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# ASSURANCE:

Information assurance pertains to the level of confidence in the protection of information and systems through security measures, ensuring that they are available, they have integrity, authenticity, and are confidential. These measures encompass capabilities for protection, detection, and reaction, including the ability to restore systems. It is essential to recognize that assurance does not offer an absolute guarantee that these measures will function flawlessly. The challenge of quantifying the security of a system is significant. Despite this, individuals often expect and unknowingly obtain assurance.

For instance, someone may regularly receive product suggestions from peers, not realizing that such recommendations inherently contribute to a sense of assurance.

In this chapter the focus is on the strategic planning for assurance outlining two distinct categories of methods and tools one related to the design and subsequent application of assurance and other concerning operational assurance further segmented into audits and monitoring the delineation between these categories can be somewhat unclear due to substantial overlap for instance topics such as configuration management or audits that are typically associated with operational assurance also hold significant importance during the developmental phase of a system the discourse leans towards giving more attention to technical considerations during design and implementation assurance while under operational assurance there is a combination of management operational technical issues discussed.

## 7.1 AUTHORIZATON:

Authorization signifies the formal managerial decision to approve the functioning of a system typically granted by a high-ranking organizational executive the authorizing official explicitly recognizes the risks associated with running the system across various dimensions including organizational operations assets individuals other entities and the nation this approval is contingent upon the implementation of a mutually agreed-upon set of security and privacy controls a collaborative partnership between the authorizing official and the senior agency official for privacy saop is indispensable as outlined in omb a-130 saops have the responsibility of reviewing and endorsing privacy plans before authorization and scrutinizing authorization packages for systems containing personally identifiable information pii consequently the authorizing official engages in ongoing communication with the saop addressing any privacy-related concerns before making the final authorization decision the authorization process necessitates a collaborative effort between managers and technical staff to formulate practical cost-effective solutions that align with security needs technical and operational constraints and other system quality attributes such as privacy all in accordance with mission or business requirements

To facilitate well-informed, risk-based decision-making, the foundation lies in dependable and up-to-date information regarding the implementation and efficacy of both technical and non-technical safeguards. This encompasses:

1. Technical features (Are they functioning as intended?)

2. Operational policies and practices (Is the system being operated in accordance with stated policies and practices?)

3. Overall security (Are there threats that the existing safeguards fail to address?)

4. Remaining risk (Is the residual risk at an acceptable level?)

The responsibility for authorizing a system, permitting its operation, and establishing a plan for continuous monitoring lies with the Authorizing Official. This entails ensuring that the system is not only authorized initially but also has a robust framework in place for ongoing and vigilant monitoring.

### 7.1.1 Assurance and Authorization:

Assurance has a important part in the decision of process for giving access to a system to operate this includes checking whether the technical measures and procedures align with a defined set of security aspects and broader quality principles the ultimate decision regarding level and types of assurance for a system rests with the authorized official to arrive at a collective decision the authorizing official considers factors such as the systems categorization impact level and reviews the outcomes of risk assessments this analysis entails balancing the benefits and drawbacks of the cost of assurance the expenses included with controls and the major threats posed to the organization following the completion of authorization work it becomes the responsibility of the authorizing official to recognize and accept the remaining risks present within the system.

### 7.1.2 Authorization of Products to Operate in a Similar Situation:

Granting authorization for a product or system to operate in a comparable situation can offer a level of assurance, commonly known as reciprocity. Nevertheless, it is crucial to understand that authorization is context-specific, tied to the environment and the specific system in question. As the authorization process involves a delicate balance between risks and benefits, a product may receive approval for operation in one environment but not in another, even if the same authorizing official is involved. For example, an authorizing official may endorse the use of cloud storage for research data within a system but refrain from approving it for handling human resource data under the same system's purview.

## 7.2 Security Engineering:

In the contemporary landscape, the size and intricacy of systems underscore the importance of prioritizing the construction of reliable systems. Systems security engineering offers a fundamental methodology for developing trustworthy systems in the intricate realm of modern computing. For additional insights into security engineering, one can consult NIST SP 800-160.

Security engineering refers to the process of integrating security controls into an information system to make them an inherent part of the system's operational capabilities. This practice aligns with other systems engineering activities, aiming to deliver engineering solutions that meet predetermined functional and user requirements. However, security engineering goes beyond conventional systems engineering by incorporating measures to prevent misuse and malicious behavior, typically guided by a security policy.

While security engineering has informally existed for centuries, with examples such as locksmithing and security printing, its formalization in modern computer systems gained momentum with seminal works like Willis H. Ware's 1967 RAND paper, "Security and Privacy in Computer Systems." This paper, later expanded in 1979, laid the groundwork for fundamental information security concepts, now encompassed by the broader field of Cybersecurity, influencing diverse computing environments from cloud implementations to embedded IoT.

Recent significant events, notably 9/11, propelled security engineering into a rapidly growing field. A 2006 report estimated the global security industry's value at a substantial US $150 billion.

Security engineering encompasses elements of social science, psychology (focusing on designing systems to "fail well" rather than eliminating all error sources), economics, as well as traditional scientific disciplines like physics, chemistry, mathematics, criminology, architecture, and landscaping. Techniques such as fault tree analysis, derived from safety engineering, are applied, and previously military-restricted methods like cryptography have found broader applications. Ross Anderson is recognized as one of the pioneers in establishing security engineering as a formal field of study.

## 7.2.1 Planning and Assurance:

The planning of assurance in information security is a critical process that involves systematic and proactive measures to ensure the effectiveness, reliability, and integrity of security controls within an information system. Here are key aspects of planning for assurance in information security:

**Risk Assessment:**

- Begin with a comprehensive risk assessment to identify potential threats, vulnerabilities, and risks to the information system.
- Evaluate the potential impact of security incidents on the confidentiality, integrity, and availability of data.

**Define Security Objectives:**

- Clearly define security objectives based on the identified risks and organizational requirements.
- Set measurable goals for the assurance level needed, considering factors such as confidentiality, integrity, and availability.

**Regulatory Compliance:**

- Ensure that the security plan aligns with relevant laws, regulations, and industry standards applicable to the organization.

**System Categorization:**

- Categorize the information system based on the sensitivity and criticality of the data it handles.
- This categorization helps in determining the appropriate level of security controls.

**Security Controls Selection:**

- Select security controls that are suitable for the identified risks and the categorized system.
- Consider a mix of technical, administrative, and physical controls to address various aspects of security.

**Assurance Testing:**

- Plan and conduct assurance testing, including vulnerability assessments, penetration testing, and security audits.
- Regularly review and update testing methodologies to adapt to evolving threats.

**Incident Response Planning:**

- Develop a robust incident response plan to address security incidents promptly and effectively.
- Define roles, responsibilities, and communication procedures in the event of a security breach.

**Continuous Monitoring:**

- Implement continuous monitoring mechanisms to detect and respond to security events in real-time.
- Leverage automated tools and manual reviews to ensure ongoing assurance.

**Employee Training and Awareness:**

- Provide training programs to employees to enhance their awareness of security policies and best practices.
- Regularly update training materials to reflect current threats and mitigation strategies.

**Documentation and Reporting:**

- Maintain comprehensive documentation of security policies, procedures, and control implementations.
- Generate regular reports for management, highlighting the state of security, incidents, and compliance.

**Budgeting and Resource Allocation:**

- Allocate appropriate resources, including budget and personnel, to implement and sustain security measures.
- Regularly review and adjust the budget and resource allocation based on evolving threats and organizational changes.

**Collaboration and Communication:**

- Foster collaboration between different departments, including IT, legal, compliance, and management.
- Establish effective communication channels for reporting security incidents and updates.

**Regular Review and Update:**

- Periodically review and update the security plan to adapt to changes in the threat landscape, technology, and business operations.
- Ensure that security measures evolve to meet emerging challenges.

By systematically addressing these aspects, organizations can create a robust plan for assurance in information security, reducing vulnerabilities and enhancing the overall resilience of their information systems.

## 7.2.2 Designing and Implementation of Assurance:

Assurance in design and implementation focuses on evaluating both the design and whether the functionalities of a system, application, or component align with security requirements and specifications. This aspect of assurance scrutinizes the system's design, development, and installation, typically correlating with the development/acquisition and implementation phase of the system life cycle. Nonetheless, it remains relevant throughout the system's life cycle, even during modifications.

**Design Assurance:**

Design assurance serves as the substantiation that a given design is adequately equipped to fulfill the stipulations outlined in the security policy. This assurance involves the application of sound security engineering practices to formulate a fitting security design that effectively embodies the security requirements. Additionally, design assurance encompasses an evaluation of how well the designed system aligns with the specified security requirements.

The techniques employed in design assessment rely on a policy or model that encapsulates the security requirements for the system, coupled with a detailed description or specification of the system design. During this process, assertions are made regarding the accuracy of the design concerning the security requirements. Design assurance techniques serve to provide a rationale or proof substantiating these assertions.

**Implementation Assurance:**

Implementation assurance constitutes the evidence that affirms the alignment of the implemented system with the security requirements outlined in the security policy. In practical terms, it demonstrates the congruence between the implementation and the earlier established design, a correlation established through design assurance, which, in turn, confirmed alignment with the security requirements specified in the security policy. This assurance encompasses the application of sound security engineering practices to ensure accurate implementation, encompassing development as well as maintenance and repair phases.

The implementation assurance process involves evaluating how well the implemented system adheres to its security requirements. This evaluation is carried out through a combination of testing, proof of correctness techniques, and vulnerability assessments. Design assurance and implementation assurance collectively validate the incorporation of security policy requirements into the system's design and construction.

Despite the meticulous design and implementation processes, the ultimate success of computer systems and applications hinges on their delivery, installation, and operational phases aligning with the assumptions made during design and implementation. Typically, vendors furnish supporting automated tools and documentation, accompanied by procedures and processes. It is the responsibility of the customer to ensure the accurate utilization of these resources for the effective functioning and security of the system.

## 7.2.2.1 Usage of Advanced Development

Enhancing assurance in the development of both commercial off-the-shelf cots products and custom systems involves the utilization of advanced or trusted system architectures development methodologies and software engineering techniques this may include practices such as security design and development reviews formal modeling mathematical proofs implementation of iso 9000 quality techniques adherence to the iso 15288 systems security engineering standard or the integration of security architecture concepts like a trusted computing base tcb while acknowledging that complete assurance in information technology products cannot be guaranteed established evaluation processes are in place to instill a certain level of confidence in the security functionality and assurance measures applied to these products the common criteria cc serves as a framework facilitating comparability in independent evaluations acting as a valuable guide the cc supports the development evaluation and procurement of it products with security functionality for more comprehensive information on the common criteria please visit http://www.commoncriteriaportalorg or httpsbuildsecurityinus-certgovarticlesbest-practicesrequirements-engineeringthe-common-criteria.

### 7.2.2.2 Utilization of Robust Architecture:

Within the technology landscape the architecture significantly influences the success of any system be it a hardware system or a software application website a systems architecture encompasses various features each playing a pivotal role in guaranteeing optimal performance certain system architectures inherently offer heightened reliability exemplified by those incorporating fault tolerance redundancy shadowing or features like a redundant array of independent disks raid these examples predominantly contribute to enhancing system availability.

**Availability**:
Availability refers to the ability of a system to be accessible and operational at all times, without any downtime or interruptions. An architecture that is highly available ensures that users can access the system whenever they want, without any delays or issues.

**Reliability**:
Reliability is the measure of a system's ability to function accurately and consistently over a period. A reliable architecture reduces the risk of errors, downtime, and other problems that can adversely impact the system's performance.

**Performance**:
Performance refers to the speed and efficiency of a system in executing its tasks. A well-designed architecture should provide optimal performance, allowing users to perform tasks quickly and efficiently.

**Scalability**:
Scalability is the ability of a system to handle an increasing workload without compromising its performance.

**Building Blocks:**

To create a successful system architecture, it's essential to start with building blocks. These building blocks consist of core components, user stories, roles and responsibility statements, non-functional requirements, and component refactoring.

In summary, the construction of a robust system architecture necessitates meticulous attention to various foundational elements. This includes the identification of core components, allocation of user stories, examination of roles and responsibility statements, analysis of non-functional requirements, and the adaptive refactoring of components as necessary. Additionally, employing methodologies such as the Entity Trap, Workflow approach, and Actor/Action approach proves beneficial in identifying essential components for creating a system that boasts high availability, reliability, efficient performance, scalability, elasticity, and security.

Prioritizing these building blocks and characteristics empowers architects to ensure optimal system performance, ultimately leading to the development of a successful and effective system**.**

### 7.2.2.3 Use of Reliable Security:

A crucial aspect of effective security lies in the notion of ease of safe use, suggesting that a system that is simpler to secure is inherently more likely to achieve genuine security. When a system defaults to the "most secure" option, there is a higher probability that security features will be actively employed. Additionally, a system's security can be considered more dependable if it avoids the adoption of new technologies that have not undergone real-world testing, often referred to as "bleeding-edge" technology. Conversely, a system opting for older, thoroughly tested software is less likely to harbor vulnerabilities.

### 7.2.2.4 Evaluations:

Product evaluations typically involve comprehensive testing and can be conducted by various types of organizations. These entities include domestic and foreign government agencies, independent groups like trade and professional organizations, other vendors or commercial entities, and individual users or user consortia. Evaluations take diverse forms, ranging from product reviews in trade literature to more formal assessments against specific criteria. Key considerations in utilizing evaluations include assessing the independence of the evaluating group, ensuring alignment of evaluation criteria with necessary security features, evaluating the rigor of the testing process, understanding the testing environment, taking into account the age of the evaluation, considering the competence of the evaluating organization, and recognizing any limitations imposed on the evaluations by the evaluating group, such as assumptions about the threat or operating environment.

### 7.2.2.5 Assurance Documentation:

The capacity to articulate security requirements and outline their fulfillment reflects the extent to which a system or product designer comprehends relevant security concerns. Without a thorough understanding of these requirements, it is improbable that the designer can successfully meet them.

Assurance documentation plays a crucial role in addressing security aspects at both the system and component levels. System-level documentation delineates the security requirements of the system and details their implementation, encompassing the interrelationships among applications, the operating system, and networks. This documentation extends beyond individual elements such as the operating system, security system, and applications; it portrays the integrated system as implemented within a specific environment. On the other hand, component documentation is typically associated with off-the-shelf products, while system documentation is usually developed by the system designer or implementer.

### 7.2.2.6 Product Assurances: Warranties, Integrity Statements, and Liabilities

Warranties serve as an additional layer of assurance in the realm of product reliability. When a manufacturer, producer, system developer, or integrator commits to rectifying errors within specified timeframes or by the subsequent release, it not only demonstrates a dedication to the product but also reflects the overall quality of the system for the manager. The inclusion of warranties instills confidence in the product's performance.

An integrity statement, serving as a formal declaration or certification of the product, gains additional strength when accompanied by a commitment to either (a) rectify issues through a warranty or (b) cover losses (liability) in situations where the product deviates from the stated integrity. This dual commitment underscores the seriousness of maintaining the product's integrity and provides a comprehensive level of assurance to the system manager.

### 7.2.2.7 Manufacturer’s Published Assertions:

The formal statements or published declarations made by a manufacturer or developer offer a degree of assurance, primarily relying on the reputation of the entity. However, when a contractual agreement is in force, relying solely on reputation becomes inadequate, especially considering the legal obligations imposed on the manufacturer.

### 7.2.2.8 Assurance in Distribution:

Ensuring the integrity of software upon electronic distribution is crucial, particularly to confirm that it has not been tampered with. In these instances, verification methods such as check bits or digital signatures offer a high level of assurance regarding the code's unaltered state. Additionally, anti-virus software can serve as a tool to examine software originating from less reliable sources, such as internet forums.

## 7.3 Operational Assurance:

Design and implementation assurance focuses on embedding high-quality security features into systems. On the other hand, operational assurance assesses whether a system's technical features are being circumvented or contain vulnerabilities, while also ensuring adherence to required procedures. Notably, operational assurance does not account for changes in a system's security requirements resulting from alterations to the system, its operations, or the threat environment, as covered in section 10.15.

During the operational phase of the system life cycle, security tends to degrade. Users and operators often discover new methods to intentionally or unintentionally bypass or undermine security, especially if there is a perception that doing so enhances functionality without consequences. Strict adherence to procedures is infrequent, policies become outdated, and system administration errors commonly occur.

Organizations employ three primary approaches to uphold operational assurance:

**1. System Assessment:** An event or ongoing process to evaluate security, with assessments varying in scope from scrutinizing an entire system for authorization purposes to investigating a singular anomalous event.

**2. System Audit:** An independent review of records and activities to assess the adequacy of system controls and ensure compliance with established policies and operational procedures.

**3. System Monitoring:** A process for continuously staying informed about information security, vulnerabilities, and threats to facilitate organizational risk management decisions.

Typically, the more immediate an activity, the more it aligns with the concept of monitoring. This distinction may lead to unnecessary linguistic intricacies, particularly when dealing with system-generated audit trails. Reviewing the audit trail on a daily or weekly basis to identify unauthorized access attempts is commonly seen as monitoring, whereas a retrospective examination spanning several months, such as tracing the actions of a specific user, is generally labeled as an audit. Despite these distinctions, the specific terminology applied to assurance-related activities is of lesser significance compared to the practical efforts involved in actively upholding operational assurance.

## 7.3.1 Security and Privacy Control Assessments:

Evaluations can appraise the effectiveness of a system in terms of its construction, implementation, or operation. These assessments are applicable across various stages, including the development cycle, post-installation, and throughout the operational phase of the system. Evaluation methods encompass interviews, examinations, and testing. Common testing approaches include functional testing, assessing whether a given function aligns with its requirements, and penetration testing, examining the system's resistance to security breaches. The spectrum of these techniques ranges from executing diverse test cases to conducting in-depth studies employing metrics, automated tools, or comprehensive test cases. Refer to NIST SP 800-53A for guidance on conducting assessments.

## 7.3.2 Audit Approaches and Tools:

Audits conducted to enhance operational assurance aim to assess whether the system aligns with explicitly stated or implied security requirements and adheres to organizational policies as well as system policies. While some audits also evaluate the suitability of security requirements, this aspect is typically outside the scope of operational assurance (as referenced in section 10.15). Informal audits are often referred to as security reviews.

These audits can be self-administered or independent, indicating they may be conducted internally or externally. Both types provide valuable insights into technical, procedural, managerial, and other aspects of security. The primary distinction between the two lies in objectivity.. Self-audits or assessments carried out by the system management staff inherently involve a conflict of interest, as these individuals may be disinclined to report design flaws or operational shortcomings. However, they may be driven by a genuine intent to enhance system security and possess in-depth knowledge about the system, enabling them to uncover latent issues.

Conversely, an independent auditor has no professional vested interest in the system. An individual conducting an independent audit maintains organizational independence and is not constrained by personal or external influences that could compromise their objectivity. Independent audits often adhere to generally accepted auditing standards and may be executed by a professional audit team.

Various methods and tools can be employed in the auditing process, with some of them described below

### 7.3.2.1 Automated Tools:

Even for modest multiuser systems, the manual scrutiny of security features can demand substantial resources. Automated tools offer a viable solution, making it possible to assess even extensive systems for various security vulnerabilities.

There are two primary categories of automated tools: (1) active tools, which identify vulnerabilities by attempting to exploit them; and (2) passive tests, which solely analyze the system and deduce the existence of issues from its state.

Automated tools play a crucial role in uncovering diverse threats and vulnerabilities, including improper access controls, weak passwords, lapses in system software integrity, and failure to implement all pertinent software updates and patches. These tools are often highly effective in identifying vulnerabilities and, regrettably, are sometimes employed by malicious actors to compromise systems. Leveraging these tools provides system administrators with a proactive stance. Many of these tools boast user-friendly interfaces, yet certain programs, such as access-control auditing tools for large mainframe systems, necessitate specialized skills for effective utilization and interpretation.

### 7.3.2.2 Internal Controls Audit:

An auditor has the responsibility to assess the effectiveness of controls in operation by reviewing both system-based and non-system-based controls. This examination involves employing various techniques such as inquiry, observation, and testing, which encompass scrutinizing both the data and the controls themselves. The audit process is not only focused on evaluating control efficacy but also on identifying potential issues, including illegal activities, errors, irregularities, or instances of non-compliance with laws and regulations. Additionally, the use of tools like System Security Plans and penetration testing, as discussed below, may be incorporated into the audit methodology.

### 7.3.2.3 Utilizing the System Security Plan (SSP):

The System Security Plan (SSP) functions as a comprehensive document that outlines the implementation details against which a system audit can be conducted. As detailed in section 10.12, this plan provides essential insights into critical security considerations for a system, covering management, operational, and technical aspects. One notable advantage of incorporating an SSP is its capacity to capture the unique security environment of the system, steering away from a generic list of controls.

Security control sets, encompassing national or organizational security policies and practices (commonly known as baselines), can be derived from the SSP. The SSP also serves historical purposes and, in instances involving system interconnection, may need to be shared with other organizations.

Baselines play a pivotal role as the foundational point for selecting security controls for systems. Three security control baselines are established for low-impact, moderate-impact, and high-impact systems, utilizing the high-water mark defined in FIPS 200 to establish an initial set of security controls for each impact level. After selecting a security control baseline, organizations refer to the tailoring guidance in NIST SP 800-53. This guidance assists in either removing controls from the baseline (with a risk-based justification) or adding compensating or supplementary controls to enhance the security posture of a specific system.

### 7.3.2.4 Penetration Testing:

Penetration testing employs various methods to simulate a system break-in. In addition to the utilization of active automated tools, as previously explained, penetration testing can also be conducted manually. The most effective form of penetration testing involves employing methods that could realistically be used against the system. In the case of hosts on the Internet, this would invariably encompass the use of automated tools. Many systems exhibit vulnerabilities due to lax procedures or a lack of internal controls on applications, making them prime targets for penetration testing. Another avenue explored in penetration testing is social engineering, which entails manipulating users or administrators to disclose information about systems, including their passwords.

### 7.3.3 Surveillance Techniques and Tools:

Security monitoring constitutes a continuous process aimed at identifying vulnerabilities and security issues within a system. Numerous methods employed in this practice share similarities with those used in audits but differ in frequency. In many cases, security monitoring is conducted more regularly, and with the aid of automated tools, some aspects can be addressed in real-time. This ongoing vigilance ensures a proactive approach to identifying and addressing potential security threats and weaknesses within the system.

### 7.3.3.1 Examination of System Logs:

Regularly reviewing system-generated logs or employing automated tools to analyze them is a critical practice for identifying security issues. This includes detecting attempts to surpass access authority or gain system access during unconventional hours (refer to section 10.15). This systematic review ensures timely identification of potential security threats and anomalies within the system.

### 7.3.3.2 Automated Tools:

Various automated tools are designed to monitor systems for security issues, and here are some examples:

1. **Malicious Code Scanners:** These tools are commonly used to identify infections caused by malicious code. They specifically test for the presence of malicious code within executable program files.

2. **Checksum Functions:** These functions generate a mathematical value to detect changes in data based on file contents. By comparing the generated checksum with a previously recorded value, the integrity of a file can be verified. While checksums can identify malicious code, accidental file changes, and other alterations, they may be susceptible to covert replacement by a system intruder. Digital signatures, offering broader protection against intentional file changes, can also be employed for file integrity verification.

3. **Password Strength Checkers:** These tools evaluate passwords against dictionaries, which may include both standard and specialized lists with easily guessable passwords. Additionally, they check if passwords are common permutations of the user ID. Specialized entries might include names of regional sports teams and stars, while common permutations could involve the user ID spelled backward or the addition of numbers or special characters to common passwords.

4. **Integrity Verification Programs:** These programs are utilized by applications to identify evidence of data tampering, errors, and omissions. Techniques involve consistency and reasonableness checks, validation during data entry and processing, and comparing data elements against expected values or ranges. Integrity verification programs play a crucial role in assuring individuals that inappropriate actions, whether accidental or intentional, will be detected. Many of these programs rely on logging individual user activities.

5. **Host-Based Intrusion Detection Systems:** These systems analyze the system audit trail to identify potentially unauthorized activities, particularly focusing on logons, connections, operating system calls, and various command parameters. Detailed information on intrusion detection is covered in sections 10.1 and 10.3.

**6. System Performance Monitoring:** This type of monitoring involves real-time analysis of system performance logs to identify availability problems, active attacks, system and network slowdowns, and crashes.

### 7.3.3.3 Configuration Management:

Configuration management serves to assure that the operational system is aligned with organizational needs and standards. It ensures that any proposed changes undergo a security review and are approved by management before implementation. The objective of configuration management is to facilitate changes in a controlled environment, preventing unintentional harm to any of the system's properties, including its security. In certain organizations, especially those with extensive systems like the Federal Government, a configuration control board is employed for configuration management. The involvement of an information security expert is crucial when such a board exists.

Recognizing that changes to the system can impact security, organizations need to consider potential vulnerabilities introduced or mitigated by these changes. Additionally, updates to the contingency plan, risk analysis, or authorization may be necessary in response to system modifications. For a more detailed understanding of configuration management, refer to section 10.5.

### 7.3.3.4 External Information Sources:

In addition to internal system monitoring, staying informed through external sources proves invaluable. External outlets, including trade literature in both print and electronic formats, offer valuable insights into security vulnerabilities, patches, and other factors influencing security. The Forum of Incident Response Teams (FIRST) oversees an electronic mailing list disseminating information on threats, vulnerabilities, and patches.

The United States Computer Emergency Readiness Team (US-CERT), a component of the Department of Homeland Security (DHS), takes a leading role in responding to major incidents, analyzing threats, and sharing essential cybersecurity information with trusted global partners. Furthermore, Information Sharing and Analysis Centers (ISACs) play a crucial role in disseminating sector-specific information related to both physical and cyber threats, along with mitigation strategies, to maintain sector-wide situational awareness.

## 7.4 Interdependencies:

Assurance remains a critical consideration for every control and safeguard covered in this publication. It is essential to highlight that assurance extends beyond technical controls to encompass operational controls. While this chapter predominantly addressed systems assurance, it is equally crucial to ensure the proper functioning of management controls. Questions about the currency of user IDs and access privileges, the thoroughness of contingency plan testing, the integrity of the audit trail, the effectiveness of the security program, and adherence to policies all contribute to the broader assurance perspective. As emphasized in the introduction to this chapter, the need for assurance is more pervasive than commonly recognized.

The connection between assurance and security planning in the system life cycle is significant. Systems can be strategically designed to facilitate various types of testing aligned with specified security requirements. Early planning for such testing not only enhances assurance but also contributes to cost reduction. Certain aspects of assurance are unattainable without meticulous planning.

## 7.5 Cost Considerations:

Diverse strategies are available to confirm the proper functioning of security features. As assurance methods predominantly embody qualitative attributes rather than quantitative measures, they necessitate comprehensive evaluation. The pursuit of assurance can incur substantial costs, especially when comprehensive testing is integral to the process. Evaluating the attained level of assurance vis-à-vis the associated costs becomes pivotal in making well-informed, value-driven decisions. Personnel costs typically play a substantial role in the overall cost of assurance. Meanwhile, automated tools, while often specialized in addressing specific issues, emerge as a more cost-effective alternative within the realm of security testing. Their efficiency lies in their ability to streamline processes and focus on targeted security concerns, contributing to a balanced cost-benefit equation.