



IMPORTANT

CyberFundamentals 2023

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● INTRODUCTION



The **CyberFundamentals Framework** is a set of concrete measures to:

- protect data,
- significantly reduce the risk of the most common cyberattacks,
- increase an organisation's cyber resilience.

The requirements and guidance are complemented with the relevant insights included in the NIST/CSF framework, ISO 27001/ISO 27002, IEC 62443 and the CIS Critical security Controls (ETSI TR 103 305-1).

The coding of the requirements corresponds with the codes used in the NIST CSF Framework. Since not all NIST CSF requirements are applicable, some codes that do exist in the NIST CSF framework may be missing.

The framework and the proportional approach of the assurance levels are validated by practitioners in the field and by using anonymised real-world cyberattack information provided by the federal Cyber Emergency Response Team (CERT.be - the operational service of the Centre for Cybersecurity Belgium).

The **CyberFundamentals Framework** is built around five core functions: identify, protect, detect, respond, and recover. Regardless of the organisation and industry, these functions make it possible to promote communication around cybersecurity among technical practitioners and stakeholders alike, so that cyber-related risks can be incorporated into the overall risk management strategy of the organisation.

Identify

Being aware of important cyber threats to your most valuable assets. Essentially, you can't protect what you don't know exists. This function helps develop an organisational understanding of how to manage cybersecurity risks related to systems, people, assets, data, and capabilities.

Protect

The protect function focuses on developing and implementing the safeguards necessary to mitigate or contain a cyber risk.

Detect

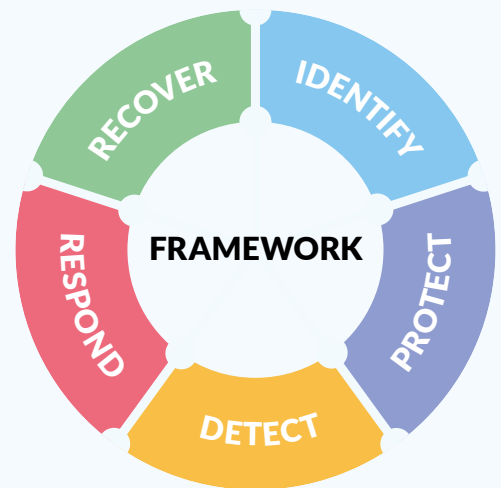
The purpose of the Detect function is to ensure the timely detection of cybersecurity events.

Respond

The Respond function is all about the controls that help respond to cybersecurity incidents. The Respond function supports the ability to contain the impact of a potential cybersecurity incident.

Recover

The Recover function focuses on those safeguards that help maintain resilience and restore services that have been affected by a cybersecurity incident.



To respond to the severity of the threat an organisation is exposed to, and in addition to the starting level **Small**, three assurance levels are also provided: **Basic**, **Important** and **Essential**.

The **starting level Small** allows an organisation to make an initial assessment. It is intended for micro-organisations or organisations with limited technical knowledge.

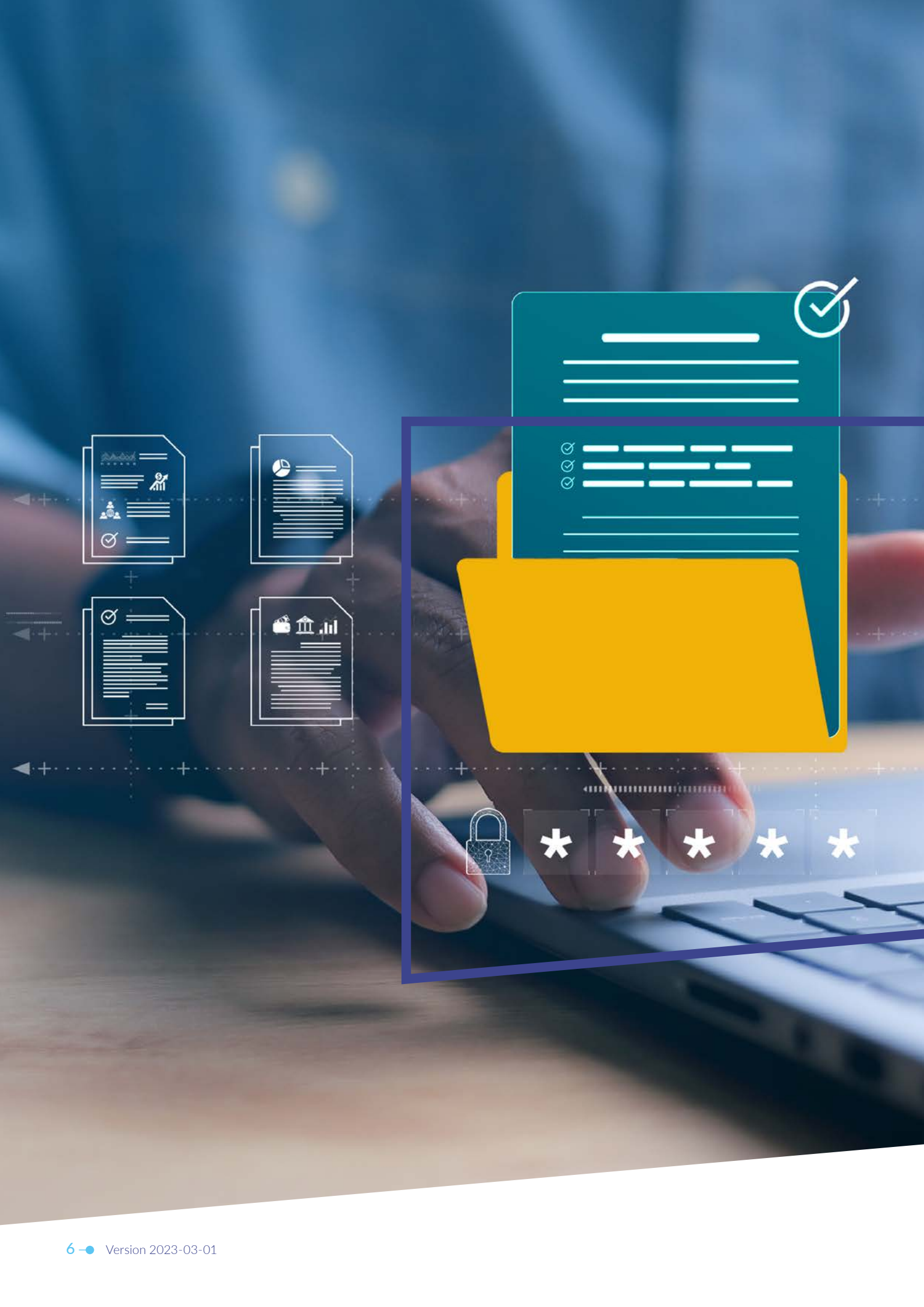
The **assurance level Basic** contains the standard information security measures for all enterprises. These provide an effective security value that includes technology and processes that are generally already available. Where justified, the measures are tailored and refined.

Building on the Basic level, security measures are supplemented to protect organisations from increased cyber risks and thereby achieve a higher level of assurance.

The **assurance level Important** is designed to minimise known cybersecurity risks and the risks of targeted cyberattacks by actors with common skills and resources.

Several controls require particular attention; These measures are labelled as **key measure** .

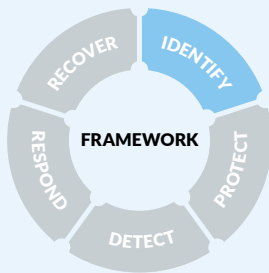
The framework is a living document and will continue to be updated and improved in response to the feedback received from stakeholders, the evolving risk of specific cybersecurity threats, the availability of technical solutions and progressive insight.



IDENTIFY



Identify



The data, personnel, devices, systems, and facilities that enable the organisation to achieve business purposes are identified and managed consistent with their relative importance to organisational objectives and the organisation's risk strategy.



ID.AM-1 Physical devices and systems used within the organisation are inventoried.

An inventory of assets associated with information and information processing facilities within the organisation shall be documented, reviewed, and updated when changes occur.

Guidance

- This inventory includes fixed and portable computers, tablets, mobile phones, Programmable Logic Controllers (PLCs), sensors, actuators, robots, machine tools, firmware, network switches, routers, power supplies, and other networked components or devices.
- This inventory must include all assets, whether or not they are connected to the organisation's network.
- The use of an IT asset management tool could be considered.

The inventory of assets associated with information and information processing facilities shall reflect changes in the organisation's context and include all information necessary for effective accountability.

Guidance

- Inventory specifications include for example, the manufacturer, device type, model, serial number, machine names and network addresses, physical location...
- Accountability is the obligation to explain, justify, and take responsibility for one's actions. It implies answerability for the outcome of the task or process.
- Changes include the decommissioning of material.

When unauthorised hardware is detected, it shall be quarantined for possible exception handling, removed, or replaced, and the inventory shall be updated accordingly.

Guidance

- Any unsupported hardware without a documented exception, is designated as unauthorised.
- Unauthorised hardware can be detected during inventory, requests for support by the user or other means.



ID.AM-2 Software platforms and applications used within the organisation are inventoried.

An inventory that reflects what software platforms and applications are being used in the organisation shall be documented, reviewed, and updated when changes occur.

Guidance

- This inventory includes software programs, software platforms and databases, even if outsourced (SaaS).
- Outsourcing arrangements should be part of the contractual agreements with the provider.
- Information in the inventory should include for example: name, description, version, number of users, data processed, etc.
- A distinction should be made between unsupported software and unauthorised software.
- The use of an IT asset management tool could be considered.

The inventory of software platforms and applications associated with information and information processing shall reflect changes in the organisation's context and include all information necessary for effective accountability.

Guidance

The inventory of software platforms and applications should include the title, publisher, initial install/use date, and business purpose for each entry; where appropriate, include the Uniform Resource Locator (URL), app store(s), version(s), deployment mechanism, and decommission date.

Individuals who are responsible and who are accountable for administering software platforms and applications within the organisation shall be identified.

Guidance

There are no additional guidelines.

When unauthorised software is detected, it shall be quarantined for possible exception handling, removed, or replaced, and the inventory shall be updated accordingly.

Guidance

- Any unsupported software without an exception documentation, is designated as unauthorised.
- Unauthorised software can be detected during inventory, requests for support by the user or other means.



ID.AM-3 Organisational communication and data flows are mapped.

Information that the organisation stores and uses shall be identified.

Guidance

- Start by listing all the types of information your business stores or uses. Define “information type” in any useful way that makes sense to your business. You may want to have your employees make a list of all the information they use in their regular activities. List everything you can think of, but you do not need to be too specific. For example, you may keep customer names and email addresses, receipts for raw material, your banking information, or other proprietary information.
- Consider mapping this information with the associated assets identified in the inventories of physical devices, systems, software platforms and applications used within the organisation (see ID.AM-1 & ID.AM-2).

All connections within the organisation's ICT/OT environment, and to other organisation-internal platforms shall be mapped, documented, approved, and updated as appropriate.

Guidance

- Connection information includes, for example, the interface characteristics, data characteristics, ports, protocols, addresses, description of the data, security requirements, and the nature of the connection.
- Configuration management can be used as supporting asset.
- This documentation should not be stored only on the network it represents.
- Consider keeping a copy of this documentation in a safe offline environment (e.g. offline hard disk, paper hardcopy, ...)

ID.AM-4 External information systems are catalogued.

The organisation shall map, document, authorise and when changes occur, update, all external services and the connections made with them.

Guidance

- The outsourcing of systems, software platforms and applications used within the organisation is covered in ID.AM-1 & ID.AM-2
- External information systems are systems or components of systems for which organisations typically have no direct supervision and authority over the application of security requirements and controls, or the determination of the effectiveness of implemented controls on those systems i.e., services that are run in cloud, SaaS, hosting or other external environments, API (Application Programming Interface)...
- Mapping external services and the connections made to them and authorising them in advance avoids wasting unnecessary resources investigating a supposedly non-authenticated connection to external systems.

ID.AM-5 Resources are prioritised based on their classification, criticality, and business value.

The organisation's resources (hardware, devices, data, time, personnel, information, and software) shall be prioritised based on their classification, criticality, and business value.

Guidance

- Determine the organisation's resources (e.g. hardware, devices, data, time, personnel, information, and software):
 - What would happen to my business if these resources were made public, damaged or lost...?
 - What would happen to my business when the integrity of resources is no longer guaranteed?
 - What would happen to my business if I/my customers couldn't access these resources? You should also rank these resources based on their classification, criticality, and business value.
- Resources should include enterprise assets.
- Create a classification for sensitive information by first determining categories, e.g.
 - Public - freely accessible to all, even externally
 - Internal - accessible only to members of your organisation
 - Confidential - accessible only to those whose duties require access.
- Communicate these categories and identify what types of data fall into these categories (HR data, financial data, legal data, personal data, etc.).
- Consider the use of the Traffic Light Protocol (TLP).
- Data classification should apply to the three aspects: C-I-A.



ID.AM-6

Cybersecurity roles, responsibilities, and authorities for the entire workforce and third-party stakeholders are established.

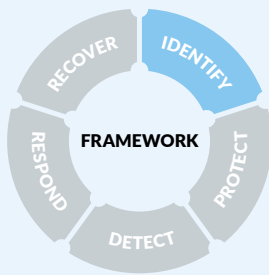


Information security and cybersecurity roles, responsibilities and authorities within the organisation shall be documented, reviewed, authorised, and updated and alignment with organisation-internal roles and external partners.

Guidance

You should consider working through the following tasks:

- Describe security roles, responsibilities, and authorities: who in your organisation should be consulted, informed, and held accountable for all or part of your assets.
- Provide security roles, responsibilities, and authority for all key functions in information/cybersecurity (legal, detection activities...).
- Include information/cybersecurity roles and responsibilities for third-party providers (e.g. suppliers, customers, partners) with physical or logical access to the organisation's ICT/OT environment.



The organisation's mission, objectives, stakeholders and activities are understood and prioritised; that information is used to determine cybersecurity roles and responsibilities, and support risk management decisions.

● ID.BE-1 The organisation's role in the supply chain is identified and communicated.

The organisation's role in the supply chain shall be identified, documented, and communicated.

Guidance

- The organisation should be able to clearly identify who is upstream and downstream of the organisation and which suppliers provide services, capabilities, products and items to the organisation.
- The organisation should communicate its position to its upstream and downstream so that those entities know where they stand in terms of their critical importance to the organisation's operations.

● ID.BE-2 The organisation's place in critical infrastructure and its industry sector is identified and communicated.

The organisation's place in critical infrastructure and its industry sector shall be identified and communicated.

Guidance

The organisation covered by NIS legislation has a responsibility to know the other organisations in the same sector in order to work with them to achieve the objectives set by NIS for that particular sector.

ID.BE-3 Priorities regarding organisational mission, objectives, and activities are established and communicated.

Priorities for organisational mission, objectives, and activities are established and communicated.

Guidance

Information protection needs should be determined, and the related processes revised as necessary.

ID.BE-4 Dependencies and critical functions for delivery of critical services are established.

Dependencies and mission-critical functions for the delivery of critical services shall be identified, documented, and prioritised according to their criticality as part of the risk assessment process.

Guidance

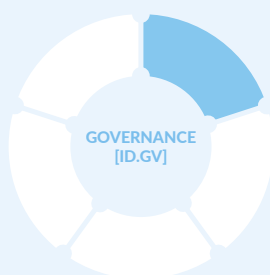
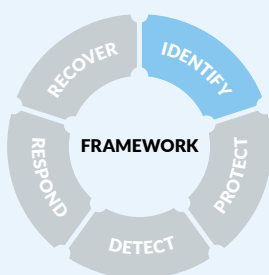
Dependencies and business-critical functions should include support services.

ID.BE-5 Resilience requirements to support delivery of critical services are established for all operating states (e.g. under duress/attack, during recovery, normal operations).

To support cyber resilience and secure the delivery of critical services, the necessary requirements are identified, documented and their implementation tested and approved.

Guidance

- Consider implementing resiliency mechanisms to support normal and adverse operational situations (e.g. failsafe, load balancing, hot swap).
- Consider aspects of business continuity management in the Business Impact Analysis (BIA), Disaster Recovery Plan (DRP) and Business Continuity Plan (BCP), for example.



The policies, procedures, and processes to manage and monitor the organisation's regulatory, legal, risk, environmental, and operational requirements are understood and inform the management of cybersecurity risk.

● ID.GV-1 Organisational cybersecurity policy is established and communicated.

Policies and procedures for information security and cybersecurity shall be created, documented, reviewed, approved, and updated when changes occur.

Guidance

- Policies and procedures used to identify acceptable practices and expectations for business operations can be used to train new employees with regard to your information security expectations, and can aid an investigation in the event of an incident. These policies and procedures should be readily accessible to employees.
- Policies and procedures for information security and cybersecurity should clearly describe your expectations for protecting the organisation's information and systems, and how management expects the company's resources to be used and protected by all employees.
- Policies and procedures should be reviewed and updated at least annually and every time there are changes in the organisation or technology. Whenever the policies are changed, employees should be made aware of the changes.

An organisation-wide information security and cybersecurity policy shall be established, documented, updated when changes occur, disseminated, and approved by senior management.

Guidance

The policy should include, for example:

- The identification and assignment of roles, responsibilities, management commitment, coordination among organisational entities, and compliance. Guidance on role profiles along with their identified titles, missions, tasks, skills, knowledge, competences is available in the "European Cybersecurity Skills Framework Role Profiles" by ENISA. (<https://www.enisa.europa.eu/publications/european-cybersecurity-skills-framework-role-profiles>)
- The coordination among organisational entities responsible for the different aspects of security (i.e., technical, physical, personnel, cyber-physical, information, access control, media protection, vulnerability management, maintenance, monitoring)
- The coverage of the full life cycle of the ICT/OT systems.



ID.GV-3 Legal and regulatory requirements regarding cybersecurity, including privacy and civil liberties obligations, are understood, and managed.

Legal and regulatory requirements regarding information/cybersecurity, including privacy obligations, shall be understood, and implemented.

Guidance

No additional Guidance on this topic.

Legal and regulatory requirements regarding information/cybersecurity, including privacy obligations, shall be managed.

Guidance

- There should be regular reviews to ensure the continuous compliance with legal and regulatory requirements regarding information/cybersecurity, including privacy obligations.
- This requirement also applies to contractors and service providers.



ID.GV-4

Governance and risk management processes address cybersecurity risks.

As part of the company's overall risk management, a comprehensive strategy to manage information security and cybersecurity risks shall be developed and updated when changes occur.

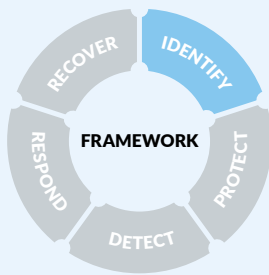
Guidance

This strategy should include determining and allocating the required resources to protect the organisation's business-critical assets.

Information security and cybersecurity risks shall be documented, formally approved, and updated when changes occur.

Guidance

Consider using Risk Management tools.



The organisation understands the cybersecurity risk to organisational operations (including mission, functions, image, or reputation), organisational assets, and individuals.

ID.RA-1 Asset vulnerabilities are identified and documented.

Threats and vulnerabilities shall be identified.

Guidance

- A vulnerability refers to a weakness in the organisation's hardware, software, or procedures. It is a gap through which a bad actor can gain access to the organisation's assets. A vulnerability exposes an organisation to threats.
- A threat is a malicious or negative event that takes advantage of a vulnerability.
- The risk is the potential for loss and damage when the threat does occur.

A process shall be established to monitor, identify, and document vulnerabilities of the organisation's business-critical systems in a continuous manner.

Guidance

- Wherever safe and feasible, the use of vulnerability scanning should be considered.
- The organisation should establish and maintain a testing program appropriate to its size, complexity, and maturity.

ID.RA-2 Cyber threat intelligence is received from information sharing forums and sources.

A threat and vulnerability awareness programme that includes a cross-organisation information-sharing capability shall be implemented.

Guidance

A threat and vulnerability awareness programme should include ongoing contact with security groups and associations in order to receive security alerts and advisories. (Security groups and associations include, for example, special interest groups, forums, professional associations, news groups, and/or peer groups of security professionals in similar organisations). This contact can include the sharing of information about potential vulnerabilities and incidents. This sharing capability should include a facility to share unclassified and classified information.

ID.RA-5 Threats, vulnerabilities, likelihoods, and impacts are used to determine risk.

The organisation shall conduct risk assessments in which risk is determined by threats, vulnerabilities and impact on business processes and assets.

Guidance

- Keep in mind that threats exploit vulnerabilities.
- Identify the consequences that losses of confidentiality, integrity and availability may have on the assets and related business processes.

The organisation shall conduct and document risk assessments in which risk is determined by threats, vulnerabilities, impact on business processes and assets, and the likelihood of their occurrence.

Guidance

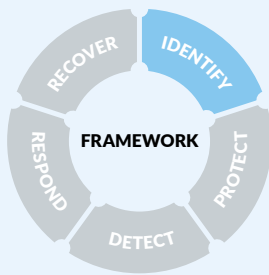
- Risk assessment should include threats from insiders and external parties.
- Qualitative and/or quantitative risk analysis methods (MAPGOOD, ISO27005, CIS RAM, ...) can be used together with software tooling.

ID.RA-6 Risk responses are identified and prioritised.

A comprehensive strategy shall be developed and implemented to manage risks to the organisation's critical systems, that includes the identification and prioritisation of risk responses.

Guidance

- Management and employees should be involved in information security and cybersecurity.
- It should be identified what the most important assets are, and how they are protected.
- It should be clear what impact will be if these assets are compromised.
- It should be established how the implementation of adequate mitigation measures will be organised.



The organisation's priorities, constraints, risk tolerances, and assumptions are established and used to support operational risk decisions.

● ID.RM-1 Risk management processes are established, managed, and agreed to by organisational stakeholders.

A cyber risk management process that identifies key internal and external stakeholders and facilitates addressing risk-related issues and information shall be created, documented, reviewed, approved, and updated when changes occur.

Guidance

External stakeholders include customers, investors, shareholders, suppliers, government agencies and the wider community.

● ID.RM-2 Organisational risk tolerance is determined and clearly expressed.

The organisation shall clearly determine its risk appetite.

Guidance

The determination and expression of risk tolerance (risk appetite) should be in line with the policies on information security and cybersecurity, as this will make it easier to demonstrate coherence between policies, risk tolerance and measures.

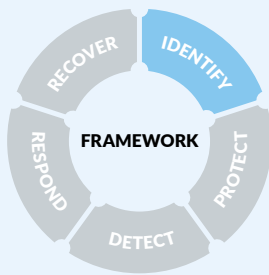
● ID.RM-3 The organisation's determination of risk tolerance is informed by its role in critical infrastructure and sector specific risk analysis.

The organisation's role in critical infrastructure and its sector shall determine the organisation's risk appetite.

Guidance

No additional Guidance on this topic.





The organisation's priorities, constraints, risk tolerances, and assumptions are established and used to support risk decisions associated with managing supply chain risk. The organisation has established and implemented the processes to identify, assess and manage supply chain risks.

ID.SC-2 Suppliers and third-party partners of information systems, components, and services are identified, prioritised, and assessed using a cyber supply chain risk assessment process.

The organisation shall conduct cyber supply chain risk assessments at least annually or when a change to the organisation's critical systems, operational environment, or supply chain occurs; These assessments shall be documented, and the results disseminated to relevant stakeholders including those responsible for ICT/OT systems.

Guidance

This assessment should identify and prioritise potential negative impacts to the organisation from the risks associated with the distributed and interconnected nature of ICT/OT product and service supply chains.

ID.SC-3 Contracts with suppliers and third-party partners are used to implement appropriate measures designed to meet the objectives of an organisation's cybersecurity program and Cyber Supply Chain Risk Management Plan.

Based on the results of the cyber supply chain risk assessment, a contractual framework for suppliers and external partners shall be established to address sharing of sensitive information and distributed and interconnected ICT/OT products and services.

Guidance

- Entities not subject to the NIS legislation should consider business-critical suppliers and third-party partners only.
- Keep in mind that GDPR requirements need to be fulfilled whenever business information contains personal data (applicable on all levels), i.e. security measures need to be addressed within the contractual framework.

ID.SC-4 Suppliers and third-party partners are routinely assessed using audits, test results, or other forms of evaluations to confirm they are meeting their contractual obligations.

The organisation shall review assessments of suppliers' and third-party partners' compliance with contractual obligations by routinely reviewing audits, test results, and other evaluations.

Guidance

Entities not subject to the **NIS legislation** could limit themselves to business-critical suppliers and third-party partners only.

ID.SC-5 Response and recovery planning and testing are conducted with suppliers and third-party providers.

The organisation shall identify and document key personnel from suppliers and third-party partners to include them as stakeholders in response and recovery planning activities.

Guidance

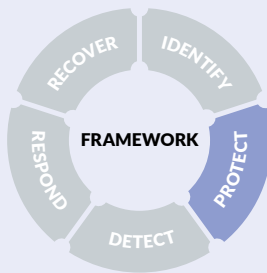
Entities not subject to the **NIS legislation** could limit themselves to business-critical suppliers and third-party partners only.



PROTECT



Protect



Access to physical and logical assets and associated facilities is limited to authorised users, processes, and devices, and is managed consistent with the assessed risk of unauthorised access to authorised activities and transactions.

PR.AC-1 Identities and credentials are issued, managed, verified, revoked, and audited for authorised devices, users, and processes.



Identities and credentials for authorised devices and users shall be managed.

Guidance

Identities and credentials for authorised devices and users could be managed by means of a password policy. A password policy is a set of rules designed to enhance ICT/OT security by encouraging organisations to: (This list is not exhaustive and the measures listed should be considered, as appropriate)

- Change all default passwords.
- Ensure that no-one works with administrator privileges when performing daily tasks.
- Keep a limited and updated list of system administrator accounts.
- Enforce password rules, e.g. passwords must be longer than a state-of-the-art number of characters with a combination of character types and changed periodically or whenever there is any suspicion of compromise.
- Use only individual accounts and never share passwords.
- Immediately disable unused accounts.
- Rights and privileges are managed by user groups.

Identities and credentials for authorised devices and users shall be managed, where feasible through automated mechanisms.

Guidance

- Automated mechanisms can help to support the management and auditing of information system credentials.
- Consider strong user authentication, meaning authentication based on the use of at least two authentication factors from different categories of either knowledge (something only the user knows), possession (something only the user possesses) or inherence (something the user is). These must be independent, in that the breach of one must not compromise the reliability of the others. Strong user authentication must be designed in such a way as to protect the confidentiality of the authentication data.



PR.AC-2 Physical access to assets is managed and protected.

Physical access to the facility, servers and network components shall be managed.

Guidance

- Consider strictly managing keys to access the premises and alarm codes. The following rules should be considered:
 - Always retrieve an employee's keys or badges when they leave the company permanently.
 - Change company alarm codes frequently.
 - Never give keys or alarm codes to external service providers (cleaning agents, etc.), unless it is possible to trace these accesses and technically restrict them to given time slots.
- Consider not leaving internal network access outlets accessible in public areas. These public places include waiting rooms, corridors, for example.

The management of physical access shall include measures related to access in emergency situations.

Guidance

- Physical access controls may include, for example: lists of authorised individuals, identity credentials, escort requirements, guards, fences, turnstiles, locks, the monitoring of facility access, and camera surveillance.
- The following measures should be considered:
 - Implement a badge system and create different security zones.
 - Limit physical access to servers and network components to authorised personnel.
 - Log all access to servers and network components.
- Visitor access records should be maintained, reviewed and acted upon as required.



PR.AC-3 Remote access is managed.

The organisation's wireless access points shall be secured.

Guidance

Consider the following when wireless networking is used:

- Change the administrative password upon installation of a wireless access points.
- Set the wireless access point so that it does not broadcast its Service Set Identifier (SSID).
- Set your router to use at least Wi-Fi Protected Access (WPA-2 or WPA-3 where possible), with the Advanced Encryption Standard (AES) for encryption.
- Ensure that wireless internet access to customers is separated from your business network.
- Connecting to unknown or unsecured / guest wireless access points, should be avoided, and if unavoidable, connection should be made using an encrypted virtual private network (VPN) capability.
- Manage all endpoint devices (fixed and mobile) in accordance with the organisation's security policies.



When accessed remotely, the organisation's networks shall be secured, including through the use of multi-factor authentication (MFA).

Guidance

Enforce MFA (e.g. 2FA) on Internet-facing systems, such as email, remote desktop, and Virtual Private Network (VPNs).



Usage restrictions, connection requirements, implementation Guidance, and authorisations for remote access to the organisation's critical systems environment shall be identified, documented, and implemented.

Guidance

Consider the following:

- Remote access methods include, wireless, broadband, Virtual Private Network (VPN) connections, mobile device connections, and communications through external networks, for example.
- Login credentials should be in line with company's user authentication policies.
- Remote access for support activities or maintenance of organisational assets should be approved, logged, and performed in a manner that prevents unauthorised access.
- The user should be made aware of any remote connection to its device by a visual indication.

Access permissions and authorisations are managed, incorporating the principles of least privilege and separation of duties.



Access permissions for users to the organisation's systems shall be defined and managed.

Guidance

The following should be considered:

- Draw up and review regularly access lists per system (files, servers, software, databases, etc.), possibly through analysis of the Active Directory in Windows-based systems, with the objective of determining who needs what kind of access (privileged or not), and to what, in order to perform their duties in the organisation.
- Set up a separate account for each user (including any contractors needing access) and require strong, unique passwords to be used for each account.
- Ensure that all employees use computer accounts without administrative privileges to perform typical work functions. This includes the separation of personal and admin accounts.
- For guest accounts, consider using the minimal privileges (e.g. internet access only) as required for your business needs.
- Permission management should be documented in a procedure and updated when appropriate.
- Use 'Single Sign On' (SSO) when appropriate.

Where feasible, automated mechanisms shall be implemented to support the management of user accounts on the organisation's critical systems, including disabling, monitoring, reporting and deleting user accounts.

Guidance

Consider separately identifying each person with access to the organisation's critical systems with a username to remove generic and anonymous accounts and access.



It shall be identified who should have access to the organisation's business-critical information and technology and is given the means to obtain access.

Guidance

Means to get access may include: a key, password, code, or administrative privilege.



Employee access to data and information shall be limited to the systems and specific information they need to do their jobs (the principle of Least Privilege).

Guidance

The principle of Least Privilege should be understood as the principle that a security architecture should be designed so that each employee is granted the minimum system resources and authorisations that they need to perform their job role. Consider:

- Not allowing any employee to have access to all the business's information.
- Limiting the number of Internet accesses and interconnections with partner networks to those that are strictly necessary to be able to centralise and homogenise the monitoring of exchanges more easily.
- Ensuring that when an employee leaves the business, all access to the business's information or systems is blocked instantly.

Separation of duties (SoD) shall be ensured in the management of access rights.

Guidance

Separation of duties includes, for example:

- Dividing operational functions and system support functions among different roles.
- Conducting system support functions using different individuals.
- Not allowing a single individual to both initiate and approve a transaction (financial or otherwise).
- Ensuring that security personnel administering access control functions do not also administer audit functions.



Nobody shall have administrator privileges for daily tasks.

Guidance

Consider the following:

- Separate administrator accounts from user accounts.
- Do not privilege user accounts to perform administration tasks.
- Create unique local administrator passwords and disable unused accounts.
- Consider prohibiting Internet browsing from administrative accounts.

Privileged users shall be managed and monitored.

Guidance

No additional Guidance on this topic.



Firewalls shall be installed and activated on all the organisation's networks.

Guidance

Consider the following:

- Install and operate a firewall between your internal network and the Internet. This may be a function of a (wireless) access point/router, or it may be a function of a router provided by the Internet Service Provider (ISP).
- Ensure that anti-virus software has been installed on purchased firewall solutions and ensure that the administrator's log-in and administrative password is changed upon installation and regularly thereafter.
- Install, use, and update a software firewall on each computer system (including smartphones and other networked devices).
- Have firewalls on each of your computers and networks even if you use a cloud service provider or a virtual private network (VPN). Ensure that for teleworking purposes, home networks and systems have hardware and software firewalls installed that are operational, and regularly updated.
- Consider installing an Intrusion Detection / Prevention System (IDPS). These devices analyse network traffic at a more detailed level and can provide a greater level of protection.



Where appropriate, network integrity of the organisation's critical systems shall be protected by incorporating network segmentation and segregation.

Guidance

- Consider creating different security zones in the network (e.g. basic network segmentation through VLAN's or other network access control mechanisms) and control/monitor the traffic between these zones.
- When the network is "flat", the compromise of a vital network component can lead to the compromise of the entire network.



Where appropriate, the network integrity of the organisation's critical systems shall be protected by:

- (1) Identifying, documenting, and controlling connections between system components.**
- (2) Limiting external connections to the organisation's critical systems.**

Guidance

Boundary protection mechanisms include, for example, routers, gateways, unidirectional gateways, data diodes, and firewalls separating system components into logically separate networks or subnetworks.



The organisation shall monitor and control connections and communications at the external boundary and at key internal boundaries within the organisation's critical systems by implementing boundary protection devices where appropriate.

Guidance

Consider implementing the following recommendations:

- Separate your public Wi-Fi network from your business network.
- Protect your business Wi-Fi with state-of-the-art encryption.
- Implement a Network Access Control (NAC) solution.
- Encrypt connections to your corporate network.
- Divide your network according to security levels and apply firewall rules. Isolate your networks for server administration.
- Force VPN on public networks.
- Implement a closed policy for security gateways (deny-all policy: only allow/open connections that have been explicitly pre-authorised).



PR.AC-6 Identities are proofed and bound to credentials and asserted in interactions.

The organisation shall implement documented procedures for verifying the identity of individuals before issuing credentials that provide access to the organisation's systems.

Guidance

No additional Guidance on this topic.

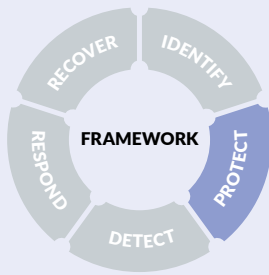


PR.AC-7 Users, devices, and other assets are authenticated (e.g., single-factor, multi-factor) commensurate with the risk of the transaction (e.g., individuals' security and privacy risks and other organisational risks)

The organisation shall perform a documented risk assessment on its critical system transactions and authenticate users, devices, and other assets (e.g. single-factor, multi-factor) commensurate with the risk of the transaction (e.g. individuals' security and privacy risks and other organisational risks).

Guidance

Consider a security-by-design approach for new systems. For existing systems a separate risk assessment should be used.



The organisation's personnel and partners are provided cybersecurity awareness education and are trained to perform their cybersecurity-related duties and responsibilities consistent with related policies, procedures, and agreements.

● PR.AT-1 All users are informed and trained.

Employees shall be trained as appropriate.

Guidance

- Employees include all users and managers of the ICT/OT systems, and they should be trained immediately when hired and regularly thereafter on the subject of the company's information security policies and what they will be expected to do to protect company's business information and technology.
- Training should be continually updated and reinforced by awareness campaigns.

The organisation shall incorporate insider threat recognition and reporting into security awareness training.

Guidance

Consider to:

- Communicate and discuss regularly to ensure that everyone is aware of their responsibilities.
- Develop an outreach programme by gathering in a document the messages you want to convey to your staff (topics, audiences, objectives, etc.) and your communication rhythm on a calendar (weekly, monthly, one-time, etc.). Communicate continuously and in an engaging way, involving management, IT colleagues, the ICT service provider and HR and Communication managers.
- Cover topics such as: recognition of fraud attempts, phishing, management of sensitive information, incidents, etc. The goal is for all employees to understand ways to protect company information.
- Discuss with your management, your ICT colleagues, or your ICT service provider some practice scenarios (e.g. what to do if a virus alert is triggered, if a storm cuts off the power, if data is blocked, if an account is hacked, etc.), determine what behaviours to adopt, document and communicate them to all your staff. The central point of contact in the event of an incident should be known to all.
- Organise a simulation of a scenario to test your knowledge. Consider performing the exercise at least once a year, for example.

PR.AT-2 Privileged users understand their roles and responsibilities.

Privileged users shall be qualified before privileges are granted, and these users shall be able to demonstrate their understanding of their roles, responsibilities, and authorities.

Guidance

No additional Guidance on this topic.

PR.AT-3 Third-party stakeholders (e.g., suppliers, customers, partners) understand their roles and responsibilities.

The organisation shall establish and enforce security requirements for business-critical third-party providers and users.

Guidance

Enforcement should include a requirement that 'third party stakeholder'-users (e.g. suppliers, customers, partners) can demonstrate the understanding of their roles and responsibilities.

Third-party providers shall be required to notify any personnel transfers, termination, or transition involving personnel with physical or logical access to components of the organisation's business-critical systems.

Guidance

Third-party providers include, for example, service providers, contractors, and other organisations providing system development, technology services, outsourced applications, or network and security management.

The organisation shall monitor business-critical service providers and users in relation to security compliance.

Guidance

Third party audit results can be used as audit evidence.



PR.AT-4 Senior executives understand their roles and responsibilities.

Senior executives shall demonstrate an understanding of their roles, responsibilities, and authorities.

Guidance

Guidance on role profiles along with their identified titles, missions, tasks, skills, knowledge, competences is available in the "European Cybersecurity Skills Framework Role Profiles" by ENISA. (<https://www.enisa.europa.eu/publications/european-cybersecurity-skills-framework-role-profiles>)

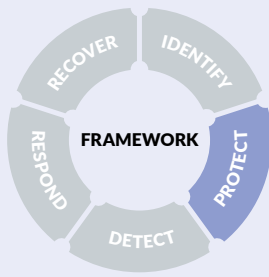


PR.AT-5 Physical security and cybersecurity personnel understand their roles and responsibilities.

The organisation shall ensure that personnel responsible for the physical protection and security of the organisation's critical systems and facilities are qualified through training before privileges are granted, and that they understand their responsibilities.

Guidance

No additional Guidance on this topic.



Information and records (data) are managed consistent with the organisation's risk strategy to protect the confidentiality, integrity, and availability of information.

PR.DS-1 Data-at-rest is protected.

This control is covered by other elements of the framework; no additional requirements are identified.

Guidance

- Consider using encryption techniques for data storage, data transmission or data transport (e.g. laptop, USB).
- Consider encrypting end-user devices and removable media containing sensitive data (e.g. hard disks, laptops, mobile devices, USB storage devices, ...). This could be done using solutions such as Windows BitLocker®, VeraCrypt, Apple FileVault®, Linux® dm-crypt,...
- Consider encrypting sensitive data stored in the cloud.

PR.DS-2 Data-in-transit is protected.

This control is covered by other elements of the framework; no additional requirements are identified.

Guidance

If the organisation frequently sends sensitive documents or e-mails, it is recommended to encrypt those documents and/or e-mails using software tools that are appropriate, supported, and authorised.

**PR.DS-3****Assets are formally managed throughout removal, transfers, and disposition.**

Assets and media shall be disposed of safely.

Guidance

- When eliminating tangible assets such as business computers/laptops, servers, hard drive(s) and other storage media (USB drives, paper...), ensure that all sensitive business or personal data are securely deleted (i.e. electronically “wiped”) before the devices or media themselves are removed and then physically destroyed (or re-commissioned). This is also known as “sanitisation” and therefore relates to the requirement and Guidance in PR.IP-6.
- Consider installing a remote-wiping application on company laptops, tablets, cell phones, and other mobile devices.

The organisation shall enforce accountability for all its business-critical assets throughout the system life cycle, including removal, transfers, and disposition.

Guidance

Accountability should include:

- Authorisation for business-critical assets to enter and exit the facility.
- Monitoring and maintaining documentation related to the movements of business-critical assets.

The organisation shall ensure that the necessary measures are taken to deal with loss, misuse, damage, or theft of assets.

Guidance

This can be done by policies, processes & procedures (reporting), technical & organisational means (encryption, Access Control (AC), Mobile Device Management (MDM), monitoring, secure wipe, awareness, signed user agreement, guidelines & manuals, backups, inventory update ...).

PR.DS-4 Adequate capacity to ensure availability is maintained.

Capacity planning shall ensure adequate resources for the organisation's critical system information processing, networking, telecommunications, and data storage.

Guidance

No additional Guidance on this topic.

Audit data from the organisation's critical systems shall be moved to an alternative system.

Guidance

Be aware that log services can become a bottleneck and can hinder the correct functioning of the source systems.

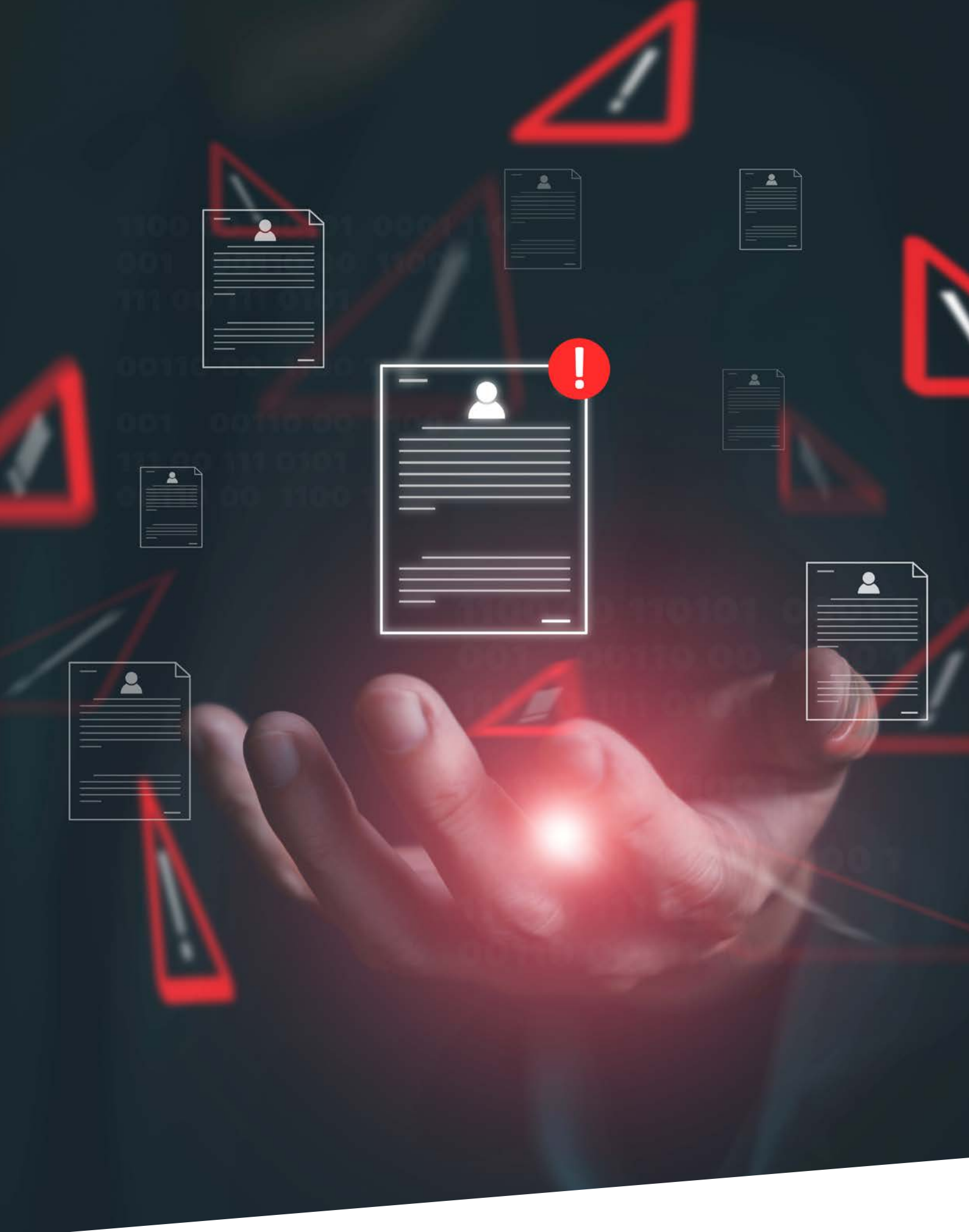
PR.DS-5 Protections against data leaks are implemented.



The organisation shall take appropriate actions resulting in the monitoring of its critical systems at external borders and critical internal points whenever unauthorised access and activities, including data leakage, are detected.

Guidance

- Consider implementing dedicated protection measures (restricted access rights, daily backups, data encryption, installation of firewalls, etc.) for the most sensitive data.
- Consider performing frequent audits of the configuration of the central directory (Active Directory in Windows environment), specifically focusing on the access to data of key persons in the company.



PR.DS-6 Integrity checking mechanisms are used to verify software, firmware, and information integrity.

The organisation shall implement software, firmware, and information integrity checks to detect unauthorised changes to its critical system components during storage, transport, start-up and whenever this is deemed necessary.

Guidance

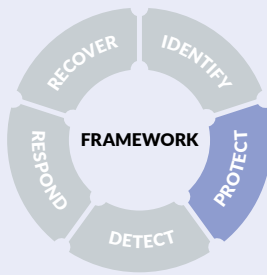
State-of-the-art integrity-checking mechanisms (e.g. parity checks, cyclical redundancy checks, and cryptographic hashes) and associated tools can automatically monitor the integrity of information systems and hosted applications.

PR.DS-7 The development and testing environment(s) are separate from the production environment.

No requirements are identified for the assurance level 'Basic' or 'Important', but guidelines are provided to increase information security.

Guidance

- Any change one wants to make to the ICT/OT environment should first be tested in an environment that is different and separate from the production environment (operational environment), before that change is effectively implemented. That way, the effect of those changes can be analysed and adjustments can be made without disrupting operational activities.
- Consider adding and testing cybersecurity features as early as during development (secure development life cycle principles).



Security policies (that address purpose, scope, roles, responsibilities, management commitment, and coordination among organisational entities), processes, and procedures are maintained and used to manage protection of information systems and assets.

PR.IP-1 A baseline configuration of information technology/industrial control systems is created and maintained incorporating security principles.

1 The organisation shall develop, document, and maintain a baseline configuration for its business-critical systems.

Guidance

- This control includes the concept of least functionality.
- Baseline configurations include for example, information about the organisation's business-critical systems, current version numbers and patch information on operating systems and applications, configuration settings/parameters, network topology, and the logical placement of those components within the system architecture.
- Network topology should include the nerve points of the IT/OT environment (external connections, servers hosting data and/or sensitive functions, DNS services security, etc.).

PR.IP-2 A System Development Life Cycle to manage systems is implemented.

The system and application development life cycle shall include security considerations.

Guidance

- The system and application development life cycle should include the acquisition process of the organisation's business-critical systems and its components.
- Vulnerability awareness and prevention training for (web application) developers, and advanced social engineering awareness training for high-profile roles should be considered.
- When hosting internet-facing applications, the implementation of a web application firewall (WAF) should be considered.

PR.IP-3 Configuration change control processes are in place.

Changes shall be tested and validated before being implemented into operational systems.

Guidance

No additional Guidance on this topic.

PR.IP-4 Backups of information are conducted, maintained, and tested.



Backups for organisation's business-critical data shall be conducted and stored on a system different from the device on which the original data resides.

Guidance

- Examples of data from the organisation's business-critical systems include software, configurations and settings, documentation, system configuration data including computer configuration backups, application configuration backups, etc.
- Consider a regular backup and put it offline periodically.
- Recovery time and recovery point objectives should be considered.
- Consider not storing the organisation's data backup on the same network as the system on which the original data resides and provide an offline copy. Among other things, this prevents file encryption by hackers (risk of ransomware).

The reliability and integrity of backups shall be verified and tested on regular basis.

Guidance

This should include regularly testing of the backup restore procedures.

A separate alternative storage site for system backups shall be operated and the same security safeguards as the primary storage location shall be employed.

Guidance

An offline backup of your data is ideally stored in a separate physical location from the original data source and, where feasible, offsite for extra protection and security.

PR.IP-5 Policy and regulations regarding the physical operating environment for organisational assets are met.

The organisation shall define, implement, and enforce policy and procedures regarding emergency and safety systems, fire protection systems, and environment controls for its critical systems.

Guidance

The measures listed below should be considered:

- Protect unattended computer equipment with padlocks or a locker and key system.
- Fire suppression mechanisms should take the organisation's critical system environment into account (e.g. water sprinkler systems could be hazardous in specific environments).

PR.IP-6 Data is destroyed according to policy.

The organisation shall ensure that data from its critical systems are destroyed in accordance with policy.

Guidance

No additional Guidance on this topic.

PR.IP-7 Protection processes are improved.

The organisation shall incorporate improvements derived from the monitoring, measurements, assessments, and lessons learned into protection process updates (continuous improvement).

Guidance

No additional Guidance on this topic.

PR.IP-8 Effectiveness of protection technologies is shared.

The organisation shall collaborate and share information about security incidents and mitigation measures concerning its critical system with designated partners.

Guidance

No additional Guidance on this topic.

Communication regarding the effectiveness of protection technologies shall be shared with appropriate parties.

Guidance

No additional Guidance on this topic.

The organisation shall implement, where feasible, automated mechanisms to assist in information collaboration.

Guidance

No additional Guidance on this topic.

PR.IP-9 Response plans (Incident Response and Business Continuity) and recovery plans (Incident Recovery and Disaster Recovery) are in place and managed.

Incident response plans (Incident Response and Business Continuity) and recovery plans (Incident Recovery and Disaster Recovery) shall be established, maintained, approved, and tested to determine the effectiveness of the plans, and the readiness to execute the plans.

Guidance

- The incident response plan is the documentation of a predetermined set of instructions or procedures to detect, respond to, and limit consequences of a malicious cyberattack.
- Plans should incorporate recovery objectives, restoration priorities, metrics, contingency roles, personnel assignments and contact information.
- Maintaining essential functions despite system disruption, and the eventual restoration of the organisation's systems, should be addressed.
- Consider defining incident types, resources and management support that are needed to effectively maintain and mature the incident response and contingency capabilities.



PR.IP-11 Cybersecurity is included in human resources practices (deprovisioning, personnel screening...).

Personnel having access to the organisation's most critical information or technology shall be verified.

Guidance

- Access to critical information or technology should be considered when recruiting, during employment and upon termination.
- Background verification checks should take into consideration applicable laws, regulations, and ethics in proportion to the business requirements, the classification of the information to be accessed and the perceived risks.

Develop and maintain a human resource information/cybersecurity process that is applicable when recruiting, during employment and upon termination of employment.

Guidance

The human resource information/cybersecurity process should include access to critical information or technology; background verification checks; code of conduct; roles, authorities, and responsibilities...

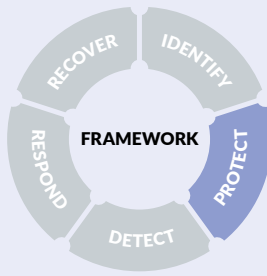


PR.IP-12 A vulnerability management plan is developed and implemented.

The organisation shall establish and maintain a documented process that allows continuous review of vulnerabilities and strategies to mitigate them.

Guidance

- Consider drawing up an inventory of sources likely to report vulnerabilities in the identified components and distribute updates (software publisher websites, CERT website, ENISA website).
- The organisation should identify where the vulnerabilities of its critical systems may be exposed to adversaries.



Maintenance and repair of industrial control and information system components are performed consistent with policies and procedures.

PR.MA-1 Maintenance and repair of organisational assets are performed and logged, with approved and controlled tools.

1 Patches and security updates for Operating Systems and critical system components shall be installed.

Guidance

The following should be considered:

- Only install those applications (operating systems, firmware, or plugins) that you need to run your business and patch/update them regularly.
- You should only install a current and vendor-supported version of software you choose to use. It may be useful to assign a day each month to check for patches.
- There are products that can scan your system and notify you when there is an update for an application you have installed. If you use one of these products, make sure it checks for updates for every application you use.
- Install patches and security updates in a timely manner.

The organisation shall plan, perform, and document preventive maintenance and repairs on its critical system components in accordance with approved processes and tools.

Guidance

Consider the measures listed below:

- Perform security updates on all software in a timely manner.
- Automate the update process and audit its effectiveness.
- Introduce an internal patching culture on desktops, mobile devices, servers, network components, etc. to ensure updates are tracked.

The organisation shall enforce requirements for the approval, control, and monitoring of maintenance tools for use on its critical systems.

Guidance

Maintenance tools can include hardware/software diagnostic test equipment, hardware/software packet sniffers and laptops

The organisation shall verify security controls following hardware maintenance or repairs and take action as appropriate.

Guidance

No additional Guidance on this topic.



PR.MA-2 Remote maintenance of organisational assets is approved, logged and performed in a manner that prevents unauthorised access.

Remote maintenance shall only occur after prior approval, shall be monitored to avoid unauthorised access and the outcome of the maintenance activities shall be approved as described in approved processes or procedures.

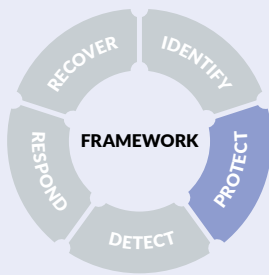
Guidance

No additional Guidance on this topic.

The organisation shall make sure that strong authenticators, record keeping, and session termination for remote maintenance are implemented.

Guidance

No additional Guidance on this topic.



Technical security solutions are managed to ensure the security and resilience of systems and assets, consistent with related policies, procedures, and agreements.

● **PR.PT-1 Audit/log records are determined, documented, implemented, and reviewed in accordance with policy.**

1 Logs shall be maintained, documented, and reviewed.

Guidance

- Ensure the activity logging functionality of protection/detection hardware or software (e.g. firewalls, anti-virus) is enabled.
- Logs should be backed up and saved for a predefined period (see also PR.DS-4).
- The logs should be reviewed for any unusual or unwanted trends, such as a large use of social media websites or an unusual number of viruses consistently found on a particular computer. These trends may indicate a more serious problem or signal the need for stronger protections in a particular area.

The organisation shall ensure that the log records include an authoritative time source or internal clock time stamp that are compared and synchronised to an authoritative time source.

Guidance

Authoritative time sources include for example, an internal Network Time Protocol (NTP) server, a radio clock, an atomic clock, and a GPS time source.

● **PR.PT-2 Removable media is protected, and its use restricted according to policy.**

The usage restriction of portable storage devices shall be ensured by means of an appropriate, documented policy and supporting safeguards.

Guidance

No additional Guidance on this topic.



The organisation should technically prohibit the connection of removable media unless strictly necessary; in other instances, the execution of autoruns from such media should be disabled.

Guidance

No additional Guidance on this topic.

PR.PT-3 The principle of least functionality is incorporated by configuring systems to provide only essential capabilities.

The organisation shall configure the business-critical systems to provide only essential capabilities.

Guidance

Consider applying the principle of least functionality to access systems and assets (see also PR.AC-4).

PR.PT-4 Communications and control networks are protected.

Web and e-mail filters shall be installed and used.

Guidance

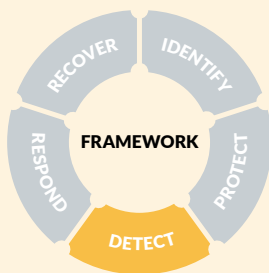
- E-mail filters should detect malicious e-mails, and filtering should be configured based on the type of message attachments so that files of the specified types are automatically processed (e.g. deleted).
- Web-filters should notify the user if a website may contain malware and potentially prevent users from accessing that website.



DETECT



Detect



Anomalous activity is detected, and the potential impact of events is understood.

DE.AE-2 Detected events are analysed to understand attack targets and methods.

The organisation shall review and analyse detected events to understand attack targets and methods.

Guidance

No additional Guidance on this topic.

DE.AE-3 Event data are collected and correlated from multiple sources and sensors.



The activity logging functionality of protection/detection hardware or software (e.g. firewalls, anti-virus) shall be enabled, backed up and reviewed.

Guidance

- Logs should be backed up and saved for a predefined period.
- The logs should be reviewed to identify any unusual or unwanted trends, such as a heavy use of social media websites or an unusual number of viruses consistently found on a particular computer. These trends may indicate a more serious problem or signal the need for stronger protections in a particular area. See also PR.PT-1.



The organisation shall ensure that event data are compiled and correlated across its critical systems using various sources such as event reports, audit monitoring, network monitoring, physical access monitoring, and user/administrator reports.

Guidance

No additional Guidance on this topic.



DE.AE-5 Incident alert thresholds are established.

The organisation shall implement automated mechanisms and system-generated alerts to support event detection and to assist in the identification of security alert thresholds.

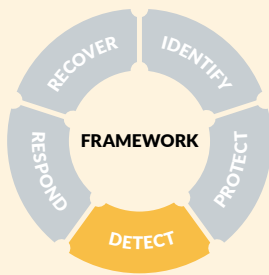
Guidance

No additional Guidance on this topic.

The organisation shall define incident alert thresholds.

Guidance

No additional Guidance on this topic.



The information system and assets are monitored to identify cybersecurity events and verify the effectiveness of protective measures.

DE.CM-1 The network is monitored to detect potential cybersecurity events.

Firewalls shall be installed and operated on the network boundaries and completed with fire-wall protection on the endpoints.

Guidance

- Endpoints include desktops, laptops, servers...
- Consider, where feasible, including smartphones and other networked devices when installing and operating firewalls.
- Consider limiting the number of interconnection gateways to the Internet.



The organisation shall monitor and identify unauthorised use of its business-critical systems by detecting unauthorised local connections, network connections and remote connections.

Guidance

- Monitoring of network communications should happen at the external boundary of the organisation's business-critical systems and at key internal boundaries within the systems.
- When hosting internet-facing applications, the implementation of a web application firewall (WAF) should be considered.

DE.CM-2 The physical environment is monitored to detect potential cybersecurity events.

The physical environment of the facility shall be monitored for potential information/cybersecurity events.

Guidance

No additional Guidance on this topic.

DE.CM-3 Personnel activity is monitored to detect potential cybersecurity events.

Endpoint and network protection tools to monitor end-user behaviour for dangerous activity shall be implemented.

Guidance

Consider deploying an Intrusion Detection/Prevention system (IDS/IPS).

Endpoint and network protection tools that monitor end-user behaviour for dangerous activity shall be managed.

Guidance

Consider using a centralised logging platform for the consolidation and exploitation of log files.

Software usage and installation restrictions shall be enforced.

Guidance

Only authorised software should be used, and user access rights should be limited to the specific data, resources and applications needed to complete a required task (least privilege principle).

DE.CM-4 Malicious code is detected.



Anti-virus, -spyware, and other -malware programs shall be installed and updated.

Guidance

- Malware includes viruses, spyware, and ransomware and should be countered by installing, using, and regularly updating anti-virus and anti-spyware software on every device used in the company's business (including computers, smartphones, tablets, and servers).
- Anti-virus and anti-spyware software should automatically check for updates in "real-time" or at least daily, followed by system scanning as appropriate.
- Organisations should consider providing the same malicious code protection mechanisms for home computers (e.g. for teleworking purposes) or for personal devices that are used to perform work of a professional nature (Bring Your Own Device" - BYOD).

DE.CM-5 Unauthorised mobile code is detected.

The organisation shall define acceptable and unacceptable mobile code and mobile code technologies and authorise, monitor, and control the use of mobile code within the system.

Guidance

- Mobile code includes any program, application, or content that can be transmitted across a network (e.g. embedded in an email, document, or website) and executed on a remote system. Mobile code technologies include items such as Java applets, JavaScript, HTML5, WebGL, and VBScript.
- Decisions regarding the use of mobile code in organisational systems should be based on the potential for the code to cause damage to the systems if used maliciously. Usage restrictions and implementation Guidance should apply to the selection and use of mobile code installed.

DE.CM-6 External service provider activity is monitored to detect potential cybersecurity events.

All external connections by vendors supporting IT/OT applications or infrastructure shall be secured and actively monitored to ensure that only permissible actions occur during the connection.

Guidance

This monitoring includes access by unauthorised personnel, and unauthorised connections, devices, and software.

External service providers' conformance with personnel security policies and procedures and contract security requirements shall be monitored relative to their cybersecurity risks.

Guidance

No additional Guidance on this topic.

DE.CM-7 Monitoring for unauthorised personnel, connections, devices, and software is performed.

The organisation's business-critical systems shall be monitored to detect access by unauthorised personnel, and unauthorised connections, devices, access points, and software.

Guidance

- Access by unauthorised personnel includes access by external service providers.
- System inventory discrepancies should be included in the monitoring.
- Unauthorised configuration changes to organisation's critical systems should be included in the monitoring.

DE.CM-8 Vulnerability scans are performed.

The organisation shall monitor and scan for vulnerabilities in its critical systems and hosted applications, to ensure that system functions are not adversely impacted by the scanning process.

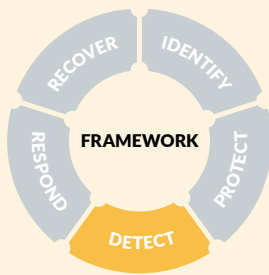
Guidance

Consider implementing a continuous vulnerability scanning program; Including reporting and mitigation plans.

The vulnerability scanning process shall include analysis, remediation, and information sharing.

Guidance

No additional Guidance on this topic.



Detection processes and procedures are maintained and tested to ensure awareness of anomalous events.

DE.DP-2 Detection activities comply with all applicable requirements.

The organisation shall conduct detection activities in accordance with applicable federal and regional laws, industry regulations and standards, policies, and other applicable requirements.

Guidance

No additional Guidance on this topic.

DE.DP-3 Detection processes are tested.

The organisation shall validate that event detection processes are operating as intended.

Guidance

- Validation includes testing.
- Validation should be demonstrable.

DE.DP-4 Event detection information is communicated.

The organisation shall communicate event detection information to predefined parties.

Guidance

Event detection information typically includes alerts on atypical account usage, unauthorised remote access, wireless connectivity, mobile device connection, altered configuration settings, contrasting system component inventory, the use of maintenance tools and nonlocal maintenance, physical access, temperature and humidity, equipment delivery and removal, communications at the information system boundaries, the use of mobile code, the use of Voice over Internet Protocol (VoIP), and malware disclosure.

DE.DP-5 Detection processes are continuously improved.

Improvements derived from the monitoring, measurement, assessment, testing, review, and lessons learned shall be incorporated into detection process revisions.

Guidance

- This will result in a continuous improvement of the detection processes.
- The use of independent teams to assess the detection process could be considered.



RESPOND



Respond



Response processes and procedures are executed and maintained, to ensure response to detected cybersecurity incidents.

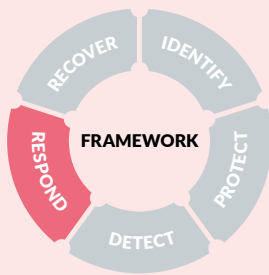


RS.RP-1 Response plan is executed during or after an incident.

An incident response process, including roles, responsibilities, and authorities, shall be executed during or after an information/cybersecurity event on the organisation's critical systems.

Guidance

- The incident response process should include a predetermined set of instructions or procedures to detect, respond to, and limit consequences of a malicious cyberattack.
- The roles, responsibilities, and authorities included within the incident response plan should specify the people involved, the contact information, the different roles and responsibilities, who makes the decision to initiate recovery procedures and who will be the contact person when communicating with the relevant external stakeholders.
- Organisations should consider determining the causes of an information/cybersecurity event and implementing a corrective action in order that the event does not recur or occur elsewhere (an infection by malicious code on one machine did not have spread elsewhere in the network). The effectiveness of any corrective action taken should be reviewed. Corrective actions should be appropriate to the effects of the information event or cybersecurity event encountered.



Response activities are coordinated with internal and external stakeholders (e.g. external support from law enforcement agencies).

● **RS.CO-1** Personnel know their roles and order of operations when a response is needed.

The organisation shall ensure that personnel understand their roles, objectives, restoration priorities, task sequences (order of operations) and assignment responsibilities when responding to an event.

Guidance

Consider using the CCB Incident Management Guide to guide you through this exercise and consider bringing in outside experts if needed. Test your plan regularly and adjust it after each incident.

● **RS.CO-2** Incidents are reported consistent with established criteria.

The organisation shall implement reporting on information/cybersecurity incidents in its critical systems within an organisation-defined timeframe to organisation-defined personnel or roles.

Guidance

All users should have a single point of contact to report any incident and should be encouraged to do so.

RS.CO-3 Information is shared consistent with response plans.

Information/cybersecurity incident information shall be communicated and shared with the organisation's employees in a format that they can understand.

Guidance

No additional Guidance on this topic.

The organisation shall share information/cybersecurity incident information with relevant stakeholders, as foreseen in the incident response plan.

Guidance

No additional Guidance on this topic.

RS.CO-4 Coordination with stakeholders occurs consistent with response plans.

The organisation shall coordinate information/cybersecurity incident response actions with all predefined stakeholders.

Guidance

- Stakeholders for incident response purposes include, mission/business owners, the organisation's critical system owners, integrators, vendors, human resources offices, physical and personnel security offices, legal departments, operations personnel, and procurement offices.
- Coordination with stakeholders occurs consistent with incident response plans.

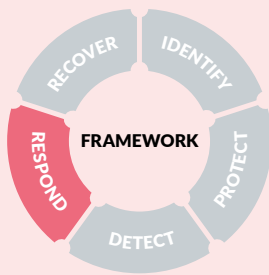
RS.CO-5 Voluntary information sharing occurs with external stakeholders to achieve broader cybersecurity situational awareness.

The organisation shall share information/cybersecurity event information voluntarily, as appropriate, with external stakeholders, industry security groups... to achieve broader situational awareness with regard to information security and cybersecurity.

Guidance

No additional Guidance on this topic.





Analysis is conducted to ensure effective response and support recovery activities.

RS.AN-1 Notifications from detection systems are investigated.

The organisation shall investigate information/cybersecurity-related notifications generated from detection systems.

Guidance

No additional Guidance on this topic.

RS.AN-2 The impact of the incident is understood.

Thorough investigation and result analysis shall form the basis for understanding the full implication of the information security or cybersecurity incident.

Guidance

- Result analysis can involve the outcome of determining the correlation between the information of the detected event and the outcome of risk assessments. In this way, insight is gained into the impact of the event across the organisation.
- Consider including detection of unauthorised changes to its critical systems in its incident response capabilities.

RS.AN-4 Incidents are categorised consistent with response plans.

Information/cybersecurity incidents shall be categorised according to the level of severity and impact consistent with the evaluation criteria included the incident response plan.

Guidance

- Organisations should consider determining the causes of an information security or cybersecurity incident and implementing a corrective action in order that the incident does not recur or occur elsewhere.
- The effectiveness of any corrective action taken should be reviewed.
- Corrective actions should be appropriate to the effects of the information/cybersecurity incident encountered.

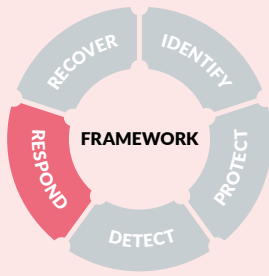
RS.AN-5 Processes are established to receive, analyse, and respond to vulnerabilities disclosed to the organisation from internal and external sources.



The organisation shall implement vulnerability management processes and procedures that include processing, analysing and remedying vulnerabilities from internal and external sources.

Guidance

Internal and external sources could include internal testing, security bulletins or security researchers.



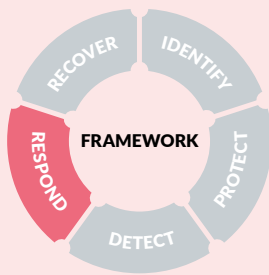
Activities are performed to prevent expansion of an event, mitigate its effects, and resolve the incident.

● RS.MI-1 Incidents are contained.

The organisation shall implement an incident-handling capability for information/cybersecurity incidents on its business-critical systems that includes preparation, detection and analysis, containment, eradication, recovery, and documented risk acceptance.

Guidance

Documented risk acceptance deals with risks that the organisation assesses as not dangerous to its business-critical systems and with regard to which the risk owner formally accepts the risk (in line with the risk appetite of the organisation)



Organisational response activities are improved by incorporating lessons learned from current and previous detection/response activities

RS.IM-1 Response plans incorporate lessons learned.

The organisation shall conduct post-incident evaluations to analyse lessons learned from incident response and recovery, and consequently improve processes/procedures/technologies to enhance its cyber resilience.

Guidance

After each incident, consider bringing the persons involved together and reflecting together on ways to improve what happened, how it happened, how we reacted, how it could have gone better, what should be done to prevent it from happening again, etc.

Lessons learned from incident-handling shall be translated into updated or new incident handling procedures that shall be tested, approved, and trained.

Guidance

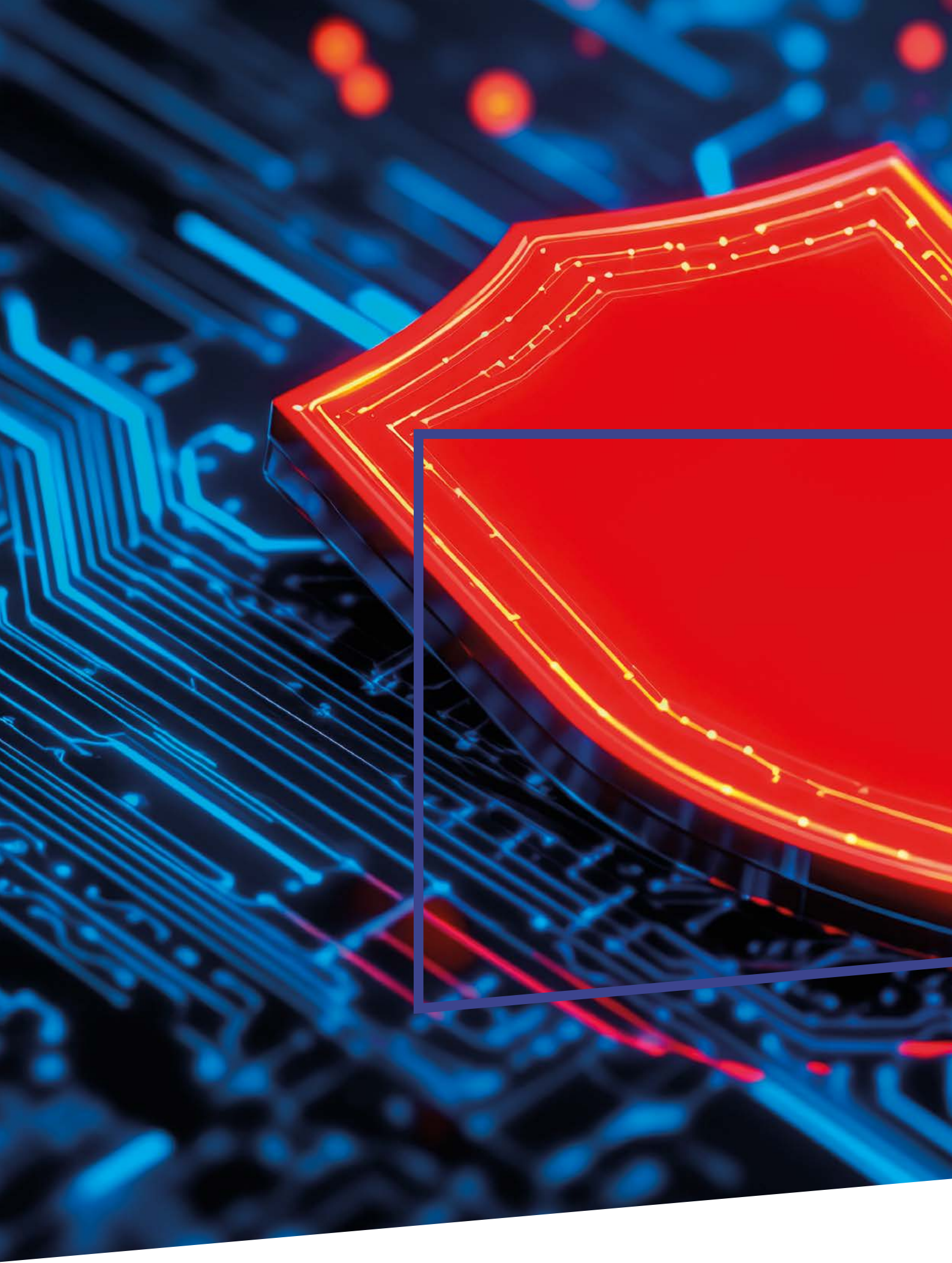
No additional Guidance on this topic.

RS.IM-2 Response and Recovery strategies are updated.

The organisation shall update the response and recovery plans to address changes in its context.

Guidance

The organisation's context relates to the organisational structure, its critical systems, attack vectors, new threats, improved technology, its operating environment, problems encountered during plan implementation/execution/testing and lessons learned.



RECOVER



Recover



Recovery processes and procedures are executed and maintained to ensure restoration of systems or assets affected by cybersecurity incidents.

RC.RP-1 Recovery plan is executed during or after a cybersecurity incident.

A recovery process for disasters and information/cybersecurity incidents shall be developed and executed as appropriate.

Guidance

A process should be developed to determine what immediate actions will be taken in the event of a fire, medical emergency, burglary, natural disaster, or an information security/cybersecurity incident.

The process should consider:

- Roles and Responsibilities, including of who makes the decision to initiate recovery procedures and who will be the contact with appropriate external stakeholders.
- What to do with the company's information and information systems in case of an incident. This includes shutting down or locking computers, moving to a backup site, physically removing important documents, etc.
- Who to call in the event of an incident.



Recovery planning and processes are improved by incorporating lessons learned into future activities.



RC.IM-1 Recovery plans incorporate lessons learned.

The organisation shall incorporate lessons learned from incident recovery activities into updated or new system recovery procedures and, after testing, provide appropriate training to ensure it is embedded.

Guidance

No additional Guidance on this topic.



Restoration activities are coordinated with internal and external parties (e.g. coordinating centers, Internet Service Providers, owners of attacking systems, victims, other CSIRTs, and vendors).

RC.CO-1 Public relations are managed.

The organisation shall centralise and coordinate how information is disseminated and manage how the organisation is presented to the public.

Guidance

Public relations management may include, for example, managing media interactions, coordinating, and logging all requests for interviews, handling and 'triaging' phone calls and e-mail requests, matching media requests with appropriate and available internal experts who are ready to be interviewed, screening all of information provided to the media, ensuring that personnel are familiar with public relations and privacy policies.

RC.CO-3 Recovery activities are communicated to internal and external stakeholders as well as executive and management teams.

The organisation shall communicate recovery activities to predefined stakeholders, and to the executive and management teams.

Guidance

Communication of recovery activities to all relevant stakeholders applies only to entities that are subject to the NIS legislation.

— ANNEX

ANNEX A: LIST OF KEY MEASURES FOR THE ASSURANCE LEVEL 'BASIC'

PROTECT

PR.AC-1 Identities and credentials are issued, managed, verified, revoked, and audited for authorised devices, users, and processes.

- (1) Identities and credentials for authorised devices and users shall be managed.

PR.AC-3 Remote access is managed.

- (2) When accessed remotely, the organisation's networks shall be secured, including by means of multi-factor authentication (MFA).

PR.AC-4 Access permissions and authorisations are managed, incorporating the principles of least privilege and separation of duties.

- (3) Access permissions for users to the organisation's systems shall be defined and managed.
- (4) It shall be identified who should have access to the organisation's business's critical information and technology and how they should obtain access.
- (5) Employee access to data and information shall be limited to the systems and specific information they need to do their jobs.
- (6) Nobody shall have administrator privileges for daily tasks.

PR.AC-5 Network integrity is protected (e.g., network segregation, network segmentation).

- (7) Firewalls shall be installed and activated on all the organisation's networks.
- (8) Where appropriate, the network integrity of the organisation's critical systems shall be protected by incorporating network segmentation and segregation.

PR.IP-4 Backups of information are conducted, maintained, and tested.

- (9) Backups for organisation's business-critical data shall be conducted and stored on a system different from the device on which the original data resides.

PR.MA-1 Maintenance and repair of organisational assets are performed and logged, with approved and controlled tools.

(10) Patches and security updates for Operating Systems and critical system components shall be installed.

PR.PT-1 Audit/log records are determined, documented, implemented, and reviewed in accordance with policy.

(11) Logs shall be maintained, documented, and reviewed.

DETECT

DE.AE-3 Event data are collected and correlated from multiple sources and sensors.

(12) The activity logging functionality of protection / detection hardware or software (e.g. firewalls, anti-virus) shall be enabled, backed up and reviewed.

DE.CM-4 Malicious code is detected.

(13) Anti-virus, anti-spyware, and other anti-malware programs shall be installed and updated.

ANNEX B: LIST OF ADDITIONAL KEY MEASURES FOR THE ASSURANCE LEVEL 'IMPORTANT'

The list below is **in addition** to the key measures for the assurance level 'Basic'.

IDENTIFY

ID.AM-6 Cybersecurity roles, responsibilities, and authorities for the entire workforce and third-party stakeholders are established.

- (1) Information security and cybersecurity roles, responsibilities and authorities within the organisation shall be documented, reviewed, authorised, and updated and alignment with organisation-internal roles and external partners.

PROTECT

PR.AC-3 Remote access is managed.

- (2) Usage restrictions, connection requirements, implementation Guidance, and authorisations for remote access to the organisation's critical systems environment shall be identified, documented, and implemented.

PR.AC-5 Network integrity is protected (e.g., network segregation, network segmentation).

- (3) Where appropriate, the network integrity of the organisation's critical systems shall be protected by (1) identifying, documenting, and controlling connections between system components and (2) limiting external connections to the organisation's critical systems.
- (4) The organisation shall monitor and control connections and communications at the external boundary and at key internal boundaries within the organisation's critical systems by implementing boundary protection devices where appropriate.

PR.DS-5 Protections against data leaks are implemented.

- (5) The organisation shall take appropriate actions resulting in the monitoring of its critical systems at external borders and critical internal points when unauthorised access and activities, including data leakage, is detected.

PR.IP-1 A baseline configuration of information technology/industrial control systems is created and maintained incorporating security principles.

- (6) The organisation shall develop, document, and maintain a baseline configuration for its business-critical systems.

DETECT

DE.CM-1 The network is monitored to detect potential cybersecurity events.

- (7) The organisation shall monitor and identify unauthorised use of its business-critical systems through the detection of unauthorised local connections, network connections and remote connections.

RESPOND

RS.AN-5 Processes are established to receive, analyse, and respond to vulnerabilities disclosed to the organisation from internal and external sources.

- (8) The organisation shall implement vulnerability management processes and procedures that include processing, analysing and remedying vulnerabilities from internal and external sources.

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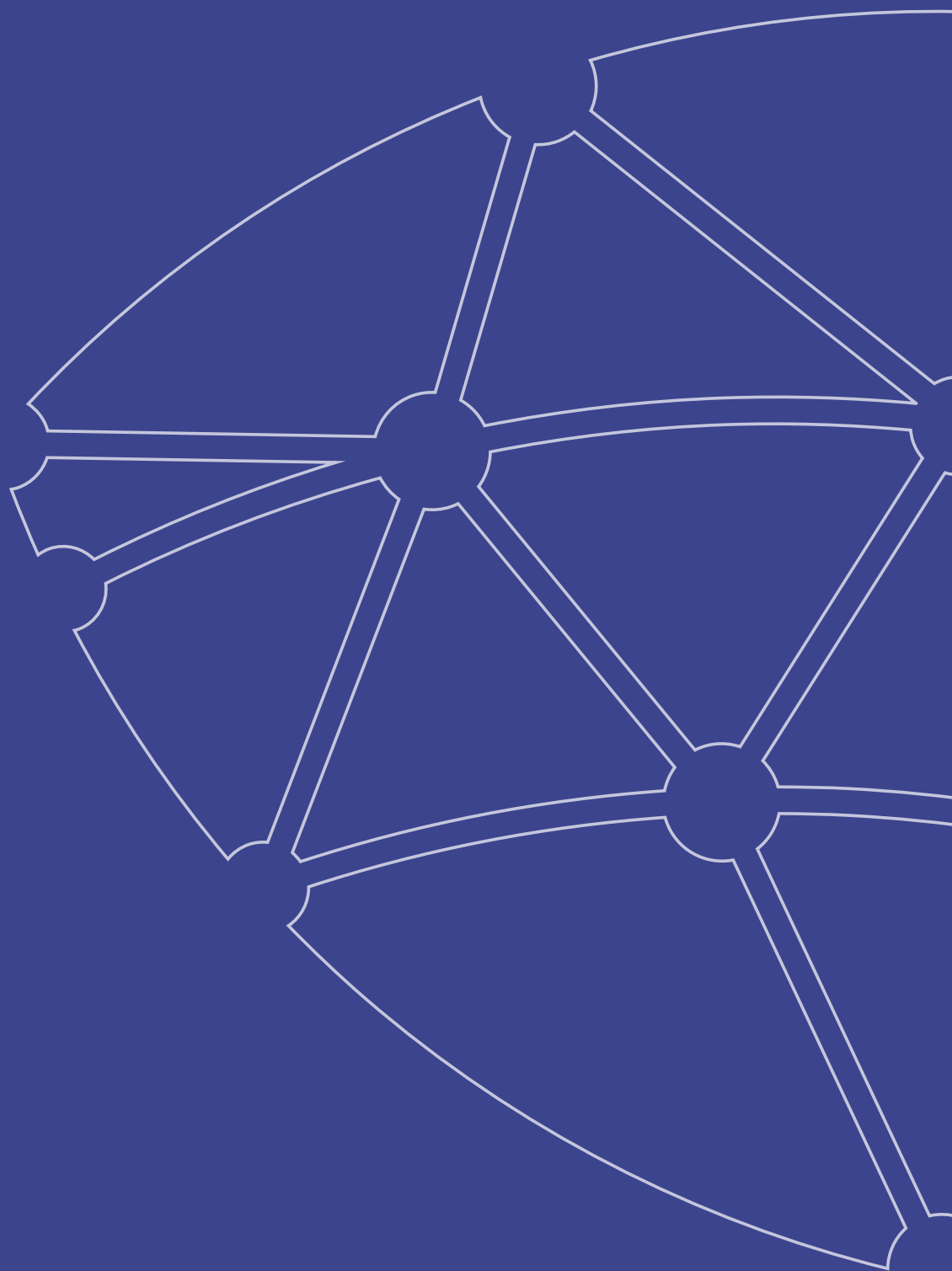
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