur. For this reason, constant monitoring is

important. The sooner an organization identifies a vulnerability and addresses it by patching it or updating their systems, the sooner it can be mitigated, reducing the organization's exposure to the vulnerability.

To learn more about the vulnerabilities explained in this section of the reading, as well as other vulnerabilities, explore the NIST National Vulnerability Database and CISA Known Exploited Vulnerabilities Catalog.

3. Related Terms and definitions

Assess: The fifth step of the NIST RMF that means to determine if established controls are implemented correctly

Authorize: The sixth step of the NIST RMF that refers to being accountable for the security and privacy risks that may exist in an organization

Business continuity: An organization's ability to maintain their everyday productivity by establishing risk disaster recovery plans

Categorize: The second step of the NIST RMF that is used to develop risk management processes and tasks

External threat: Anything outside the organization that has the potential to harm organizational assets

Implement: The fourth step of the NIST RMF that means to implement security and privacy plans for an organization

Internal threat: A current or former employee, external vendor, or trusted partner who poses a security risk

Monitor: The seventh step of the NIST RMF that means be aware of how systems are operating

Prepare: The first step of the NIST RMF related to activities that are necessary to manage security and privacy risks before a breach occurs

Ransomware: A malicious attack where threat actors encrypt an organization's data and demand payment to restore access

Risk: Anything that can impact the confidentiality, integrity, or availability of an asset

Risk mitigation: The process of having the right procedures and rules in place to quickly reduce the impact of a risk like a breach

Security posture: An organization's ability to manage its defense of critical assets and data and react to change.

Select: The third step of the NIST RMF that means to choose, customize, and capture documentation of the controls that protect an organization

Shared responsibility: The idea that all individuals within an organization take an active role in lowering risk and maintaining both physical and virtual security.

Social engineering: A manipulation technique that exploits human error to gain private information, access, or valuables.

Vulnerability: A weakness that can be exploited by a threat

4. The relationship between frameworks and controls

Frameworks and controls

Security frameworks are guidelines used for building plans to help mitigate risk and threats to data and privacy. Frameworks support organizations' ability to adhere to compliance laws and regulations. For example, the healthcare industry uses frameworks to comply with the United States' Health Insurance Portability and Accountability Act (HIPAA), which requires that medical professionals keep patient information safe.

Security controls are safeguards designed to reduce *specific* security risks. Security controls are the measures organizations use to lower risk and threats to data and privacy. For example, a control that can be used alongside frameworks to ensure a hospital remains compliant with HIPAA is requiring that patients use multi-factor authentication (MFA) to access their medical records. Using a measure like MFA to validate someone's identity is one way to help mitigate potential risks and threats to private data.

Specific frameworks and controls
There are many different frameworks and controls that organizations can use to remain compliant with regulations and achieve their security goals. Frameworks covered in this reading are the Cyber Threat Framework (CTF) and the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 27001. Several common security controls, used alongside these types of frameworks, are also explained.

Cyber Threat Framework (CTF)

According to the Office of the Director of National Intelligence, the CTF was developed by the U.S. government to provide "a common language for describing and communicating information about cyber threat activity." By providing a common language to communicate information about threat activity, the CTF helps cybersecurity professionals analyze and share information more efficiently. This allows organizations to improve their response to the constantly evolving cybersecurity landscape and threat actors' many tactics and techniques.

International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 27001

An internationally recognized and used framework is ISO/IEC 27001. The ISO 27000 family of standards enables organizations of all sectors and sizes to manage the security of assets, such as financial information, intellectual property, employee data, and information entrusted to third parties. This framework outlines requirements for an information security management system, best practices, and controls that support an organization's ability to manage risks. Although the ISO/IEC 27001 framework does not require the use of specific controls, it does provide a collection of controls that organizations can use to improve their security posture.

Controls

Controls are used alongside frameworks to reduce the possibility and impact of a security threat, risk, or vulnerability. Controls can be physical, technical, and administrative and are typically used to prevent, detect, or correct security issues.

Examples of physical controls:

- Gates, fences, and locks
- Security guards
- Closed-circuit television (CCTV), surveillance cameras, and motion detectors
- Access cards or badges to enter office spaces

Examples of technical controls:

- Firewalls
- MFA
- Antivirus software

Examples of administrative controls:

- Separation of duties
- Authorization
- Asset classification

To learn more about controls, particularly those used to protect health-related assets from a variety of threat types, review the U.S. Department of Health and Human Services' Physical Access Control presentation.

5. Use the CIA triad to protect Organizations

Learn how cybersecurity analysts use the CIA triad in the workplace.

The CIA triad for analysts

The **CIA triad** is a model that helps inform how organizations consider risk when setting up systems and security policies. It is made up of three elements that cybersecurity analysts and organizations work toward upholding: confidentiality, integrity, and availability. Maintaining an

acceptable level of risk and ensuring systems and policies are designed with these elements in mind helps establish a successful **security posture**, which refers to an organization’s ability to manage its defense of critical assets and data and react to change.

Confidentiality

Confidentiality is the idea that only authorized users can access specific assets or data. In an organization, confidentiality can be enhanced through the implementation of design principles, such as the principle of least privilege. The principle of least privilege limits users' access to only the information they need to complete work-related tasks. Limiting access is one way of maintaining the confidentiality and security of private data.

Integrity

Integrity is the idea that the data is verifiably correct, authentic, and reliable. Having protocols in place to verify the authenticity of data is essential. One way to verify data integrity is through cryptography, which is used to transform data so unauthorized parties cannot read or tamper with it (NIST, 2022). Another example of how an organization might implement integrity is by enabling encryption, which is the process of converting data from a readable format to an encoded format. Encryption can be used to prevent access and ensure data, such as messages on an organization's internal chat platform, cannot be tampered with.

Availability

Availability is the idea that data is accessible to those who are authorized to use it. When a system adheres to both availability and confidentiality principles, data can be used when needed. In the workplace, this could mean that the organization allows remote employees to access its internal network to perform their jobs. It’s worth noting that access to data on the internal network is still limited, depending on what type of access employees need to do their jobs. If, for example, an employee works in the organization’s accounting department, they might need access to corporate accounts but not data related to ongoing development projects.