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Information Security Manual

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Using the Information Security Manual

Executive summary

Purpose

The purpose of the [Information Security Manual](#) (ISM) is to outline a cyber security framework that organisations can apply, using their risk management framework, to protect their systems and data from cyber threats.

Intended audience

The ISM is intended for Chief Information Security Officers (CISOs), Chief Information Officers, cyber security professionals and information technology managers.

Authority

The ISM represents the considered advice of the Australian Cyber Security Centre (ACSC) within the Australian Signals Directorate (ASD). This advice is provided in accordance with ASD's designated functions under section 7(1)(ca) of the [Intelligence Services Act 2001](#).

The ACSC also provides cyber security advice in the form of Australian Communications Security Instructions and other cyber security-related publications. In these cases, device and application-specific advice may take precedence over the advice in the ISM.

Legislation and legal considerations

Organisations are not required as a matter of law to comply with the ISM, unless legislation, or a direction given under legislation or by some other lawful authority, compels them to comply. Furthermore, the ISM does not override any obligations imposed by legislation or law. Finally, if the ISM conflicts with legislation or law, the latter takes precedence.

While the ISM contains examples of when legislation or laws may be relevant for organisations, there is no comprehensive consideration of such issues. When designing, operating and decommissioning systems, organisations are encouraged to familiarise themselves with legislation such as the [Archives Act 1983](#), [Privacy Act 1988](#) and [Telecommunications \(Interception and Access\) Act 1979](#).

Cyber security principles

The purpose of the cyber security principles within the ISM is to provide strategic guidance on how organisations can protect their systems and data from cyber threats. These cyber security principles are grouped into four key activities: govern, protect, detect and respond. Organisations should be able to demonstrate that the cyber security principles are being adhered to within their organisation.

Cyber security guidelines

The purpose of the cyber security guidelines within the ISM is to provide practical guidance on how organisations can protect their systems and data from cyber threats. These cyber security guidelines cover governance, physical security, personnel security, and information and communications technology security topics. Organisations should consider the cyber security guidelines that are relevant to each of the systems they operate.

Further information

The ISM, including all supporting material, is regularly reviewed and updated. The [latest release of the ISM](#) is available from the ACSC.

Applying a risk-based approach to cyber security

Using a risk management framework

The risk management framework used by the ISM draws from National Institute of Standards and Technology (NIST) Special Publication (SP) 800-37 Rev. 2, [Risk Management Framework for Information Systems and Organizations: A System Life Cycle Approach for Security and Privacy](#). Broadly, the risk management framework used by the ISM has six steps: define the system, select security controls, implement security controls, assess security controls, authorise the system and monitor the system.

Define the system

Determine the type, value and security objectives for the system based on an assessment of the impact if it were to be compromised.

When embarking upon the design of a system, the type, value and security objectives for the system, based on confidentiality, integrity and availability requirements, should be determined. This will ultimately guide activities such as selecting and tailoring security controls to meet those security objectives and determining the level of residual security risk that will be accepted before the system is authorised to operate.

Following the determination of the type and value of a system, along with its security objectives, a description of the system and its characteristics should be documented in the system's system security plan.

Select security controls

Select security controls for the system and tailor them to achieve desired security objectives.

Each cyber security guideline discusses security risks associated with the topics it covers. Paired with these discussions are security controls that the ACSC considers to provide efficient and effective mitigations based on their suitability to achieve the security objectives for a system.

While security risks and security controls are discussed in the cyber security guidelines, and act as a security control baseline, they should not be considered an exhaustive list for a specific activity or technology. As such, the cyber security guidelines provide an important input into each organisation's risk identification and risk treatment activities however do not represent the full extent of such activities.

While the cyber security guidelines can assist with risk identification and risk treatment activities, organisations will still need to undertake their own risk analysis and risk evaluation activities due to the unique nature of each system, its operating environment and the organisation's risk tolerances.

Following the selection and tailoring of security controls for a system, they should be recorded along with the details of their planned implementation in the system's system security plan annex. In addition, and as appropriate, security controls should also be recorded in both the system's incident response plan and continuous monitoring plan.

Implement security controls

Implement security controls for the system and its operating environment.

Once suitable security controls have been identified and agreed upon for a system, they should be implemented. In doing so, the details of their actual implementation, if different from their planned implementation, should be documented in the system's system security plan annex.

Assess security controls

Assess security controls for the system and its operating environment to determine if they have been implemented correctly and are operating as intended.

In conducting a security assessment, it is important that assessors and system owners first agree to the scope, type and extent of assessment activities, which may be documented in a security assessment plan, such that any risks associated with the security assessment can be appropriately managed. To a large extent, the scope of the security assessment will be determined by the type of system and security controls that have been implemented for the system and its operating environment.

For TOP SECRET systems, including sensitive compartmented information systems, security assessments can be undertaken by ASD assessors (or their delegates). While for SECRET and below systems, security assessments can be undertaken by an organisation's own assessors or Infosec Registered Assessors Program (IRAP) assessors. In all cases, assessors should hold an appropriate security clearance and have an appropriate level of experience and understanding of the type of system they are assessing.

At the conclusion of a security assessment, a security assessment report should be produced outlining the scope of the security assessment, the system's strengths and weaknesses, security risks associated with the operation of the system, the effectiveness of the implementation of security controls, and any recommended remediation actions. This will assist in performing any initial remediation actions as well as guiding the development of the system's plan of action and milestones.

Authorise the system

Authorise the system to operate based on the acceptance of the security risks associated with its operation.

Before a system can be granted authorisation to operate, sufficient information should be provided to the authorising officer in order for them to make an informed risk-based decision as to whether the security risks associated with its operation are acceptable or not. This information should take the form of an authorisation package that includes the system's system security plan, incident response plan, continuous monitoring plan, security assessment report, and plan of action and milestones.

In some cases, the security risks associated with a system's operation will be acceptable and it will be granted authorisation to operate; however, in other cases the security risks associated with operation of a system may be unacceptable. In such cases, the authorising officer may request further work, and potentially another security assessment, be undertaken by the system owner. In the intervening time, the authorising officer may choose to grant authorisation to operate but with constraints placed on the system's use. Finally, if the authorising officer deems the security risks to be unacceptable regardless of any potential constraints on the system's use, they may deny authorisation to operate until such time that sufficient remediation actions, if possible, have been completed to an acceptable standard.

For TOP SECRET systems, and systems that process, store or communicate sensitive compartmented information, the authorising officer is Director-General ASD or their delegate; while for SECRET and below systems, the authorising officer is an organisation's CISO or their delegate.

For multinational and multi-organisation systems, the authorising officer should be determined by a formal agreement between the parties involved.

For commercial providers providing services to organisations, the authorising officer is the CISO of the supported organisation or their delegate.

In all cases, the authorising officer should have an appropriate level of seniority and understanding of security risks they are accepting on behalf of their organisation. In cases where an organisation does not have a CISO, the authorising officer could be a Chief Security Officer, a Chief Information Officer or other senior executive within the organisation.

Monitor the system

Monitor the system, and associated cyber threats, security risks and security controls, on an ongoing basis.

Regular monitoring of cyber threats, security risks and security controls associated with a system and its operating environment, as outlined in a continuous monitoring plan, is essential to maintaining its security posture. In doing so, specific events may necessitate additional risk management activities. Such events may include:

- changes in security policies relating to the system
- detection of new or emerging cyber threats to the system or its operating environment
- the discovery that security controls for the system are not as effective as planned
- a major cyber security incident involving the system
- major architectural changes to the system.

Following the implementation or modification of any security controls as a result of risk management activities, another security assessment should be completed. In doing so, the system's authorisation package should be updated. This in turn allows the authorising officer to make an informed risk-based decision as to whether the security risks associated with the system's operation are still acceptable, and whether to grant ongoing authorisation to operate.

Further information

Further information on various risk management frameworks and practices can be found in:

- International Organization for Standardization (ISO) 31000:2018, [Risk management – Guidelines](#)
- ISO Guide 73:2009, [Risk management – Vocabulary](#)
- International Electrotechnical Commission 31010:2019, [Risk management – Risk assessment techniques](#)
- ISO/International Electrotechnical Commission 27005:2018, [Information technology – Security techniques – Information security risk management](#)
- NIST SP 800-30 Rev. 1, [Guide for Conducting Risk Assessments](#)
- NIST SP 800-37 Rev. 2, [Risk Management Framework for Information Systems and Organizations: A System Life Cycle Approach for Security and Privacy](#).

Further information on [the purpose of IRAP](#), and [a list of current IRAP assessors](#), is available from the ACSC.

Cyber Security Principles

The cyber security principles

Purpose of the cyber security principles

The purpose of the cyber security principles is to provide strategic guidance on how organisations can protect their systems and data from cyber threats. These cyber security principles are grouped into four key activities: govern, protect, detect and respond.

- **Govern:** Identifying and managing security risks.
- **Protect:** Implementing security controls to reduce security risks.
- **Detect:** Detecting and understanding cyber security events.
- **Respond:** Responding to and recovering from cyber security incidents.

Govern principles

- **G1:** A Chief Information Security Officer provides leadership and oversight of cyber security.
- **G2:** The identity and value of systems, applications and data is determined and documented.
- **G3:** The confidentiality, integrity and availability requirements for systems, applications and data are determined and documented.
- **G4:** Security risk management processes are embedded into organisational risk management frameworks.
- **G5:** Security risks are identified, documented, managed and accepted both before systems and applications are authorised for use, and continuously throughout their operational life.

Protect principles

- **P1:** Systems and applications are designed, deployed, maintained and decommissioned according to their value and their confidentiality, integrity and availability requirements.
- **P2:** Systems and applications are delivered and supported by trusted suppliers.
- **P3:** Systems and applications are configured to reduce their attack surface.
- **P4:** Systems and applications are administered in a secure, accountable and auditable manner.
- **P5:** Security vulnerabilities in systems and applications are identified and mitigated in a timely manner.
- **P6:** Only trusted and supported operating systems, applications and computer code can execute on systems.
- **P7:** Data is encrypted at rest and in transit between different systems.
- **P8:** Data communicated between different systems is controlled, inspectable and auditable.
- **P9:** Data, applications and configuration settings are backed up in a secure and proven manner on a regular basis.
- **P10:** Only trusted and vetted personnel are granted access to systems, applications and data repositories.
- **P11:** Personnel are granted the minimum access to systems, applications and data repositories required for their duties.

- **P12:** Multiple methods are used to identify and authenticate personnel to systems, applications and data repositories.
- **P13:** Personnel are provided with ongoing cyber security awareness training.
- **P14:** Physical access to systems, supporting infrastructure and facilities is restricted to authorised personnel.

Detect principles

- **D1:** Cyber security events and anomalous activities are detected, collected, correlated and analysed in a timely manner.

Respond principles

- **R1:** Cyber security incidents are identified and reported both internally and externally to relevant bodies in a timely manner.
- **R2:** Cyber security incidents are contained, eradicated and recovered from in a timely manner.
- **R3:** Business continuity and disaster recovery plans are enacted when required.

Maturity modelling

When implementing the cyber security principles, organisations can use the following maturity model to assess the implementation of either individual principles, groups of principles or the cyber security principles as a whole. The five levels in the maturity model are:

- **Incomplete:** The cyber security principles are either partially implemented or not implemented.
- **Initial:** The cyber security principles are implemented, but in a poor or ad hoc manner.
- **Developing:** The cyber security principles are sufficiently implemented, but on a project-by-project basis.
- **Managing:** The cyber security principles are established as standard business practices and robustly implemented throughout the organisation.
- **Optimising:** A deliberate focus on optimisation and continual improvement exists for the implementation of the cyber security principles throughout the organisation.

Guidelines for Cyber Security Roles

Chief Information Security Officer

Required skills and experience

The role of the Chief Information Security Officer (CISO) requires a combination of technical and soft skills, such as business acumen, leadership, communications and relationship building. Additionally, CISOs must adopt a continuous approach to learning and up-skilling in order to maintain pace with the cyber threat landscape and new technologies. It is expected that CISOs show innovation and imagination in conceiving and delivering cyber security strategies for their organisations.

Providing cyber security leadership and guidance

To provide cyber security leadership and guidance within organisations, it is important that each organisation appoints a CISO.

Security Control: 0714; Revision: 5; Updated: Oct-20; Applicability: All

A CISO is appointed to provide cyber security leadership and guidance for their organisation.

Overseeing the cyber security program

The CISO within an organisation is responsible for overseeing their organisation's cyber security program and ensuring compliance with cyber security policy, standards, regulations and legislation. They are likely to work with a Chief Security Officer, a Chief Information Officer and other senior executives within their organisation.

Security Control: 1478; Revision: 1; Updated: Oct-20; Applicability: All

The CISO oversees their organisation's cyber security program and ensures their organisation's compliance with cyber security policy, standards, regulations and legislation.

Security Control: 1617; Revision: 0; Updated: Oct-20; Applicability: All

The CISO regularly reviews and updates their organisation's cyber security program to ensure its relevance in addressing cyber threats and harnessing business and cyber security opportunities.

Security Control: 0724; Revision: 2; Updated: Oct-20; Applicability: All

The CISO implements cyber security measurement metrics and key performance indicators for their organisation.

Coordinating cyber security

The CISO is responsible for ensuring the alignment of cyber security and business objectives within their organisation. To achieve this, they should facilitate communication between cyber security and business stakeholders. This includes translating cyber security concepts and language into business concepts and language, as well as ensuring that business teams consult with cyber security teams to determine appropriate security controls when planning new business projects. Additionally, as the CISO is responsible for the development of their organisation's cyber security program, they are best placed to advise projects on the strategic direction of cyber security within the organisation.

Security Control: 0725; Revision: 3; Updated: Dec-21; Applicability: All

The CISO coordinates cyber security and business alignment through a cyber security steering committee or advisory board, comprising of key cyber security and business executives, which meets formally and on a regular basis.

Security Control: 0726; Revision: 2; Updated: Oct-20; Applicability: All

The CISO coordinates security risk management activities between cyber security and business teams.

Reporting on cyber security

The CISO is responsible for reporting cyber security matters to their organisation's senior executive and/or Board. Reporting should cover:

- the organisation's security risk profile
- the status of key systems and any outstanding security risks
- any planned cyber security uplift activities
- any recent cyber security incidents
- expected returns on cyber security investments.

Reporting on cyber security matters should be structured by business functions, regions or legal entities and support a consolidated view of the organisation's security risks.

It is important that the CISO is able to translate security risks into operational risks for their organisation, including financial and legal risks, in order to enable more holistic conversations about their organisation's risks.

Security Control: 0718; Revision: 2; Updated: Oct-20; Applicability: All

The CISO reports directly to their organisation's senior executive and/or Board on cyber security matters.

Overseeing incident response activities

To ensure the CISO is able to accurately report to their organisation's senior executive and/or Board on cyber security matters, it is important they are fully aware of all cyber security incidents within their organisation.

The CISO is also responsible for overseeing their organisation's response to cyber security incidents, including how internal teams respond and communicate with each other during an incident. In the event of a major cyber security incident, the CISO should be prepared to step into a crisis management role. They should understand how to bring clarity to the situation and communicate effectively with internal and external stakeholders.

Security Control: 0733; Revision: 2; Updated: Oct-20; Applicability: All

The CISO is fully aware of all cyber security incidents within their organisation.

Security Control: 1618; Revision: 0; Updated: Oct-20; Applicability: All

The CISO oversees their organisation's response to cyber security incidents.

Contributing to business continuity and disaster recovery planning

The CISO is responsible for contributing to the development and maintenance of their organisation's business continuity and disaster recovery plans, with the aim to improve business resilience and ensure the continued operation of critical business processes.

Security Control: 0734; Revision: 3; Updated: Jun-21; Applicability: All

The CISO contributes to the development and maintenance of business continuity and disaster recovery plans for their organisation to ensure that business-critical services are supported appropriately in the event of a disaster.

Developing a cyber security communications strategy

To facilitate cyber security cultural change across their organisation, the CISO should act as a thought leader by continually communicating their strategy and vision. A communication strategy can be helpful in achieving this. Communications should be tailored to different parts of the organisation and be topical for the intended audience.

Security Control: 0720; Revision: 1; Updated: Oct-20; Applicability: All

The CISO develops and maintains a cyber security communications strategy for their organisation.

Working with suppliers and service providers

The CISO is responsible for ensuring that consistent vendor management processes are applied across their organisation, from discovery through to ongoing management. As supplier and service provider relationships come with additional security risks, the CISO should assist personnel with assessing cyber supply chain risks and understand the security impacts of entering into contracts with suppliers and service providers.

Security Control: 0731; Revision: 2; Updated: Oct-20; Applicability: All

The CISO oversees cyber supply chain risk management activities for their organisation.

Receiving and managing a dedicated cyber security budget

Receiving and managing a dedicated cyber security budget will ensure the CISO has sufficient access to funding to support their cyber security program, including cyber security uplift activities and responding to cyber security incidents.

Security Control: 0732; Revision: 2; Updated: Oct-20; Applicability: All

The CISO receives and manages a dedicated cyber security budget for their organisation.

Overseeing cyber security personnel

The CISO is responsible for the cyber security workforce within their organisation, including plans to attract, train and retain cyber security personnel. CISOs should also delegate relevant tasks to cyber security managers and other personnel as required and provide them with adequate authority and resources to perform their duties.

Security Control: 0717; Revision: 2; Updated: Oct-20; Applicability: All

The CISO oversees the management of cyber security personnel within their organisation.

Overseeing cyber security awareness raising

To ensure personnel are actively contributing to the security culture of their organisation, a cyber security awareness training program should be developed. As the CISO is responsible for cyber security within their organisation, they should oversee the development and operation of the cyber security awareness training program.

Security Control: 0735; Revision: 2; Updated: Oct-20; Applicability: All

The CISO oversees the development and operation of their organisation's cyber security awareness training program.

System owners

System ownership and oversight

System owners are responsible for ensuring the secure operation of their systems; however, system owners may delegate the day-to-day management and operation of their systems to system managers.

Security Control: 1071; Revision: 1; Updated: Sep-18; Applicability: All

Each system has a designated system owner.

Security Control: 1525; Revision: 1; Updated: Jan-21; Applicability: All

System owners register each system with its authorising officer.

Protecting systems and their resources

Broadly, the risk management framework used by the [Information Security Manual](#) has six steps: define the system, select security controls, implement security controls, assess security controls, authorise the system and monitor the

system. System owners are responsible for the implementation of this six step risk management framework for each of their systems.

Security Control: 1633; Revision: 0; Updated: Jan-21; Applicability: All

System owners determine the type, value and security objectives for each system based on an assessment of the impact if it were to be compromised.

Security Control: 1634; Revision: 0; Updated: Jan-21; Applicability: All

System owners select security controls for each system and tailor them to achieve desired security objectives.

Security Control: 1635; Revision: 1; Updated: Dec-21; Applicability: All

System owners implement security controls for each system and its operating environment.

Security Control: 1636; Revision: 0; Updated: Jan-21; Applicability: All

System owners ensure security controls for each system and its operating environment are assessed to determine if they have been implemented correctly and are operating as intended.

Security Control: 0027; Revision: 4; Updated: Jan-21; Applicability: All

System owners obtain authorisation to operate each system from its authorising officer based on the acceptance of the security risks associated with its operation.

Security Control: 1526; Revision: 1; Updated: Jan-21; Applicability: All

System owners monitor each system, and associated cyber threats, security risks and security controls, on an ongoing basis.

Annual reporting of system security status

Annual reporting by system owners on the security status of their systems to their authorising officer can assist the authorising officer in maintaining awareness of the security posture of systems within their organisation.

Security Control: 1587; Revision: 0; Updated: Aug-20; Applicability: All

System owners report the security status of each system to its authorising officer at least annually.

Further information

Further information on using the [Information Security Manual](#)'s six step risk management framework can be found in [Using the Information Security Manual](#).

Further information on monitoring systems and their operating environments can be found in the [Guidelines for System Monitoring](#).

Guidelines for Cyber Security Incidents

Detecting cyber security incidents

Cyber security events

A cyber security event is an occurrence of a system, service or network state indicating a possible breach of security policy, failure of safeguards or a previously unknown situation that may be relevant to security.

Cyber security incidents

A cyber security incident is an unwanted or unexpected cyber security event, or a series of such events, that have a significant probability of compromising business operations.

Cyber resilience

Cyber resilience is the ability to adapt to disruptions caused by cyber security incidents while maintaining continuous business operations. This includes the ability to detect, manage and recover from cyber security incidents.

Detecting cyber security incidents

One of the core elements of detecting and investigating cyber security incidents is the availability of appropriate data sources. Fortunately, many data sources can be extracted from existing systems without requiring specialised capabilities.

The following table describes some of the data sources that organisations can use for detecting and investigating cyber security incidents.

Data Source	Description
Domain Name System logs	Can assist in identifying attempts to resolve malicious domains or Internet Protocol addresses which can indicate an exploitation attempt or successful compromise.
Email server logs	Can assist in identifying users targeted with spear-phishing emails. Can also assist in identifying the initial vector of a compromise.
Operating system event logs	Can assist in tracking process execution, file/registry/network activity, authentication events, operating system created security alerts and other activity.
Security product logs	Can assist in the identification of anomalous or malicious activity which can indicate an exploitation attempt or successful compromise.

Virtual Private Network and remote access logs	Can assist in identifying unusual source addresses, times of access and logon/logoff times associated with malicious activity.
Web proxy logs	Can assist in identifying Hypertext Transfer Protocol-based vectors and malware communication traffic.

Intrusion detection and prevention policy

Establishing an intrusion detection and prevention policy can increase the likelihood of detecting, and subsequently preventing, malicious activity on networks and hosts. In doing so, an intrusion detection and prevention policy will likely cover the following:

- methods of network-based intrusion detection and prevention used
- methods of host-based intrusion detection and prevention used
- guidelines for reporting and responding to detected intrusions
- resources assigned to intrusion detection and prevention activities.

Security Control: 0576; Revision: 7; Updated: Aug-19; Applicability: All
An intrusion detection and prevention policy is developed and implemented.

Trusted insider program

As a trusted insider's system access and knowledge of business processes often makes them harder to detect, establishing a trusted insider program can assist organisations to detect and respond to trusted insider threats before they occur, or limit damage if they do occur. In doing so, organisations will likely obtain the most benefit by logging and analysing the following user activities:

- excessive copying or modification of files
- unauthorised or excessive use of removable media
- connecting devices capable of data storage to systems (e.g. mobile devices and digital cameras)
- unusual system usage outside of normal business hours
- excessive data access or printing compared to their peers
- data transfers to unauthorised cloud services or webmail
- use of unauthorised Virtual Private Networks, file transfer applications or anonymity networks.

Security Control: 1625; Revision: 0; Updated: Nov-20; Applicability: All
A trusted insider program is developed and implemented.

Security Control: 1626; Revision: 0; Updated: Nov-20; Applicability: All
Legal advice is sought regarding the development and implementation of a trusted insider program.

Access to sufficient data sources and tools

Successful detection of cyber security incidents requires trained cyber security personnel with access to sufficient data sources complemented by tools that support both manual and automated analysis. As such, it is important that during system design and development activities, functionality is added to systems to ensure that sufficient data sources can be captured and provided to cyber security personnel.

Security Control: 0120; Revision: 5; Updated: May-20; Applicability: All

Cyber security personnel have access to sufficient data sources and tools to ensure that systems can be monitored for key indicators of compromise.

Further information

Further information on detecting cyber security incidents can be found in the event logging and auditing section of the [Guidelines for System Monitoring](#).

Further information on establishing and operating a trusted insider program can be found in the Carnegie Mellon University's Software Engineering Institute's [Common Sense Guide to Mitigating Insider Threats](#) publication.

Managing cyber security incidents

Cyber security incident register

Recording cyber security incidents in a register can assist with ensuring that appropriate remediation activities are undertaken. In addition, information such as the types and frequency of cyber security incidents, along with the costs of any remediation activities, can be used as an input to future risk assessment activities.

Security Control: 0125; Revision: 5; Updated: Jun-21; Applicability: All

A cyber security incident register is maintained that covers the following:

- *the date the cyber security incident occurred*
- *the date the cyber security incident was discovered*
- *a description of the cyber security incident*
- *any actions taken in response to the cyber security incident*
- *to whom the cyber security incident was reported.*

Handling and containing data spills

When a data spill occurs, organisations should inform data owners and restrict access to the data. In doing so, affected systems can be powered off, have their network connectivity removed or have additional access controls applied to the data. It should be noted though that powering off systems could destroy data that would be useful for forensic investigations. Furthermore, users should be made aware of appropriate actions to take in the event of a data spill such as not deleting, copying, printing or emailing the data.

Security Control: 0133; Revision: 2; Updated: Jun-21; Applicability: All

When a data spill occurs, data owners are advised and access to the data is restricted.

Handling and containing malicious code infections

Taking immediate remediation steps after the discovery of malicious code can minimise the time and cost spent eradicating and recovering from the infection. As a priority, all infected systems and media should be isolated to prevent the infection from spreading. Once isolated, infected systems and media can be scanned by antivirus software to potentially remove the infection or recover data. It is important to note though, a complete system restoration from a known good backup or rebuild may be the only reliable way to ensure that malicious code can be truly eradicated or data recovered.

Security Control: 0917; Revision: 7; Updated: Oct-19; Applicability: All

When malicious code is detected, the following steps are taken to handle the infection:

- *the infected systems are isolated*

- *all previously connected media used in the period leading up to the infection are scanned for signs of infection and isolated if necessary*
- *antivirus software is used to remove the infection from infected systems and media*
- *if the infection cannot be reliably removed, systems are restored from a known good backup or rebuilt.*

Handling and containing intrusions

When an intrusion is detected on a system, organisations may wish to allow the intrusion to continue for a short period of time in order to fully understand the extent of the compromise and to assist with planning intrusion remediation activities. Organisations allowing an intrusion to continue should first establish with their legal advisors whether any actions, such as collecting further data or evidence, would be breaching the [Telecommunications \(Interception and Access\) Act 1979](#).

To increase the likelihood of intrusion remediation activities successfully removing an adversary from their system, organisations can take preventative measures to ensure the adversary has limited forewarning and awareness of planned intrusion remediation activities. Specifically, using an alternative system to plan and coordinate intrusion remediation activities will prevent alerting the adversary if they have already compromised email, messaging or collaboration services. In addition, conducting intrusion remediation activities in a coordinated manner during the same planned outage will prevent forewarning the adversary, thereby depriving them of sufficient time to establish alternative access points or persistence methods on the system.

Following intrusion remediation activities, organisation should determine whether the adversary has been successfully removed from the system, including whether or not they have since reacquired access. This can be achieved, in part, by capturing and analysing network traffic for at least seven days following remediation activities.

Security Control: 0137; Revision: 4; Updated: Dec-21; Applicability: All

Legal advice is sought before allowing intrusion activity to continue on a system for the purpose of collecting further data or evidence.

Security Control: 1609; Revision: 2; Updated: Dec-21; Applicability: All

System owners are consulted before allowing intrusion activity to continue on a system for the purpose of collecting further data or evidence.

Security Control: 1731; Revision: 0; Updated: Dec-21; Applicability: All

Planning and coordination of intrusion remediation activities are conducted on a separate system to that which has been compromised.

Security Control: 1732; Revision: 0; Updated: Dec-21; Applicability: All

To the extent possible, all intrusion remediation activities are conducted in a coordinated manner during the same planned outage.

Security Control: 1213; Revision: 2; Updated: Dec-21; Applicability: All

Following intrusion remediation activities, full network traffic is captured for at least seven days and analysed to determine whether the adversary has been successfully removed from the system.

Integrity of evidence

When gathering evidence following a cyber security incident, it is important that its integrity is maintained. Even though an investigation may not directly lead to a prosecution, it is important that the integrity of evidence, such as manual logs, automatic audit trails and intrusion detection tool outputs, be protected.

If the Australian Cyber Security Centre (ACSC) is requested to assist with investigations, no actions which could affect the integrity of evidence should be carried out before the ACSC becomes involved.

Security Control: 0138; Revision: 4; Updated: Aug-20; Applicability: All

The integrity of evidence gathered during an investigation is maintained by investigators:

- *recording all of their actions*
- *creating checksums for all evidence*
- *copying evidence onto media for archiving*
- *maintaining a proper chain of custody.*

Further information

Further information on incident response plans can be found in the system-specific security documentation section of the [Guidelines for Security Documentation](#).

Further information on event logging, including retention periods, can be found in the event logging and auditing section of the [Guidelines for System Monitoring](#).

Further information on handling and managing data spills can be found in the ACSC's [Data Spill Management Guide](#) publication.

Reporting cyber security incidents

Reporting cyber security incidents

Reporting cyber security incidents, including unplanned outages, to an organisation's Chief Information Security Officer (CISO), or one of their delegates, as soon as possible after they occur or are discovered provides senior management with the opportunity to assess the impact to their organisation and to take remediation actions if necessary. In doing so, organisations should be cognisant of any legislative obligations in regards to reporting cyber security incidents to authorities, customers or the public.

Security Control: 0123; Revision: 3; Updated: Sep-18; Applicability: All

Cyber security incidents are reported to an organisation's CISO, or one of their delegates, as soon as possible after they occur or are discovered.

Security Control: 0141; Revision: 5; Updated: Dec-21; Applicability: All

Service providers report cyber security incidents to their customer's CISO, or one of their delegates, as soon as possible after they occur or are discovered.

Security Control: 1433; Revision: 3; Updated: Dec-21; Applicability: All

Service providers and their customers maintain 24/7 contact details for each other, including additional out-of-band contact details for when normal communication channels fail, in order to report cyber security incidents.

Reporting cyber security incidents to the ACSC

The ACSC uses the cyber security incident reports it receives as the basis for providing assistance to organisations. Cyber security incident reports are also used by the ACSC to identify trends and maintain an accurate threat environment picture. The ACSC utilises this understanding to assist in the development of new and updated cyber security advice, capabilities, and techniques to better prevent and respond to evolving cyber threats. Organisations are recommended to internally coordinate their reporting of cyber security incidents to the ACSC.

The types of cyber security incidents that should be reported to the ACSC include:

- suspicious activities (e.g. domain administrator account lockouts and unusual remote access activities)
- compromise of sensitive or classified data
- unauthorised access or attempts to access a system

- emails with suspicious attachments or links
- denial-of-service attacks
- ransomware attacks
- suspected tampering of ICT equipment or mobile devices.

*Security Control: 0140; Revision: 6; Updated: May-19; Applicability: All
Cyber security incidents are reported to the ACSC.*

Further information

Further information on [reporting cyber security incidents](#) is available from the ACSC.

Guidelines for Outsourcing

Information technology and cloud services

Cloud services

The terminology and definitions used in this section for cloud services are consistent with National Institute of Standards and Technology (NIST) Special Publication (SP) 800-145, [The NIST Definition of Cloud Computing](#). This section also applies to cloud services that have a payment model which differs to the NIST pay-per-use measured service characteristic.

Cyber supply chain risk management

Cyber supply chain risk management activities should be conducted during the earliest possible stage of procurement processes. In particular, organisations should consider the security risks that may arise as systems, software and hardware are being designed, built, stored, delivered, installed, operated, maintained and decommissioned. This includes identifying and managing jurisdictional, governance, privacy and security risks associated with the use of suppliers and service providers. For example, outsourced cloud services may be located offshore and subject to lawful and covert data collection without their customers' knowledge. Additionally, use of offshore services introduces jurisdictional risks as foreign countries' laws could change with little warning. Finally, foreign owned service providers operating in Australia may be subject to a foreign government's lawful access to data belonging to their customers.

In managing cyber supply chain risks, it is important that organisations preference suppliers and service providers that have demonstrated a commitment to secure-by-design practices and have a strong track record of transparency and maintaining the security of their own systems, services and cyber supply chains. Also, in some cases, a shared responsibility model which clearly defines the responsibilities of suppliers, service providers and their customers can be highly beneficial.

Security Control: 1631; Revision: 0; Updated: Dec-20; Applicability: All

Components and services relevant to the security of systems are identified and understood.

Security Control: 1452; Revision: 3; Updated: Dec-20; Applicability: All

Before obtaining components and services relevant to the security of systems, a review of suppliers and service providers (including their country of origin) is performed to assess the potential increase to systems' security risk profile, including by identifying those that are high risk.

Security Control: 1567; Revision: 1; Updated: Dec-20; Applicability: All

Suppliers and service providers identified as high risk are not used.

Security Control: 1568; Revision: 1; Updated: Dec-20; Applicability: All

Components and services relevant to the security of systems are chosen from suppliers and service providers that have made a commitment to secure-by-design practices.

Security Control: 1632; Revision: 0; Updated: Dec-20; Applicability: All

Components and services relevant to the security of systems are chosen from suppliers and service providers that have a strong track record of transparency and maintaining the security of their own systems, services and cyber supply chains.

Security Control: 1569; Revision: 1; Updated: Dec-20; Applicability: All

A shared responsibility model is created, documented and shared between suppliers, service providers and their customers in order to articulate the security responsibilities of each party.

Outsourced cloud services

Outsourcing can be a cost-effective option for providing cloud services, as well as potentially delivering a superior service; however, it can also affect an organisation's security risk profile. Ultimately, organisations will still need to decide whether a particular outsourced cloud service represents an acceptable security risk and, if appropriate to do so, authorise it for their own use.

Cloud service providers and their cloud services will need to undergo regular security assessments by an Infosec Registered Assessor Program (IRAP) assessor to determine their security posture and security risks associated with their use. Following an initial security assessment, subsequent security assessments should focus on any new cloud services that are being offered as well as any security-related changes that have occurred since the previous security assessment.

Security Control: 1637; Revision: 0; Updated: Jan-21; Applicability: All

An outsourced cloud services register is maintained and regularly audited.

Security Control: 1638; Revision: 1; Updated: Jun-21; Applicability: All

An outsourced cloud services register contains the following for each outsourced cloud service:

- *cloud service provider's name*
- *cloud service's name*
- *purpose for using the cloud service*
- *sensitivity or classification of data involved*
- *due date for the next security assessment of the cloud service*
- *point of contact for users of the cloud service*
- *point of contact for the cloud service provider.*

Security Control: 1570; Revision: 0; Updated: Jul-20; Applicability: All

Cloud service providers and their cloud services undergo a security assessment by an IRAP assessor at least every 24 months.

Security Control: 1529; Revision: 2; Updated: Dec-21; Applicability: S, TS

Only community or private clouds are used for outsourced SECRET and TOP SECRET cloud services.

Contractual security requirements

Obligations for protecting data are no different when using an outsourced information technology or cloud service than when using an in-house service. As such, contractual arrangements between service providers and their customers should address how security risks will be managed. However, in some cases an organisation may require information technology or cloud services to be used before all security requirements have been implemented by a service provider. In such cases, contractual arrangements should include appropriate timeframes for the implementation of security requirements and break clauses if these are not achieved.

In addition, although data ownership resides with service providers' customers, this can become less clear in some circumstances, such as when legal action is taken and a service provider is asked to provide access to, or data from, their assets. To mitigate the likelihood of data being unavailable or compromised, organisations can document the types of data and its ownership through contractual arrangements.

Furthermore, organisations may make the decision to move from their current service provider for strategic, operational or governance reasons. This may include scenarios such as changing to another service provider, moving to a different service with the same service provider or moving back to an on-premises solution. In many cases, transferring data and functionality between old and new services or systems will be desired. Service providers can assist

their customers by ensuring data is as portable as possible and that as much data can be exported as possible. As such, data should be stored in a documented format, preferably an open standard, noting that undocumented or proprietary formats may make it more difficult for organisations to perform backup, service migration or service decommissioning activities.

Finally, to ensure that organisations are given sufficient time to download their data or move to another service provider should a service provider cease offering a particular service, a one month notification period should be documented in contractual arrangements.

Security Control: 1395; Revision: 6; Updated: Dec-21; Applicability: All

Service providers provide an appropriate level of protection for any data entrusted to them or their services.

Security Control: 0072; Revision: 7; Updated: Jun-21; Applicability: All

Security requirements associated with the confidentiality, integrity and availability of data entrusted to a service provider are documented in contractual arrangements.

Security Control: 1571; Revision: 1; Updated: Jun-21; Applicability: All

The right to audit security controls associated with the protection of data and services is specified in contractual arrangements.

Security Control: 1451; Revision: 3; Updated: Jun-21; Applicability: All

Types of data and its ownership is documented in contractual arrangements.

Security Control: 1572; Revision: 1; Updated: Jun-21; Applicability: All

The regions or availability zones where data will be processed, stored and communicated is documented in contractual arrangements.

Security Control: 1573; Revision: 1; Updated: Jun-21; Applicability: All

Access to all logs relating to an organisation's data and services are specified in contractual arrangements.

Security Control: 1574; Revision: 1; Updated: Jun-21; Applicability: All

Data entrusted to a service provider is stored in a portable manner that allows organisations to perform backups, service migration or service decommissioning without any loss of data.

Security Control: 1575; Revision: 0; Updated: Jul-20; Applicability: All

A minimum notification period of one month for the cessation of any services by a service provider is documented in contractual arrangements.

Access to systems and data by service providers

To perform their contracted duties, service providers may need to access their customers' systems and data. However, without proper security controls in place, this could leave systems and data vulnerable – especially when access occurs from outside of Australian borders. As such, organisations should ensure that their systems and data are not accessed or administered by service providers unless such requirements, and associated measures to control such requirements, are documented in contractual arrangements. In doing so, it is important that sufficient measures are also in place to detect and record any unauthorised access, such as customer support representatives or platform engineers accessing encryption keys. In such cases, the service provider should immediately report the cyber security incident to their customer and make available all logs pertaining to the unauthorised access.

Security Control: 1073; Revision: 5; Updated: Jun-21; Applicability: All

An organisation's systems and data are not accessed or administered by a service provider unless a contractual arrangement exists between the organisation and the service provider to do so.

Security Control: 1576; Revision: 1; Updated: Jun-21; Applicability: All

If an organisation's systems or data are accessed or administered by a service provider in an unauthorised manner, organisations are immediately notified.

Further information

Further information on the definition of cloud computing can be found in NIST SP 800-145, [*The NIST Definition of Cloud Computing*](#).

Further information on [*securing cloud services*](#) is available from the Australian Cyber Security Centre (ACSC).

Further information on conducting security assessments of cloud service providers can be found in the ACSC's [*Anatomy of a Cloud Assessment and Authorisation*](#) publication.

Further information on [*the purpose of IRAP*](#), and [*a list of current IRAP assessors*](#), is available from the ACSC.

Further information on the whole-of-government policy for secure cloud computing can be found in the Digital Transformation Agency's [*Secure Cloud Strategy*](#) publication.

Further information on outsourced goods and services can be found in the Attorney-General's Department's [*Protective Security Policy Framework*](#), [*Security governance for contracted goods and service providers*](#) policy.

Further information on cyber supply chain risk management can be found in the ACSC's [*Cyber Supply Chain Risk Management*](#) and [*Identifying Cyber Supply Chain Risks*](#) publications.

Further information on supply chain integrity can be found in NIST SP 800-161, [*Supply Chain Risk Management Practices for Federal Information Systems and Organizations*](#).

Guidelines for Security Documentation

Development and maintenance of security documentation

Cyber security strategy

A cyber security strategy sets out an organisation's guiding principles, objectives and priorities for cyber security, typically over a three to five year period. In addition, a cyber security strategy may also cover an organisation's threat environment, cyber security initiatives or investments the organisation plans to make as part of its cyber security program. Without a cyber security strategy, organisations risk failing to adequately plan for and manage security and business risks within their organisation.

Security Control: 0039; Revision: 4; Updated: May-19; Applicability: All
A cyber security strategy is developed and implemented for the organisation.

Approval of security documentation

If security documentation is not approved, personnel will have difficulty ensuring appropriate policies, processes and procedures are in place. Approval of security documentation not only assists in the implementation of policies, processes and procedures, it also ensures personnel are aware of cyber security issues and security risks.

Security Control: 0047; Revision: 4; Updated: May-19; Applicability: All
Organisational-level security documentation is approved by the Chief Information Security Officer while system-specific security documentation is approved by the system's authorising officer.

Maintenance of security documentation

Threat environments are dynamic. If security documentation is not kept up-to-date to reflect the current threat environment, policies, processes and procedures may cease to be effective. In such a situation, resources could be devoted to cyber security initiatives or investments that have reduced effectiveness or are no longer relevant.

Security Control: 0888; Revision: 5; Updated: May-19; Applicability: All
Security documentation is reviewed at least annually and includes a 'current as at [date]' or equivalent statement.

Communication of security documentation

It is important that once security documentation has been approved, either initially or following any changes, it is published and communicated to all stakeholders. If security documentation is not communicated to stakeholders they will be unaware of what policies and procedures have been implemented for systems.

Security Control: 1602; Revision: 0; Updated: Aug-20; Applicability: All
Security documentation, including notification of subsequent changes, is communicated to all stakeholders.

Further information

Further information on system-specific security documentation, such as a system security plan, incident response plan, continuous monitoring plan, security assessment report and plan of action and milestones, can be found in the following section of these guidelines.

Further information on business continuity and disaster recovery plans can be found in the [Guidelines for Cyber Security Roles](#).

Further information on intrusion detection and prevent policy can be found in the [Guidelines for Cyber Security Incidents](#).

Further information on cyber security incident registers can be found in the [Guidelines for Cyber Security Incidents](#).

Further information on authorised Radio Frequency and infrared device registers can be found in the [Guidelines for Physical Security](#).

Further information on cable registers can be found in the [Guidelines for Communications Infrastructure](#).

Further information on cable labelling processes and procedures can be found in the [Guidelines for Communications Infrastructure](#).

Further information on telephone system usage policy can be found in the [Guidelines for Communications Systems](#).

Further information on denial of service response plans for video conferencing and Internet Protocol telephony services can be found in the [Guidelines for Communications Systems](#).

Further information on fax machine and multifunction device usage policy can be found in the [Guidelines for Communications Systems](#).

Further information on mobile device management policy can be found in the [Guidelines for Enterprise Mobility](#).

Further information on mobile device usage policy can be found in the [Guidelines for Enterprise Mobility](#).

Further information on mobile device emergency sanitisation processes and procedures can be found in the [Guidelines for Enterprise Mobility](#).

Further information on ICT equipment management policy can be found in the [Guidelines for ICT Equipment](#).

Further information on ICT equipment sanitisation processes and procedures can be found in the [Guidelines for ICT Equipment](#).

Further information on ICT equipment disposal processes and procedures can be found in the [Guidelines for ICT Equipment](#).

Further information on ICT equipment registers can be found in the [Guidelines for ICT Equipment](#).

Further information on media management policy can be found in the [Guidelines for Media](#).

Further information on removable media usage policy can be found in the [Guidelines for Media](#).

Further information on media sanitisation processes and procedures can be found in the [Guidelines for Media](#).

Further information on media destruction processes and procedures can be found in the [Guidelines for Media](#).

Further information on media disposal processes and procedures can be found in the [Guidelines for Media](#).

Further information on removable media registers can be found in the [Guidelines for Media](#).

Further information on system administration processes and procedures can be found in the [Guidelines for System Management](#).

Further information on patch management processes and procedures can be found in the [Guidelines for System Management](#).

Further information on software registers can be found in the [Guidelines for System Management](#).

Further information on change management processes and procedures can be found in the [Guidelines for System Management](#).

Further information on digital preservation policy can be found in the [Guidelines for System Management](#).

Further information on data backup processes and procedures can be found in the [Guidelines for System Management](#).

Further information on data restoration processes and procedures can be found in the [Guidelines for System Management](#).

Further information on event logging policy can be found in the [Guidelines for System Monitoring](#).

Further information on event log auditing processes and procedures can be found in the [Guidelines for System Monitoring](#).

Further information on database registers can be found in the [Guidelines for Database Systems](#).

Further information on email usage policy can be found in the [Guidelines for Email](#).

Further information on network device registers can be found in the [Guidelines for Networking](#).

Further information on web usage policy can be found in the [Guidelines for Gateways](#).

Further information on data transfer processes and procedures can be found in the [Guidelines for Data Transfers](#).

System-specific security documentation

System-specific security documentation

System-specific security documentation, such as a system security plan, incident response plan, continuous monitoring plan, security assessment report, and plan of action and milestones, supports the accurate and consistent application of policies, processes and procedures for systems. As such, it is important that they are developed by personnel with a good understanding of security matters, the technologies being used and the business requirements of the organisation.

System-specific security documentation may be presented in a number of formats including dynamic content such as wikis or other forms of document repositories. Furthermore, depending on the documentation framework used, details common to multiple systems could be consolidated into higher level security documentation.

System security plan

The system security plan provides a description of a system and includes an annex that describes the security controls that have been identified and implemented for the system.

There can be many stakeholders involved in developing and maintaining a system security plan. This can include representatives from:

- cyber security teams within the organisation
- project teams who deliver the capability (including contractors)
- support teams who operate and support the capability
- data owners for data processed, stored or communicated by the system
- users for whom the capability is being developed.

Security Control: 0041; Revision: 4; Updated: Dec-21; Applicability: All

Systems have a system security plan that includes a description of the system and an annex that covers both applicable security controls from this document and any additional security controls that have been identified.

Incident response plan

Having an incident response plan ensures that when a cyber security incident occurs, a plan is in place to respond appropriately to the situation. In most situations, the aim of the response will be to prevent the cyber security incident from escalating, restore any impacted system or data, and preserve any evidence.

Security Control: 0043; Revision: 4; Updated: Dec-21; Applicability: All

Systems have an incident response plan that covers the following:

- *guidelines on what constitutes a cyber security incident*
- *the types of cyber security incidents likely to be encountered and the expected response to each type*
- *how to report cyber security incidents, internally to an organisation and externally to relevant authorities*
- *other parties which need to be informed in the event of a cyber security incident*
- *the authority, or authorities, responsible for investigating and responding to cyber security incidents*
- *the criteria by which an investigation of a cyber security incident would be requested from a law enforcement agency, the Australian Cyber Security Centre or other relevant authority*
- *the steps necessary to ensure the integrity of evidence relating to a cyber security incident*
- *system contingency measures or a reference to such details if they are located in a separate document.*

Continuous monitoring plan

A continuous monitoring plan can assist organisations in proactively identifying, prioritising and responding to security vulnerabilities. Measures to monitor and manage security vulnerabilities in systems can also provide organisations with a wealth of valuable information about their exposure to cyber threats, as well as assisting them to determine security risks associated with the operation of their systems. Undertaking continuous monitoring activities is important as cyber threats and the effectiveness of security controls will change over time.

Three types of continuous monitoring activities are vulnerability assessments, vulnerability scans and penetration tests. A vulnerability assessment typically consists of a review of a system's architecture or an in-depth hands-on assessment while a vulnerability scan involves using software tools to conduct automated checks for known security vulnerabilities. In each case, the goal is to identify as many security vulnerabilities as possible. A penetration test however is designed to exercise real-world scenarios in an attempt to achieve a specific goal, such as compromising critical system components or data. Regardless of the continuous monitoring activities chosen, they should be conducted by suitably skilled personnel independent of the system being assessed. Such personnel can be internal to an organisation or from a third party. This ensures that there is no conflict of interest, perceived or otherwise, and that the activities are undertaken in an objective manner.

Security Control: 1163; Revision: 7; Updated: Dec-21; Applicability: All

Systems have a continuous monitoring plan that includes:

- *conducting vulnerability scans for systems at least monthly*
- *conducting vulnerability assessments or penetration tests for systems at least annually*
- *analysing identified security vulnerabilities to determine their potential impact*
- *using a risk-based approach to prioritise the implementation of mitigations based on effectiveness and cost.*

Security assessment report

At the conclusion of a security assessment for a system, a security assessment report should be produced by the assessor. This will assist the system owner in performing any initial remediation actions as well as guiding the development of the system's plan of action and milestones.

Security Control: 1563; Revision: 0; Updated: May-20; Applicability: All

At the conclusion of a security assessment for a system, a security assessment report is produced by the assessor and covers:

- *the scope of the security assessment*
- *the system's strengths and weaknesses*
- *security risks associated with the operation of the system*
- *the effectiveness of the implementation of security controls*
- *any recommended remediation actions.*

Plan of action and milestones

At the conclusion of a security assessment for a system, and after the production of a security assessment report by the assessor, a plan of action and milestones should be produced by the system owner. This will assist with tracking any of the system's identified weaknesses and recommended remediation actions identified during the security assessment.

Security Control: 1564; Revision: 0; Updated: May-20; Applicability: All

At the conclusion of a security assessment for a system, a plan of action and milestones is produced by the system owner.

Guidelines for Physical Security

Facilities and systems

Physical access to systems

The application of the defence-in-depth principle to the protection of systems is enhanced through the use of successive layers of physical security. The first layer of physical security being the use of a security zone for facilities containing systems.

Deployable platforms should also meet physical security requirements. Notably, physical security certification authorities dealing with deployable platforms may have specific requirements that supersede the security controls in these guidelines. This may include perimeter controls, building standards and manning levels. As such, organisations implementing deployable platforms should contact their physical security certification authority to seek additional guidance.

Security Control: 0810; Revision: 5; Updated: Dec-21; Applicability: O, P, S, TS

Systems are secured in facilities that meet the requirements for a security zone suitable for their sensitivity or classification.

Physical access to servers, network devices and cryptographic equipment

The second layer of physical security is the use of an additional security zone for a server room or communications room. This is then further supplemented by the use of security containers or secure rooms for the protection of servers, network devices and cryptographic equipment.

Security Control: 1053; Revision: 3; Updated: Dec-21; Applicability: O, P, S, TS

Servers, network devices and cryptographic equipment are secured in server rooms or communications rooms that meet the requirements for a security zone suitable for their sensitivity or classification.

Security Control: 1530; Revision: 1; Updated: Dec-21; Applicability: O, P, S, TS

Servers, network devices and cryptographic equipment are secured in security containers or secure rooms suitable for their sensitivity or classification taking into account the combination of security zones they reside in.

Security Control: 0813; Revision: 4; Updated: Dec-21; Applicability: All

Server rooms, communications rooms, security containers and secure rooms are not left in unsecured states.

Security Control: 1074; Revision: 3; Updated: Dec-21; Applicability: All

Keys or equivalent access mechanisms to server rooms, communications rooms, security containers and secure rooms are appropriately controlled.

Physical access to network devices in public areas

Unprotected network devices in public areas could lead to either accidental or deliberate physical damage resulting in an interruption of services. Alternatively, unauthorised access to network devices may allow an adversary to reset them to factory default settings, thereby removing any security controls, or connect directly to them in order to bypass network access controls. Even if access to a network device is not gained by resetting it to factory default settings, it is highly likely that it will cause an interruption of services.

Physical access to network devices can be restricted through physical security controls such as enclosures that prevent access to their console ports and factory reset buttons, mounting them on ceilings or behind walls, or securing them in security containers.

Security Control: 1296; Revision: 3; Updated: Dec-21; Applicability: All

Physical security controls are implemented to protect network devices in public areas from physical damage or unauthorised access.

Bringing Radio Frequency and infrared devices into facilities

Radio Frequency (RF) devices, such as mobile devices, wireless keyboards and Bluetooth devices (e.g. keyboards, headphones and pointers), as well as infrared (IR) devices, can pose a security risk to organisations, especially when they are capable of recording or transmitting audio or data. In SECRET and TOP SECRET areas, it is important that organisations understand the security risks associated with the introduction of RF and IR devices and maintain a register of those that have been authorised for use in such environments.

In deciding which RF or IR devices to authorise to be brought into SECRET and TOP SECRET areas, organisations should consider any existing mitigating measures such as whether any IR communications would be prevented from travelling outside secured spaces, whether systems of different sensitivities or classifications are used in the same spaces, and if any temporary or permanent method of blocking RF or IR transmissions has been applied to the facility.

Security Control: 1543; Revision: 2; Updated: Sep-21; Applicability: S, TS

An authorised RF and IR device register is maintained and regularly audited for SECRET and TOP SECRET areas.

Security Control: 0225; Revision: 3; Updated: Sep-21; Applicability: S, TS

Unauthorised RF and IR devices are not brought into SECRET and TOP SECRET areas.

Security Control: 0829; Revision: 4; Updated: Mar-19; Applicability: S, TS

Security measures are used to detect and respond to unauthorised RF devices in SECRET and TOP SECRET areas.

Preventing observation by unauthorised people

Without sufficient perimeter security, the inside of a facility is often observable by unauthorised people, either directly or with the assistance of equipment using a telephoto lens. Ensuring systems, in particular workstation displays and keyboards, are not visible through windows, such as via the use of blinds, curtains, privacy films or workstation positioning, will assist in reducing this security risk.

Security Control: 0164; Revision: 3; Updated: Dec-21; Applicability: All

Unauthorised people are prevented from observing systems, in particular workstation displays and keyboards, within facilities.

Further information

Further information on emanation security considerations associated with bringing RF devices into SECRET and TOP SECRET areas can be found in the emanation security section of the [Guidelines for Communications Infrastructure](#).

Further information on the certification and accreditation authorities for physical security can be found in the Attorney-General's Department (AGD)'s [Protective Security Policy Framework](#) (PSPF), [Entity facilities](#) policy.

Further information on the physical security requirements for specific security zones can be found in AGD's PSPF, [Entity facilities](#) policy.

Further information on selecting security zones, security containers and secure rooms for the protection of ICT equipment can be found in AGD's PSPF, [Physical security for entity resources](#) policy.

ICT equipment and media

Securing ICT equipment and media

ICT equipment and media needs to be secured when not in use. This can be achieved by implementing one of the following approaches:

- securing ICT equipment and media in an appropriate security container or secure room
- using ICT equipment without hard drives and sanitising memory at shut down
- encrypting hard drives of ICT equipment and sanitising memory at shut down
- sanitising memory of ICT equipment at shut down and removing and securing any hard drives.

If none of the above approaches are feasible, organisation may wish to minimise the potential impact of not securing ICT equipment when not in use. This can be achieved by preventing sensitive or classified data from being stored on hard drives (e.g. by storing user profiles and documents on network shares), removing temporary user data at logoff, scrubbing virtual memory at shut down, and sanitising memory at shut down. It should be noted though that there is no guarantee that such measures will always work effectively or will not be bypassed due to circumstances such as an unexpected loss of power. Therefore, hard drives in such cases will retain their sensitivity or classification for the purposes of reuse, reclassification, declassification, sanitisation, destruction and disposal.

Security Control: 0161; Revision: 5; Updated: Mar-19; Applicability: All
ICT equipment and media are secured when not in use.

Further information

Further information on ICT equipment and media can be found in the [Guidelines for Communications Systems](#), [Guidelines for ICT Equipment](#) and [Guidelines for Media](#).

Further information on the encryption of media can be found in the [Guidelines for Cryptography](#).

Further information on selecting security zones, security containers and secure rooms for the protection of ICT equipment can be found in AGD's PSPF, [Physical security for entity resources](#) policy.

Guidelines for Personnel Security

Cyber security awareness training

Providing cyber security awareness training

Organisations should ensure that cyber security awareness training is provided to all personnel in order to assist them in understanding their security responsibilities. The content of cyber security awareness training will depend on the security objectives of each organisation; however, personnel with responsibilities beyond that of a standard user will require tailored privileged user training.

Security Control: 0252; Revision: 6; Updated: Jun-20; Applicability: All

Cyber security awareness training is undertaken annually by all personnel and covers:

- the purpose of the cyber security awareness training
- security appointments and contacts within the organisation
- authorised use of systems and their resources
- protection of systems and their resources
- reporting of cyber security incidents and suspected compromises of systems and their resources.

Security Control: 1565; Revision: 0; Updated: Jun-20; Applicability: All

Tailored privileged user training is undertaken annually by all privileged users.

Reporting suspicious contact via online services

Online services such as email, internet forums, messaging apps and direct messaging on social media can all be used by an adversary in an attempt to elicit sensitive or classified information from personnel. As such, personnel should be advised of what suspicious contact via online services is and how to report it.

Security Control: 0817; Revision: 4; Updated: Jan-20; Applicability: All

Personnel are advised of what suspicious contact via online services is and how to report it.

Posting work information to online services

Personnel should be advised to take special care not to post work information to online services unless authorised to do so, especially in internet forums and on social media. Even information that appears to be benign in isolation could, along with other information, have a considerable security impact. In addition, to ensure that personal opinions of individuals are not misinterpreted, personnel should be advised to maintain separate work and personal accounts for online services, especially when using social media.

Security Control: 0820; Revision: 5; Updated: Jan-20; Applicability: All

Personnel are advised to not post work information to unauthorised online services and to report cases where such information is posted.

Security Control: 1146; Revision: 2; Updated: Sep-18; Applicability: All

Personnel are advised to maintain separate work and personal accounts for online services.

Posting personal information to online services

Personnel should be advised that any personal information they post to online services, such as social media, could be used by an adversary to develop a detailed understanding of their lifestyle and interests. In turn, this information could

be used to build trust in order to elicit sensitive or classified information from them, or influence them to undertake specific actions such as opening malicious email attachments or visiting malicious websites. Furthermore, encouraging personnel to use any available privacy settings for online services can reduce security risks by restricting who can view their information as well as their interactions with such services.

Security Control: 0821; Revision: 3; Updated: Oct-19; Applicability: All

Personnel are advised of security risks associated with posting personal information to online services and are encouraged to use any available privacy settings to restrict who can view such information.

Sending and receiving files via online services

When personnel send and receive files via unauthorised online services, such as messaging apps and social media, they often bypass security controls put in place to detect and quarantine malicious code. Advising personnel to send and receive files via authorised online services instead will ensure files are appropriately protected and scanned for malicious code.

Security Control: 0824; Revision: 2; Updated: Sep-18; Applicability: All

Personnel are advised not to send or receive files via unauthorised online services.

Further information

Further information on email usage policy can be found in the email usage section of the [Guidelines for Email](#).

Further information on web usage policy can be found in the web proxies section of the [Guidelines for Gateways](#).

Further information on detecting socially engineered messages be found in the Australian Cyber Security Centre (ACSC)'s [Detecting Socially Engineered Messages](#) publication.

Further information on the use of social media can be found in the ACSC's [Security Tips for Social Media and Messaging Apps](#) publication.

Further information on the sanitisation of documents before posting them to authorised online services can be found in the ACSC's [An Examination of the Redaction Functionality of Adobe Acrobat Pro DC 2017](#) publication.

Access to systems and their resources

Security clearances

Where these guidelines refer to security clearances, it applies to Australian security clearances or security clearances from a foreign government which are formally recognised by Australia.

System access requirements

Documenting access requirements for a system and its resources can assist in determining if personnel have the appropriate authorisation, security clearance, briefings and need-to-know to access the system and its resources. Types of users for which access requirements should be documented include unprivileged users, privileged users, foreign nationals and contractors.

Security Control: 0432; Revision: 7; Updated: Dec-21; Applicability: All

Access requirements for a system and its resources are documented in its system security plan.

Security Control: 0434; Revision: 6; Updated: Aug-19; Applicability: All

Personnel undergo appropriate employment screening, and where necessary hold an appropriate security clearance, before being granted access to a system and its resources.

Security Control: 0435; Revision: 3; Updated: Aug-19; Applicability: All

Personnel receive any necessary briefings before being granted access to a system and its resources.

User identification

Having uniquely identifiable users ensures accountability for access to a system and its resources. Furthermore, where a system processes, stores or communicates Australian Eyes Only (AUSTEO), Australian Government Access Only (AGAO) or Releasable To (REL) data, and foreign nationals have access to the system, it is important that the foreign nationals are identified as such.

Security Control: 0414; Revision: 4; Updated: Aug-19; Applicability: All

Personnel granted access to a system and its resources are uniquely identifiable.

Security Control: 0415; Revision: 3; Updated: Aug-19; Applicability: All

The use of shared user accounts is strictly controlled, and personnel using such accounts are uniquely identifiable.

Security Control: 1583; Revision: 0; Updated: Aug-20; Applicability: All

Personnel who are contractors are identified as such.

Security Control: 0420; Revision: 11; Updated: Dec-21; Applicability: S, TS

Where a system processes, stores or communicates AUSTEO, AGAO or REL data, personnel who are foreign nationals are identified as such, including by their specific nationality.

Unprivileged access to systems

Personnel seeking access to systems, applications and data repositories should have a genuine business requirement validated by their manager or another appropriate authority.

Security Control: 0405; Revision: 7; Updated: Dec-21; Applicability: All

Requests for unprivileged access to systems, applications and data repositories are validated when first requested.

Security Control: 1566; Revision: 2; Updated: Dec-21; Applicability: All

Use of unprivileged access is logged.

Security Control: 1714; Revision: 0; Updated: Dec-21; Applicability: All

Unprivileged access event logs are centrally stored and protected from unauthorised modification and deletion, monitored for signs of compromise, and actioned when cyber security events are detected.

Unprivileged access to systems by foreign nationals

Due to the extra sensitivities associated with AUSTEO, AGAO and REL data, foreign access to such data is strictly controlled.

Security Control: 0409; Revision: 7; Updated: Jun-21; Applicability: S, TS

Foreign nationals, including seconded foreign nationals, do not have access to systems that process, store or communicate AUSTEO or REL data unless effective security controls are in place to ensure such data is not accessible to them.

Security Control: 0411; Revision: 6; Updated: Jun-21; Applicability: S, TS

Foreign nationals, excluding seconded foreign nationals, do not have access to systems that process, store or communicate AGAO data unless effective security controls are in place to ensure such data is not accessible to them.

Privileged access to systems

Privileged accounts are considered to be those which can alter or circumvent a system's security controls. This can also apply to users who have only limited privileges, such as software developers, but can still bypass security controls. A privileged account often has the ability to modify system configurations, account privileges, audit logs and security configurations for applications.

Privileged users, and in some cases privileged service accounts, are targeted by adversaries as they can potentially give full access to systems. As such, ensuring that privileged accounts do not have the ability to access the internet, email and web services minimises opportunities for these accounts to be compromised.

Note, for organisations implementing only Maturity Level Two of the [Essential Eight Maturity Model](#), security controls 1508, 1649 and 1651-1653 are not applicable.

Security Control: 1507; Revision: 2; Updated: Sep-21; Applicability: All

Requests for privileged access to systems and applications are validated when first requested.

Security Control: 1733; Revision: 0; Updated: Dec-21; Applicability: All

Requests for privileged access to data repositories are validated when first requested.

Security Control: 1508; Revision: 2; Updated: Sep-21; Applicability: All

Privileged access to systems and applications is limited to only what is required for users and services to undertake their duties.

Security Control: 1175; Revision: 4; Updated: Sep-21; Applicability: All

Privileged user accounts are prevented from accessing the internet, email and web services.

Security Control: 1653; Revision: 0; Updated: Sep-21; Applicability: All

Privileged service accounts are prevented from accessing the internet, email and web services.

Security Control: 1649; Revision: 0; Updated: Sep-21; Applicability: All

Just-in-time administration is used for administering systems and applications.

Security Control: 0445; Revision: 6; Updated: Sep-18; Applicability: All

Privileged users are assigned a dedicated privileged account to be used solely for tasks requiring privileged access.

Security Control: 1509; Revision: 1; Updated: Sep-21; Applicability: All

Use of privileged access is logged.

Security Control: 1650; Revision: 0; Updated: Sep-21; Applicability: All

Changes to privileged accounts and groups are logged.

Security Control: 1651; Revision: 0; Updated: Sep-21; Applicability: All

Privileged access event logs are centrally stored and protected from unauthorised modification and deletion, monitored for signs of compromise, and actioned when cyber security events are detected.

Security Control: 1652; Revision: 0; Updated: Sep-21; Applicability: All

Privileged account and group change event logs are centrally stored and protected from unauthorised modification and deletion, monitored for signs of compromise, and actioned when cyber security events are detected.

Privileged access to systems by foreign nationals

As privileged accounts often have the ability to bypass a system's security controls, it is strongly encouraged that foreign nationals are not given privileged access to systems that process, store or communicate AUSTEO, AGAO or REL data.

Security Control: 0446; Revision: 5; Updated: Jun-21; Applicability: S, TS

Foreign nationals, including seconded foreign nationals, do not have privileged access to systems that process, store or communicate AUSTEO or REL data.

Security Control: 0447; Revision: 4; Updated: Jun-21; Applicability: S, TS

Foreign nationals, excluding seconded foreign nationals, do not have privileged access to systems that process, store or communicate AGAO data.

Suspension of access to systems

Removing or suspending access to systems, applications and data repositories can prevent them from being accessed when there is no longer a legitimate business requirement for their use, such as when personnel change duties, leave an organisation or are detected undertaking malicious activities.

Security Control: 0430; Revision: 7; Updated: Sep-19; Applicability: All

Access to systems, applications and data repositories is removed or suspended on the same day personnel no longer have a legitimate requirement for access.

Security Control: 1591; Revision: 0; Updated: Aug-20; Applicability: All

Access to systems, applications and data repositories is removed or suspended as soon as practicable when personnel are detected undertaking malicious activities.

Security Control: 1404; Revision: 3; Updated: Dec-21; Applicability: All

Unprivileged access to systems and applications is automatically disabled after 45 days of inactivity.

Security Control: 1648; Revision: 0; Updated: Sep-21; Applicability: All

Privileged access to systems and applications is automatically disabled after 45 days of inactivity.

Security Control: 1716; Revision: 0; Updated: Dec-21; Applicability: All

Access to data repositories is automatically disabled after 45 days of inactivity.

Security Control: 1647; Revision: 0; Updated: Sep-21; Applicability: All

Privileged access to systems and applications is automatically disabled after 12 months unless revalidated.

Security Control: 1734; Revision: 0; Updated: Dec-21; Applicability: All

Privileged access to data repositories is automatically disabled after 12 months unless revalidated.

Recording authorisation for personnel to access systems

Retaining records of system account requests will assist in maintaining personnel accountability. This is needed to ensure there is a record of all personnel authorised to access a system, their user identification, who provided the authorisation, when the authorisation was granted and when the access was last reviewed.

Security Control: 0407; Revision: 4; Updated: Sep-18; Applicability: All

A secure record is maintained for the life of each system covering:

- *all personnel authorised to access the system, and their user identification*
- *who provided authorisation for access*
- *when access was granted*
- *the level of access that was granted*
- *when access, and the level of access, was last reviewed*
- *when the level of access was changed, and to what extent (if applicable)*
- *when access was withdrawn (if applicable).*

Temporary access to systems

Under strict circumstances, temporary access to systems, applications or data repositories may be granted to personnel who lack an appropriate security clearance or briefing. In such circumstances, personnel should have their access controlled in such a way that they only have access to data required for them to undertake their duties.

Security Control: 0441; Revision: 7; Updated: Jun-21; Applicability: All

When personnel are granted temporary access to a system, effective security controls are put in place to restrict their access to only data required for them to undertake their duties.

Security Control: 0443; Revision: 3; Updated: Sep-18; Applicability: S, TS

Temporary access is not granted to systems that process, store or communicate caveated or sensitive compartmented information.

Emergency access to systems

It is important that organisations do not lose access to systems. As such, organisations should always have a method for gaining access during emergencies. Typically, such emergencies would occur where access to systems cannot be gained via normal authentication processes (e.g. due to misconfigurations of authentication services, misconfigurations of security settings or due to a cyber security incident). In these situations, a break glass account (also known as an emergency access account) can be used to regain access. As break glass accounts generally have the highest level of privileges available for systems, extreme care should be taken to both protect them and to monitor for any signs of compromise or abuse.

When break glass accounts are used, actions undertaken will not be directly attributable to an individual, and systems may not generate audit logs. As such, additional security controls need to be implemented in order to ensure the system's integrity. In doing so, organisations should ensure that configuration changes made using a break glass account are identified and documented using change management processes and procedures. This includes documenting the individual using the break glass account, the reason for using the break glass account and the reason for any configuration changes made to a system.

As the custodian of each break glass account should be the only party who knows the account's credentials, credentials will need to be changed and tested by custodians after any authorised access by another party. Modern password managers that support automated credential changes and testing can assist in reducing the administrative overhead of such activities.

Security Control: 1610; Revision: 0; Updated: Aug-20; Applicability: All

A method of emergency access to systems is documented and tested at least once when initially implemented and each time fundamental information technology infrastructure changes occur.

Security Control: 1611; Revision: 0; Updated: Aug-20; Applicability: All

Break glass accounts are only used when normal authentication processes cannot be used.

Security Control: 1612; Revision: 0; Updated: Aug-20; Applicability: All

Break glass accounts are only used for specific authorised activities.

Security Control: 1613; Revision: 1; Updated: Dec-21; Applicability: All

Use of break glass accounts is logged.

Security Control: 1715; Revision: 0; Updated: Dec-21; Applicability: All

Break glass event logs are centrally stored and protected from unauthorised modification and deletion, monitored for signs of compromise, and actioned when cyber security events are detected.

Security Control: 1614; Revision: 0; Updated: Aug-20; Applicability: All

Break glass account credentials are changed by the account custodian after they are accessed by any other party.

Security Control: 1615; Revision: 0; Updated: Aug-20; Applicability: All

Break glass accounts are tested after credentials are changed.

Control of Australian systems

Due to extra sensitivities associated with AUSTEO and AGAO data, it is essential that control of systems that process, store or communicate such data are maintained by Australian nationals working for or on behalf of the Australian

Government. Furthermore, AUSTEO and AGAO data should only be accessible from systems under the sole control of the Australian Government that are located within facilities authorised by the Australian Government.

Security Control: 0078; Revision: 5; Updated: Jun-21; Applicability: S, TS

Systems processing, storing or communicating AUSTEO or AGAO data remain at all times under the control of an Australian national working for or on behalf of the Australian Government.

Security Control: 0854; Revision: 6; Updated: Dec-21; Applicability: S, TS

AUSTEO and AGAO data can only be accessed from systems under the sole control of the Australian Government that are located within facilities authorised by the Australian Government.

Further information

Further information on access to government resources, including temporary access, can be found in the Attorney-General's Department's [Protective Security Policy Framework](#), [Access to information](#) policy.

Guidelines for Communications Infrastructure

Cabling infrastructure

Applicability

This section is only applicable to facilities located within Australia. In addition, this section only applies to new cabling infrastructure installations or upgrades.

Shared facilities

In addition to common security controls, this section provides additional security controls for shared facilities (e.g. a single floor, or part of a floor, within a multi-tenanted building).

Cables and structured cabling systems

For the purposes of this section, a cable is defined as any fibre optic or copper material housed within a protective sheath for the purposes of transmitting data or control signals from one point in a facility to another. Each cable will form part of a structured cabling system and will need to comply with the Australian Standards associated with that system. In addition to network communications and data systems, some common building management structured cabling systems found within facilities are:

- fire control and sensor systems
- security control and surveillance systems
- lighting control systems
- access control systems
- voice and emergency telephony systems
- emergency control alert systems.

Cable sheaths and conduits

A cable's protective sheath is not considered to be a conduit.

Cable connector types

The same cable connector types can be used for all systems within a facility regardless of their sensitivity or classification.

Cabling infrastructure standards

Cabling infrastructure should be installed by an endorsed cable installer to the relevant Australian Standards to ensure personnel safety and system availability.

Security Control: 0181; Revision: 3; Updated: Mar-21; Applicability: All

Cabling infrastructure is installed in accordance with relevant Australian Standards, as directed by the Australian Communications and Media Authority.

Use of fibre-optic cables

Fibre-optic cables do not produce, nor are influenced by, electromagnetic emanations; thereby offering the highest degree of protection from electromagnetic emanation effects.

Security Control: 1111; Revision: 3; Updated: Mar-21; Applicability: All

Fibre-optic cables are used for cabling infrastructure instead of copper cables.

Cable register

Maintaining and regularly auditing cable registers assists installers and inspectors, with the help of floor plan diagrams, to trace cables for malicious or accidental changes or damage. In doing so, cable registers should track all cabling changes throughout the life of a system.

Security Control: 0211; Revision: 5; Updated: Jan-21; Applicability: All

A cable register is maintained and regularly audited.

Security Control: 0208; Revision: 6; Updated: Jun-21; Applicability: All

A cable register contains the following for each cable:

- *cable identifier*
- *cable colour*
- *sensitivity/classification*
- *source*
- *destination*
- *location*
- *seal numbers (if applicable).*

Floor plan diagrams

Floor plan diagrams, developed using computer-aided design and drafting software, and using alphanumeric grid referencing, provide an accurate scaled view for each floor and are critical to ensuring that cabling infrastructure components can be easily located by installers and inspectors. In doing so, floor plan diagrams should track all cabling infrastructure changes throughout the life of a system.

Security Control: 1645; Revision: 0; Updated: Jun-21; Applicability: All

Floor plan diagrams are maintained and regularly audited.

Security Control: 1646; Revision: 0; Updated: Jun-21; Applicability: All

Floor plan diagrams contain the following:

- *cable paths (including ingress and egress points between floors)*
- *cable reticulation system and conduit paths*
- *floor concentration boxes*
- *wall outlet boxes*
- *network cabinets.*

Cable labelling processes and procedures

Well documented cable labelling processes, and supporting cable labelling procedures, can make cable auditing and fault finding easier.

Security Control: 0206; Revision: 6; Updated: Dec-21; Applicability: All

Cable labelling processes, and supporting cable labelling procedures, are developed and implemented.

Labelling cables

Labelling cables with the correct source and destination details minimises the likelihood of cross-patching and aids in fault finding and configuration management.

Security Control: 1096; Revision: 2; Updated: Oct-19; Applicability: All

Cables are labelled at each end with sufficient source and destination details to enable the physical identification and inspection of the cable.

Labelling building management cables

All facilities will contain structured cabling systems to support building management and control functions. As Australian Standards require some structured cabling systems to use colours such as red (e.g. fire control systems), it is important that all cables are appropriately labelled.

Security Control: 1639; Revision: 0; Updated: Mar-21; Applicability: All

Building management cables are labelled with their purpose in black writing on a yellow background, with a minimum size of 2.5 cm x 1 cm, and attached at five-metre intervals.

Labelling cables for foreign systems in Australian facilities

Labelling cables for foreign systems in Australian facilities helps prevent unintended cross-patching of Australian and foreign systems.

Security Control: 1640; Revision: 0; Updated: Mar-21; Applicability: All

Cables for foreign systems installed in Australian facilities are labelled at inspection points.

Cable colours

The use of designated cable colours can provide an easy way to distinguish SECRET and TOP SECRET systems from other systems. For example, while SECRET and TOP SECRET cables have designated colours, cables for other systems may be any colour except for those reserved for SECRET and TOP SECRET systems. In addition, cable colours for other systems may be the same colour (e.g. blue).

Security Control: 0926; Revision: 9; Updated: Dec-21; Applicability: O, P

OFFICIAL and PROTECTED cables are coloured neither salmon pink nor red.

Security Control: 1718; Revision: 0; Updated: Dec-21; Applicability: S

SECRET cables colours are coloured salmon pink.

Security Control: 1719; Revision: 0; Updated: Dec-21; Applicability: TS

TOP SECRET cables colours are coloured red.

Cable colour non-conformance

In certain circumstances it may not be possible to use the correct colour for SECRET or TOP SECRET cables. Therefore, organisations should band such cables with the appropriate colour and ensure that the cable bands are easily visible at inspection points. In doing so, it is important that cable bands are robust enough to stand the test of time. Examples of appropriate cable bands include stick-on coloured labels, colour heat shrink, coloured ferrules or short lengths of banded conduit.

Security Control: 1216; Revision: 3; Updated: Dec-21; Applicability: S, TS

SECRET and TOP SECRET cables with non-conformant cable colouring are both banded with the appropriate colour and labelled at inspection points.

Cable inspectability

The ability to inspect cabling infrastructure is necessary to detect illicit tampering or degradation.

Security Control: 1112; Revision: 3; Updated: Dec-21; Applicability: All

Cables are inspectable at a minimum of five-metre intervals.

Security Control: 1119; Revision: 2; Updated: Dec-21; Applicability: O, P, S, TS

Cables in TOP SECRET areas are fully inspectable for their entire length.

Common cable reticulation systems and conduits

Cables from different cable groups can share common cable reticulation systems and conduits to reduce costs.

Security Control: 0187; Revision: 7; Updated: Dec-21; Applicability: S, TS

SECRET and TOP SECRET systems belong exclusively to their own cable groups.

Security Control: 0189; Revision: 4; Updated: Sep-21; Applicability: All

Cables only carry a single cable group, unless each cable group belongs to a different subunit.

Security Control: 1114; Revision: 3; Updated: Mar-21; Applicability: All

Cable groups sharing a common cable reticulation system have a dividing partition or a visible gap between the cable groups.

Enclosed cable reticulation systems

In shared facilities, cables should be enclosed in a sealed cable reticulation system to prevent access and enhance cable management.

Security Control: 1130; Revision: 4; Updated: Dec-21; Applicability: All

In shared facilities, cables are run in an enclosed cable reticulation system.

Covers for enclosed cable reticulation systems

In shared facilities, clear covers on enclosed cable reticulation systems are a convenient method of maintaining inspection requirements. Having clear covers face inwards increases their inspectability.

Security Control: 1164; Revision: 3; Updated: Dec-21; Applicability: All

In shared facilities, conduits or the front covers of ducts, cable trays in floors and ceilings, and associated fittings are clear plastic.

Sealing cable reticulation systems and conduits

In shared facilities, Security Construction and Equipment Committee (SCEC) endorsed seals should be used to provide evidence of any tampering or illicit access to TOP SECRET cable reticulation systems. In addition, TOP SECRET conduits should be sealed with a visible smear of conduit glue to prevent access.

Security Control: 0195; Revision: 6; Updated: Dec-21; Applicability: TS

In shared facilities, uniquely identifiable SCEC endorsed tamper-evident seals are used to seal all removable covers on TOP SECRET cable reticulation systems.

Security Control: 0194; Revision: 3; Updated: Dec-21; Applicability: TS

In shared facilities, a visible smear of conduit glue is used to seal all plastic conduit joints and TOP SECRET conduits connected by threaded lock nuts.

Labelling conduits

Labels for TOP SECRET conduits should be of sufficient size and colour to allow for easy identification.

Security Control: 0201; Revision: 3; Updated: Mar-21; Applicability: TS

Labels for TOP SECRET conduits are a minimum size of 2.5 cm x 1 cm, attached at five-metre intervals and marked as 'TS RUN'.

Cables in walls

Cables run correctly in walls allow for neater installations while maintaining separation and inspection requirements.

Security Control: 1115; Revision: 4; Updated: Dec-19; Applicability: All

Cables from cable trays to wall outlet boxes are run in flexible or plastic conduit.

Cables in party walls

In shared facilities, TOP SECRET cables are not run in party walls; however, an inner wall can be used to run TOP SECRET cables where sufficient space exists for their inspection.

Security Control: 1133; Revision: 3; Updated: Dec-21; Applicability: TS

In shared facilities, TOP SECRET cables are not run in party walls.

Wall penetrations

Penetrating a wall between a TOP SECRET area and a lower classified area requires the integrity of the TOP SECRET area to be maintained. In such scenarios, TOP SECRET cables should be encased in conduit with all gaps between the TOP SECRET conduit and the wall filled with an appropriate sealing compound.

Security Control: 1122; Revision: 2; Updated: Dec-21; Applicability: TS

Where wall penetrations exit a TOP SECRET area into a lower classified area, TOP SECRET cables are encased in conduit with all gaps between the TOP SECRET conduit and the wall filled with an appropriate sealing compound.

Wall outlet boxes

Wall outlet boxes are the main method of connecting cabling infrastructure to workstations. They allow the management of cables and the types of connectors allocated to various systems.

Security Control: 1104; Revision: 4; Updated: Dec-21; Applicability: All

Wall outlet boxes have connectors on opposite sides of the wall outlet box if the cable group contains cables belonging to different systems.

Security Control: 1105; Revision: 3; Updated: Mar-21; Applicability: All

Different cables groups do not share a wall outlet box.

Labelling wall outlet boxes

Clear labelling of wall outlet boxes diminishes the possibility of incorrectly attaching ICT equipment to the wrong wall outlet box. In cases where a wall outbox has a cable group containing cables belonging to different systems, each connector should be individually labelled.

Security Control: 1095; Revision: 5; Updated: Dec-21; Applicability: All

Wall outlet boxes denote the systems, cable identifiers and wall outlet box identifier.

Wall outlet box colours

The use of designated wall outlet box colours can provide an easy way to distinguish SECRET and TOP SECRET systems from other systems. For example, while SECRET and TOP SECRET wall outlet boxes have designated colours, wall outlet boxes for other systems may be any colour except for those reserved for SECRET and TOP SECRET systems. In addition, wall outlet box colours for other systems may be the same colour (e.g. white). Ideally, wall outlet boxes should be the same colour that is used for associated cabling infrastructure.

Security Control: 1107; Revision: 5; Updated: Dec-21; Applicability: O, P
OFFICIAL and PROTECTED wall outlet boxes are coloured neither salmon pink nor red.

Security Control: 1720; Revision: 0; Updated: Dec-21; Applicability: S
SECRET wall outlet boxes are coloured salmon pink.

Security Control: 1721; Revision: 0; Updated: Dec-21; Applicability: TS
TOP SECRET wall outlet boxes are coloured red.

Wall outlet box covers

Transparent wall outlet box covers allow for inspection of cable cross-patching and tampering.

Security Control: 1109; Revision: 3; Updated: Dec-19; Applicability: All
Wall outlet box covers are clear plastic.

Fly lead installation

Keeping the lengths of TOP SECRET fibre-optic fly leads to a minimum prevents clutter around desks, prevents damage, and reduces the chance of cross-patching and tampering. If lengths become excessive, TOP SECRET fibre-optic fly leads should be treated as cabling infrastructure and run in TOP SECRET conduit or fixed infrastructure such as desk partitioning.

Security Control: 0218; Revision: 6; Updated: Dec-21; Applicability: TS
If TOP SECRET fibre-optic fly leads exceeding five metres in length are used to connect wall outlet boxes to ICT equipment, they are run in a protective and easily inspected pathway that is clearly labelled at the ICT equipment end with the wall outlet box's identifier.

Connecting cable reticulation systems to cabinets

Controlling the routing from cable reticulation systems to cabinets can assist in preventing unauthorised modifications and tampering while also providing easy inspection of cables.

Security Control: 1102; Revision: 3; Updated: Dec-21; Applicability: All
Cable reticulation systems leading into cabinets are terminated as close as possible to the cabinet.

Security Control: 1101; Revision: 3; Updated: Dec-21; Applicability: O, P, S, TS
In TOP SECRET areas, cable reticulation systems leading into cabinets in server rooms or communications rooms are terminated as close as possible to the cabinet.

Security Control: 1103; Revision: 3; Updated: Dec-21; Applicability: O, P, S, TS
In TOP SECRET areas, cable reticulation systems leading into cabinets not in server rooms or communications rooms are terminated at the boundary of the cabinet.

Terminating cables in cabinets

Having individual or divided cabinets can assist in preventing accidental or deliberate cross-patching and makes inspection of cables easier.

Security Control: 1098; Revision: 4; Updated: Dec-21; Applicability: All

Cables are terminated in individual cabinets; or for small systems, one cabinet with a division plate to delineate cable groups.

Security Control: 1100; Revision: 1; Updated: Sep-18; Applicability: TS

TOP SECRET cables are terminated in an individual TOP SECRET cabinet.

Terminating cable groups on patch panels

Terminating cable groups on different patch panels in cabinets can assist in preventing accidental or deliberate cross-patching and makes inspection of cables easier.

Security Control: 0213; Revision: 3; Updated: Mar-21; Applicability: All

Different cable groups do not terminate on the same patch panel.

Physical separation of cabinets and patch panels

Physical separation between TOP SECRET systems and systems of lower classifications reduces the chance of cross-patching, thereby the possibility of unauthorised personnel gaining access to TOP SECRET systems.

Security Control: 1116; Revision: 3; Updated: Oct-19; Applicability: O, P, S, TS

There is a visible gap between TOP SECRET cabinets and cabinets of lower classifications.

Security Control: 0216; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS

TOP SECRET and non-TOP SECRET patch panels are physically separated by installing them in separate cabinets.

Security Control: 0217; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS

Where spatial constraints demand patch panels of lower classifications than TOP SECRET be located in the same cabinet as a TOP SECRET patch panel:

- *a physical barrier in the cabinet is provided to separate patch panels*
- *only personnel holding a Positive Vetting security clearance have access to the cabinet*
- *approval from the TOP SECRET system's authorising officer is obtained prior to installation.*

Audio secure rooms

Audio secure rooms are designed to prevent audio conversations from being overheard. The Australian Security Intelligence Organisation should be consulted before any modifications are made to TOP SECRET audio secure rooms.

Security Control: 0198; Revision: 3; Updated: Dec-21; Applicability: TS

When penetrating a TOP SECRET audio secure room, the Australian Security Intelligence Organisation is consulted and all directions provided are complied with.

Power reticulation

It is important that TOP SECRET systems have control over the power system to prevent denial of service by deliberate or accidental means.

Security Control: 1123; Revision: 3; Updated: Dec-21; Applicability: TS

A power distribution board with a feed from an Uninterruptible Power Supply is used to power all TOP SECRET ICT equipment.

Further information

[Australian cabling standards and regulations](#) can be obtained from the Australian Communications and Media Authority.

Further information on audio secure rooms can be found in the Attorney-General's Department's [Protective Security Policy Framework](#), [Physical security for entity resources](#) policy.

Further information on endorsed seals for various sealing requirements is available in the SCEC's [Security Equipment Evaluated Products List](#).

Emanation security

Emanation security threat assessments in Australia

Obtaining advice from the Australian Cyber Security Centre (ACSC) on potential adversaries, and appropriate emanation security controls, is vital to protecting SECRET and TOP SECRET systems.

Security Control: 0248; Revision: 6; Updated: Dec-21; Applicability: O, P

System owners deploying OFFICIAL or PROTECTED systems with Radio Frequency transmitters that will be co-located with SECRET or TOP SECRET systems contact the ACSC for an emanation security threat assessment and implement any additional installation criteria derived from the threat assessment.

Security Control: 0247; Revision: 4; Updated: Dec-21; Applicability: S, TS

System owners deploying SECRET or TOP SECRET systems with Radio Frequency transmitters inside or co-located with their facility contact the ACSC for an emanation security threat assessment and implement any additional installation criteria derived from the threat assessment.

Security Control: 1137; Revision: 3; Updated: Dec-21; Applicability: S, TS

System owners deploying SECRET or TOP SECRET systems in shared facilities contact the ACSC for an emanation security threat assessment and implement any additional installation criteria derived from the threat assessment.

Emanation security threat assessments outside Australia

Fixed sites outside Australia, and deployed military platforms, are more vulnerable to emanation security threats. Failing to implement emanation security controls could result in systems or military platforms emanating compromising signals, which if intercepted and analysed, could lead to serious consequences.

Security Control: 0249; Revision: 4; Updated: Dec-21; Applicability: O, P, S, TS

System owners deploying systems or military platforms overseas contact the ACSC for an emanation security threat assessment and implement any additional installation criteria derived from the threat assessment.

Early identification of emanation security controls

It is important to identify emanation security controls for systems early in their project life cycle as costs will be much greater if changes have to be made once a system has been designed and deployed.

Security Control: 0246; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS

An emanation security threat assessment is sought as early as possible in a project's life cycle as emanation security controls can have significant cost implications.

Electromagnetic interference/electromagnetic compatibility standards

While all ICT equipment may not need certification to emanation security standards, it still needs to meet applicable industry and government standards relating to electromagnetic interference/electromagnetic compatibility.

Security Control: 0250; Revision: 4; Updated: Dec-21; Applicability: All

ICT equipment meets industry and government standards relating to electromagnetic interference/electromagnetic compatibility.

Guidelines for Communications Systems

Telephone systems

Telephone system usage policy

All non-secure telephone systems are subject to interception. Personnel accidentally or maliciously communicating sensitive or classified information over a public telephone network can lead to its compromise.

Security Control: 1078; Revision: 3; Updated: Dec-21; Applicability: All

A telephone system usage policy is developed and implemented.

Personnel awareness

As there is a potential for unintended disclosure of information when using telephone systems, it is important that personnel are made aware of the sensitivity or classification of conversations that they can be used for. In addition, personnel should also be made aware of the security risks associated with the use of non-secure telephone systems in sensitive or classified areas.

When using cryptographic equipment to enable different levels of conversation for different kinds of connections, providing a visual indication to personnel as to the sensitivity or classification of information that can be discussed over the telephone system can assist in reducing the likelihood of unintended disclosure of information.

Security Control: 0229; Revision: 3; Updated: Sep-18; Applicability: All

Personnel are advised of the permitted sensitivity or classification of information that can be discussed over both internal and external telephone systems.

Security Control: 0230; Revision: 3; Updated: Sep-18; Applicability: All

Personnel are advised of security risks posed by non-secure telephone systems in areas where sensitive or classified conversations can occur.

Security Control: 0231; Revision: 2; Updated: Dec-21; Applicability: All

When using cryptographic equipment to permit different levels of conversation for different kinds of connections, telephone systems give a visual indication of what kind of connection has been made.

Protecting conversations

When sensitive or classified conversations are held using telephone systems, the conversation needs to be appropriately protected through the use of encryption.

Security Control: 0232; Revision: 3; Updated: Sep-18; Applicability: All

Telephone systems used for sensitive or classified conversations encrypt all traffic that passes over external systems.

Cordless telephone systems

Cordless telephone systems have minimal transmission security and are susceptible to interception. Using cordless telephone systems can result in disclosure of information to an unauthorised party through interception.

Security Control: 0233; Revision: 3; Updated: Sep-18; Applicability: All

Cordless telephone systems are not used for sensitive or classified conversations.

Speakerphones

As speakerphones are designed to pick up and transmit conversations in the vicinity of the device, using speakerphones in TOP SECRET areas presents a number of security risks; however, if personnel are able to reduce security risks through the use of an audio secure room that is secure during any conversations then they may be used.

Security Control: 0235; Revision: 4; Updated: Dec-21; Applicability: O, P, S, TS

Speakerphones are not used on telephone systems in TOP SECRET areas unless the telephone system is located in an audio secure room, the room is audio secure during conversations and only personnel involved in conversations are present in the room.

Off-hook audio protection

Using off-hook protection features minimises the chance of background conversations being accidentally coupled into handsets, headsets and speakerphones. Limiting the time an active microphone is open minimises this security risk.

Security Control: 0236; Revision: 5; Updated: Dec-21; Applicability: All

Off-hook audio protection features are used on telephone systems in areas where background conversations may exceed the sensitivity or classification that the telephone system is authorised for communicating.

Security Control: 0931; Revision: 6; Updated: Dec-21; Applicability: O, P, S, TS

In SECRET and TOP SECRET areas, push-to-talk handsets or push-to-talk headsets are used to meet any off-hook audio protection requirements.

Further information

Further information on Internet Protocol (IP) telephony can be found in the video conferencing and Internet Protocol telephony section of these guidelines.

Further information on mobile phones can be found in the [Guidelines for Enterprise Mobility](#).

Further information on encryption can be found in the [Guidelines for Cryptography](#).

Video conferencing and Internet Protocol telephony

Video conferencing and Internet Protocol telephony gateways

Where a video conferencing or IP telephony network is connected to another video conferencing or IP telephony network from a different security domain, the gateways section of the [Guidelines for Gateways](#) applies.

Where an analog telephone network, such as the Public Switched Telephone Network (PSTN), is connected to a data network, the gateways section of the [Guidelines for Gateways](#) does not apply.

Video conferencing and Internet Protocol telephony infrastructure hardening

Video conferencing and IP telephony infrastructure can be hardened in order to reduce its attack surface. For example, by ensuring that a Session Initiation Protocol server has a fully patched operating system, uses fully patched software and runs only required services.

Security Control: 1562; Revision: 0; Updated: Dec-19; Applicability: All

Video conferencing and IP telephony infrastructure is hardened.

Video-aware and voice-aware firewalls

The use of video-aware and voice-aware firewalls provides network security while supporting video and voice traffic. As such, when a requirement exists to implement a firewall in a gateway, and video conferencing or IP telephony traffic

passes through the gateway, a video-aware and/or voice-aware firewall will need to be used; however, this does not require separate firewalls to be deployed for video conferencing, IP telephony and data traffic. In such cases, organisations are encouraged to implement one firewall that is video-aware and data-aware; voice-aware and data-aware; or video-aware, voice-aware and data-aware depending on their needs.

Security Control: 0546; Revision: 7; Updated: Dec-21; Applicability: All

Where a requirement exists to implement a firewall in a gateway, and video conferencing or IP telephony traffic passes through the gateway, a video-aware and/or voice-aware firewall is used.

Protecting video conferencing and Internet Protocol telephony traffic

Video conferencing and IP telephony traffic can be vulnerable to eavesdropping, denial of service, person-in-the-middle and call spoofing attacks. To mitigate this security risk, video conferencing and IP telephony signalling and audio/video data can be protected with the use of Transport Layer Security. This is achieved through the use of the Session Initiation Protocol Secure protocol and the Secure Real-time Transport Protocol.

Security Control: 0548; Revision: 4; Updated: Dec-21; Applicability: All

Video conferencing and IP telephony calls are established using a secure session initiation protocol.

Security Control: 0547; Revision: 4; Updated: Dec-21; Applicability: All

Video conferencing and IP telephony calls are conducted using a secure real-time transport protocol.

Video conferencing unit and Internet Protocol phone authentication

Blocking unauthorised or unauthenticated devices by default will reduce the likelihood of unauthorised access to a video conferencing or IP telephony network.

Security Control: 0554; Revision: 1; Updated: Sep-18; Applicability: All

An encrypted and non-replayable two-way authentication scheme is used for call authentication and authorisation.

Security Control: 0553; Revision: 3; Updated: Sep-18; Applicability: All

Authentication and authorisation is used for all actions on a video conferencing network, including call setup and changing settings.

Security Control: 0555; Revision: 3; Updated: Dec-19; Applicability: All

Authentication and authorisation is used for all actions on an IP telephony network, including registering a new IP phone, changing phone users, changing settings and accessing voicemail.

Security Control: 0551; Revision: 7; Updated: Jan-20; Applicability: All

IP telephony is configured such that:

- *IP phones authenticate themselves to the call controller upon registration*
- *auto-registration is disabled and only authorised devices are allowed to access the network*
- *unauthorised devices are blocked by default*
- *all unused and prohibited functionality is disabled.*

Security Control: 1014; Revision: 6; Updated: Dec-21; Applicability: S, TS

Individual logins are implemented for IP phones used for SECRET or TOP SECRET conversations.

Traffic separation

Video conferencing and IP telephony traffic should be physically or logically separated from other data traffic to ensure its availability and quality of service.

Security Control: 0549; Revision: 4; Updated: Oct-19; Applicability: All

Video conferencing and IP telephony traffic is separated physically or logically from other data traffic.

Security Control: 0556; Revision: 5; Updated: Oct-19; Applicability: All

Workstations are not connected to video conferencing units or IP phones unless the workstation or the device uses Virtual Local Area Networks or similar mechanisms to maintain separation between video conferencing, IP telephony and other data traffic.

Internet Protocol phones in public areas

IP phones in public areas may give an adversary the opportunity to access data networks or poorly protected voicemail and directory services. As such, any services accessible to IP phones in public areas should be restricted.

Security Control: 0558; Revision: 6; Updated: Dec-21; Applicability: All

IP phones used in public areas do not have the ability to access data networks, voicemail and directory services.

Microphones and webcams

Microphones (including headsets and Universal Serial Bus [USB] handsets) and webcams can pose a security risk in SECRET and TOP SECRET areas. Specifically, an adversary can email or host a malicious application on a compromised website and use social engineering techniques to convince users into installing the application on their workstation. Such malicious applications may then activate microphones or webcams that are attached to the workstation to act as remote listening and recording devices.

Security Control: 0559; Revision: 5; Updated: Dec-21; Applicability: O, P

Microphones (including headsets and USB handsets) and webcams are not used with non-SECRET workstations in SECRET areas.

Security Control: 1450; Revision: 2; Updated: Dec-21; Applicability: O, P, S

Microphones (including headsets and USB handsets) and webcams are not used with non-TOP SECRET workstations in TOP SECRET areas.

Developing a denial of service response plan

Video conferencing and IP telephony services are considered a critical service for many organisations. A denial of service response plan will assist in responding to denial-of-service attacks against these services.

Security Control: 1019; Revision: 8; Updated: Dec-21; Applicability: All

A denial of service response plan is developed and implemented for video conferencing and IP telephony services that includes:

- *how to identify signs of a denial-of-service attack*
- *how to identify the source of a denial-of-service attack*
- *how capabilities can be maintained during a denial-of-service attack*
- *what actions can be taken to respond to a denial-of-service attack.*

Further information

Further information on the use of telephone systems can be found in the telephone systems section of these guidelines.

Further information on the use of mobile devices can be found in the [Guidelines for Enterprise Mobility](#).

Further information on encryption can be found in the [Guidelines for Cryptography](#).

Further information on firewalls and gateways can be found in the [Guidelines for Gateways](#).

Further information on the use of web conferencing solutions can be found in the Australian Cyber Security Centre's [Web Conferencing Security](#) publication.

Fax machines and multifunction devices

Using cryptographic equipment with fax machines and multifunction devices

Further information on processes and procedures for sending classified fax messages using High Assurance Cryptographic Equipment can be requested from the Australian Cyber Security Centre.

Fax machine and multifunction device usage policy

As fax machines and multifunction devices (MFDs) are a potential source of cyber security incidents, it is important that organisations develop a policy governing their use.

Security Control: 0588; Revision: 3; Updated: Aug-19; Applicability: All

A fax machine and MFD usage policy is developed and implemented.

Sending fax messages

Once a fax machine or MFD has been connected to cryptographic equipment, and used to send a sensitive or classified fax message, it can no longer be trusted when connected directly to unsecured telecommunications infrastructure, such as the PSTN. For example, if a fax machine fails to send a sensitive or classified fax message the device will continue attempting to send the fax message even if it has been disconnected from cryptographic equipment and re-connected directly to the PSTN. In such cases, the fax machine could send the sensitive or classified fax message in the clear causing a data spill.

Security Control: 1092; Revision: 2; Updated: Sep-18; Applicability: All

Separate fax machines or MFDs are used for sending sensitive or classified fax messages and all other fax messages.

Security Control: 0241; Revision: 4; Updated: Dec-21; Applicability: All

When sending fax messages, the fax message is encrypted to an appropriate level to be communicated over unsecured telecommunications infrastructure.

Receiving fax messages

While the communications path between fax machines and MFDs may be appropriately protected, personnel should still be aware of who has a need to know of the information being communicated. It is therefore important that fax messages are collected from the receiving fax machine or MFD as soon as possible. Furthermore, if an expected fax message is not received it may indicate that there was a problem with the original transmission or the fax message has been taken by an unauthorised person.

Security Control: 1075; Revision: 2; Updated: Dec-21; Applicability: All

The sender of a fax message makes arrangements for the receiver to collect the fax message as soon as possible after it is sent and for the receiver to notify the sender if the fax message does not arrive in an agreed amount of time.

Connecting multifunction devices to networks

As networked MFDs are considered to be devices that reside on a network, they should have security controls (e.g. authentication and auditing measures) of a similar strength to other devices on the network.

Security Control: 0590; Revision: 5; Updated: Dec-19; Applicability: All

Security controls for MFDs connected to a network are of a similar strength to those for other devices on the network.

Connecting multifunction devices to both networks and digital telephone systems

When an MFD is connected to both a network and a digital telephone system, the MFD can act as a bridge between the two. The digital telephone system therefore needs to operate at the same sensitivity or classification as the network.

Security Control: 0245; Revision: 5; Updated: Dec-19; Applicability: All

A direct connection from an MFD to a digital telephone system is not enabled unless the digital telephone system is authorised to operate at the same sensitivity or classification as the network to which the MFD is connected.

Copying documents on multifunction devices

As networked MFDs are capable of sending scanned or copied documents across a connected network, personnel should be aware that if they scan or copy documents at a level higher than that of the network the device is connected to it will cause a data spill.

Security Control: 0589; Revision: 5; Updated: Dec-19; Applicability: All

MFDs connected to networks are not used to copy documents above the sensitivity or classification of the connected network.

Observing fax machine and multifunction device use

Placing fax machines and MFDs in public areas can help reduce the likelihood of any suspicious use going unnoticed.

Security Control: 1036; Revision: 3; Updated: Sep-18; Applicability: All

Fax machines and MFDs are located in areas where their use can be observed.

Further information

Further information on encryption can be found in the [Guidelines for Cryptography](#).

Further information on MFDs communicating via gateways can be found in the [Guidelines for Gateways](#).

Guidelines for Enterprise Mobility

Mobile device management

Types of mobile devices

These guidelines describe the use and protection of mobile devices such as mobile phones, tablets and laptops. Further guidance for laptops is available in the [Guidelines for System Hardening](#) and the [Guidelines for System Management](#).

Mobile device management policy

Since mobile devices routinely leave the office environment, and the protection it affords, it is important that a mobile device management policy is developed to ensure that they are protected in an appropriate manner.

Security Control: 1533; Revision: 2; Updated: Aug-19; Applicability: All
A mobile device management policy is developed and implemented.

Security Control: 1195; Revision: 1; Updated: Sep-18; Applicability: All
A Mobile Device Management solution is used to ensure mobile device management policy is applied to all mobile devices.

Approval for use

Due to the requirement for the provision of keying material, all mobile devices that process, store or communicate SECRET or TOP SECRET data need to be approved for use by the Australian Cyber Security Centre (ACSC) before keying material will be issued.

Security Control: 0687; Revision: 8; Updated: Dec-21; Applicability: S, TS
Mobile devices do not process, store or communicate SECRET or TOP SECRET data until approved for use by the ACSC.

Privately-owned mobile devices

Allowing privately-owned mobile devices to access an organisation's systems or data can increase liability risk. Organisations should seek legal advice to ascertain whether this scenario affects compliance with relevant legislation (e.g. the [Privacy Act 1988](#) and the [Archives Act 1983](#)), and also consider whether the increased liability risks are acceptable to the organisation. Risks will be dependent on each organisation's mobile device usage policy and its implementation.

If organisations choose to allow personnel to use a privately-owned mobile device to access their organisation's systems or data, they should ensure that it does not present an unacceptable security risk. Further information on security risks, and recommended security controls, for allowing the use of privately-owned mobile devices are discussed in the ACSC's [Risk Management of Enterprise Mobility Including Bring Your Own Device \(BYOD\)](#) publication.

Security Control: 1297; Revision: 4; Updated: Dec-21; Applicability: All
Legal advice is sought prior to allowing privately-owned mobile devices to access systems or data.

Security Control: 1400; Revision: 6; Updated: Dec-21; Applicability: O, P
Personnel accessing OFFICIAL and PROTECTED systems or data using a privately-owned mobile device use an ACSC-approved platform, a security configuration in accordance with ACSC guidance and have enforced separation of work data from any personal data.

Security Control: 0694; Revision: 7; Updated: Dec-21; Applicability: S, TS
Privately-owned mobile devices do not access SECRET and TOP SECRET systems or data.

Organisation-owned mobile devices

If organisations choose to issue personnel with an organisation-owned mobile device to access their organisation's systems or data, they should ensure that it does not present an unacceptable security risk. Further information on security risks, and recommended security controls, for allowing the use of organisation-owned mobile devices are discussed in the ACSC's [Risk Management of Enterprise Mobility Including Bring Your Own Device \(BYOD\)](#) publication.

Security Control: 1482; Revision: 5; Updated: Dec-21; Applicability: O, P, S, TS

Personnel accessing systems or data using an organisation-owned mobile device use an ACSC-approved platform with a security configuration in accordance with ACSC guidance.

Storage encryption

Encrypting the internal storage, and any removable media, for mobile devices will prevent adversaries from gaining easy access to any sensitive or classified data stored on them if they are lost or stolen.

Security Control: 0869; Revision: 5; Updated: Dec-21; Applicability: All

Mobile devices encrypt their internal storage and any removable media.

Communications encryption

If appropriate encryption is not available to protect data in transit, mobile devices communicating sensitive or classified data will present a security risk.

Security Control: 1085; Revision: 4; Updated: Dec-21; Applicability: All

Mobile devices encrypt all sensitive or classified data communicated over public network infrastructure.

Bluetooth functionality

To mitigate security risks associated with pairing mobile devices with other Bluetooth devices, Bluetooth version 4.1 introduced the Secure Connections functionality for Bluetooth Classic, while Bluetooth version 4.2 introduced the Secure Connections functionality for Bluetooth Low Energy. This functionality uses keys generated using Elliptic Curve Diffie-Hellman cryptography, thereby offering greater security compared to previous key exchange protocols. In addition, personnel should consider the location and manner in which they pair Bluetooth devices (e.g. by avoiding pairing devices in public locations) and remove all Bluetooth pairings when there is no longer a requirement for their use.

Finally, the Bluetooth protocol provides inadequate protection for SECRET and TOP SECRET data to be communicated between mobile devices and other Bluetooth devices. As such, Bluetooth functionality is not suitable for use with SECRET and TOP SECRET mobile devices.

Security Control: 1196; Revision: 1; Updated: Sep-18; Applicability: O, P

Mobile devices are configured to remain undiscoverable to other Bluetooth devices except during Bluetooth pairing.

Security Control: 1200; Revision: 4; Updated: Dec-21; Applicability: O, P

Bluetooth pairing is performed using Secure Connections, preferably with Numeric Comparison if supported.

Security Control: 1198; Revision: 1; Updated: Sep-18; Applicability: O, P

Bluetooth pairing is performed in a manner such that connections are only made between intended Bluetooth devices.

Security Control: 1199; Revision: 2; Updated: Dec-21; Applicability: O, P

Bluetooth pairings are removed when there is no longer a requirement for their use.

Security Control: 0682; Revision: 5; Updated: Dec-21; Applicability: S, TS

Bluetooth functionality is not enabled on SECRET and TOP SECRET mobile devices.

Maintaining mobile device security

Poorly secured mobile devices are more vulnerable to compromise, and provide an adversary with a potential access point into any connected systems. Although organisations may initially provide secure mobile devices, their security posture may degrade over time if personnel are capable of installing or uninstalling non-approved applications, or disabling or modifying security functionality. Furthermore, it is important that security updates are applied to mobile devices as soon as they become available in order to maintain their security posture.

Security Control: 0863; Revision: 4; Updated: Dec-21; Applicability: All

Mobile devices prevent personnel from installing or uninstalling non-approved applications once provisioned.

Security Control: 0864; Revision: 4; Updated: Dec-21; Applicability: All

Mobile devices prevent personnel from disabling or modifying security functionality once provisioned.

Security Control: 1366; Revision: 2; Updated: Dec-21; Applicability: All

Security updates are applied to mobile devices as soon as they become available.

Connecting mobile devices to the internet

When connecting mobile devices to the internet, best practice involves establishing a Virtual Private Network (VPN) connection to an organisation's internet gateway rather than a direct connection to the internet. In doing so, mobile devices will be protected by additional security functionality, such as web content filtering, provided by their organisation's internet gateway.

A split tunnel VPN can allow access into an organisation's network from other networks, such as the internet. If split tunnelling is not disabled there is an increased security risk that the VPN connection will be susceptible to intrusions from other networks. Organisations can refer to the relevant ACSC security configuration guidance for mobile devices on how to manage this security risk.

Security Control: 0874; Revision: 5; Updated: Dec-21; Applicability: All

Mobile devices access the internet via a VPN connection to an organisation's internet gateway rather than via a direct connection to the internet.

Security Control: 0705; Revision: 4; Updated: Dec-21; Applicability: All

When accessing an organisation's network via a VPN connection, split tunnelling is disabled.

Further information

Further information on hardening operating systems and applications for laptops can be found in the [Guidelines for System Hardening](#).

Further information on applying patches to operating systems and applications for laptops can be found in the system patching section of the [Guidelines for System Management](#).

Further information on encryption can be found in the [Guidelines for Cryptography](#).

Further information on allowing the use of privately-owned mobile devices by personnel to access their organisation's systems and data can be found in the ACSC's [Bring Your Own Device for Executives](#) publication.

Further information and specific guidance on enterprise mobility can be found in the ACSC's [Risk Management of Enterprise Mobility Including Bring Your Own Device \(BYOD\)](#) publication.

Further information on ACSC-approved platforms can be found in the following ACSC publications:

- [Security Configuration Guide – Apple iOS 14 Devices](#)
- [Security Configuration Guide – Samsung Galaxy S10, S20 and Note 20 Devices](#)
- [Security Configuration Guide – Viasat Mobile Dynamic Defense](#).

Further information on Bluetooth security can be found in National Institute of Standards and Technology Special Publication 800-121 Rev. 2, [Guide to Bluetooth Security](#).

Mobile device usage

Mobile device usage policy

Since mobile devices routinely leave the office environment, and the protection it affords, it is important that organisations develop a mobile device usage policy governing their use.

Security Control: 1082; Revision: 2; Updated: Aug-19; Applicability: All

A mobile device usage policy is developed and implemented.

Personnel awareness

Mobile devices can have both a voice and data communications component. In such cases, personnel should know the sensitivity or classification of voice and data that mobile devices have been approved to process, store and communicate.

Security Control: 1083; Revision: 2; Updated: Sep-18; Applicability: All

Personnel are advised of the sensitivity or classification permitted for voice and data communications when using mobile devices.

Paging, message services and messaging apps

As paging, messaging services and many messaging apps do not sufficiently encrypt data in transit, they cannot be relied upon for the communication of sensitive or classified data.

Security Control: 0240; Revision: 7; Updated: Dec-21; Applicability: All

Paging, Multimedia Message Service, Short Message Service and messaging apps are not used to communicate sensitive or classified data.

Using mobile devices in public spaces

Personnel should be aware of the environment in which they use mobile devices to view or communicate sensitive or classified data, especially in public areas such as public transport, transit lounges and coffee shops. In such locations, personnel should take care to ensure that sensitive or classified data is not observed by other parties. In some cases, privacy filters can be applied to the screen of a mobile device to prevent onlookers from reading content off its screen.

In addition, personnel should maintain awareness of the environments from which they conduct sensitive or classified phone calls and the potential for their conversations to be overheard.

Security Control: 0866; Revision: 5; Updated: Jun-21; Applicability: All

Sensitive or classified data is not viewed or communicated in public locations unless care is taken to reduce the chance of the screen of a mobile device being observed.

Security Control: 1145; Revision: 4; Updated: Dec-21; Applicability: S, TS

Privacy filters are applied to the screens of SECRET and TOP SECRET mobile devices.

Security Control: 1644; Revision: 0; Updated: Jun-21; Applicability: All

Sensitive or classified phone calls are not conducted in public locations unless care is taken to reduce the chance of conversations being overheard.

Maintaining control of mobile devices

As mobile devices are portable in nature, and can be easily lost or stolen, it is strongly advised that personnel maintain continual direct supervision of them when they are being actively used and carry or store them in a secured state (i.e. encryption is active) when they are not being actively used. Note, while mobile devices may be encrypted, the effectiveness of encryption might be reduced if they are lost or stolen while in sleep mode or powered on with a locked screen.

Security Control: 0871; Revision: 3; Updated: Apr-19; Applicability: All

Mobile devices are kept under continual direct supervision when being actively used.

Security Control: 0870; Revision: 3; Updated: Apr-19; Applicability: All

Mobile devices are carried or stored in a secured state when not being actively used.

Security Control: 1084; Revision: 4; Updated: Dec-21; Applicability: All

If unable to carry or store mobile devices in a secured state, they are physically transferred in a security briefcase or an approved multi-use satchel, pouch or transit bag.

Mobile device emergency sanitisation processes and procedures

The sanitisation of mobile devices in emergency situations can assist in reducing the potential for compromise of data by an adversary. This may be achieved through the use of a remote wipe capability or a cryptographic key zeroise or sanitisation function if present.

Security Control: 0701; Revision: 5; Updated: Dec-21; Applicability: All

Mobile device emergency sanitisation processes, and supporting mobile device emergency sanitisation procedures, are developed and implemented.

Security Control: 0702; Revision: 5; Updated: Dec-21; Applicability: S, TS

If a cryptographic zeroise or sanitise function is provided for cryptographic keys on a SECRET or TOP SECRET mobile device, the function is used as part of mobile device emergency sanitisation processes and procedures.

Before travelling overseas with mobile devices

Personnel travelling overseas with mobile devices face additional security risks compared to travelling domestically, especially when travelling to high or extreme risk countries. As such, appropriate precautions should be taken. Personnel should also be aware that when they leave Australian borders they also leave behind any expectations of privacy.

Security Control: 1298; Revision: 2; Updated: Oct-19; Applicability: All

Personnel are advised of privacy and security risks when travelling overseas with mobile devices.

Security Control: 1554; Revision: 1; Updated: Dec-21; Applicability: All

If travelling overseas with mobile devices to high or extreme risk countries, personnel are:

- *issued with newly provisioned accounts, mobile devices and removable media from a pool of dedicated travel devices which are used solely for work-related activities*
- *advised on how to apply and inspect tamper seals to key areas of mobile devices*
- *advised to avoid taking any personal mobile devices, especially if rooted or jailbroken.*

Security Control: 1555; Revision: 1; Updated: Dec-21; Applicability: All

Before travelling overseas with mobile devices, personnel take the following actions:

- *record all details of the mobile devices being taken, such as product types, serial numbers and International Mobile Equipment Identity numbers*

- *update all operating systems and applications*
- *remove all non-essential accounts, applications and data*
- *apply security configuration settings, such as lock screens*
- *configure remote locate and wipe functionality*
- *enable encryption, including for any removable media*
- *backup all important data and configuration settings.*

While travelling overseas with mobile devices

Personnel lose control of mobile devices and removable media any time they are not on their person. This includes when placing mobile devices and removable media in checked-in luggage or leaving them in hotel rooms (including hotel room safes). In addition, allowing untrusted people to access mobile devices provides an opportunity for them to be tampered with.

Security Control: 1299; Revision: 3; Updated: Dec-21; Applicability: All

Personnel take the following precautions when travelling overseas with mobile devices:

- *never leaving mobile devices or removable media unattended for any period of time, including by placing them in checked-in luggage or leaving them in hotel safes*
- *never storing credentials with mobile devices that they grant access to, such as in laptop bags*
- *never lending mobile devices or removable media to untrusted people, even if briefly*
- *never allowing untrusted people to connect their mobile devices or removable media, including for charging*
- *never using designated charging stations, wall outlet charging ports or chargers supplied by untrusted people*
- *avoiding connecting mobile devices to open or untrusted Wi-Fi networks*
- *using a VPN connection to encrypt all mobile device communications*
- *using encrypted messaging apps for communications instead of using foreign telecommunication networks*
- *disabling any communications capabilities of mobile devices when not in use, such as cellular data, wireless, Bluetooth and Near Field Communication*
- *avoiding reuse of removable media once used with other parties' systems or mobile devices*
- *ensuring any removable media used for data transfers are thoroughly checked for malicious code beforehand*
- *never using any gifted mobile devices, especially removable media, when travelling or upon returning from travelling.*

Security Control: 1088; Revision: 5; Updated: Dec-21; Applicability: All

Personnel report the potential compromise of mobile devices, removable media or credentials to their organisation as soon as possible, especially if they:

- *provide credentials to foreign government officials*
- *decrypt mobile devices for foreign government officials*
- *have mobile devices taken out of sight by foreign government officials*
- *have mobile devices or removable media stolen that are later returned*
- *lose mobile devices or removable media that are later found*
- *observe unusual behaviour of mobile devices.*

After travelling overseas with mobile devices

Following overseas travel with mobile devices, personnel should take appropriate precautions to ensure that they don't pose an undue security risk to their organisation's systems and data. In most cases, sanitising and resetting mobile devices, including all removable media, will be sufficient; however, upon returning from high or extreme risk countries, additional precautions will likely be needed.

Security Control: 1300; Revision: 5; Updated: Dec-21; Applicability: All

Upon returning from travelling overseas with mobile devices, personnel take the following actions:

- *sanitise and reset mobile devices, including all removable media*
- *decommission any physical credentials that left their possession during their travel*
- *report if significant doubt exists as to the integrity of any mobile devices or removable media.*

Security Control: 1556; Revision: 1; Updated: Dec-21; Applicability: All

If returning from travelling overseas with mobile devices to high or extreme risk countries, personnel take the following additional actions:

- *reset user credentials used with mobile devices, including those used for remote access to their organisation's systems*
- *monitor accounts for any indicators of compromise, such as failed logon attempts.*

Further information

Further information on bringing mobile devices into SECRET and TOP SECRET areas can be found in the facilities and systems section of the [Guidelines for Physical Security](#).

Further information on travelling overseas with mobile devices can be found in the ACSC's [Travelling Overseas with Electronic Devices](#) publication.

Further information on security briefcases can be found in the Australian Security Intelligence Organisation (ASIO)'s Security Equipment Guide-005, [Briefcases for the Carriage of Security Classified Information](#). ASIO's Security Equipment Guide-005 is available from the Protective Security Policy GovTEAMS community or ASIO by email.

Further information on approved multi-use satchels, pouches and transit bags is available in the Security Construction and Equipment Committee's [Security Equipment Evaluated Products List](#).

Guidelines for Evaluated Products

Evaluated product acquisition

Evaluated products

An evaluated product provides a level of assurance in its security functionality that an unevaluated product does not. To assist in providing this assurance, the Australian Cyber Security Centre (ACSC) performs product evaluations through the following programs:

- Enterprise Mobility Evaluation Program, for enterprise mobility products used to protect sensitive or classified data.
- High Assurance Evaluation Program, for products used to protect SECRET and TOP SECRET data.

The Australian Certification Authority within the ACSC also certifies product evaluations conducted by licensed commercial facilities, in accordance with the Common Criteria, as part of the Australian Information Security Evaluation Program (AISEP).

For organisations seeking to procure evaluated products, the Common Criteria's [Certified Products List](#) contains a list of products that have been evaluated and certified in accordance with the Common Criteria. Alternatively, the ACSC can be contacted for information on products that are either in-evaluation or have completed evaluation via the Enterprise Mobility Evaluation Program or the High Assurance Evaluation Program.

Cryptographic evaluations

The Common Criteria leverages the [Cryptographic Algorithm Validation Program](#) for the evaluation of cryptographic algorithms used by cryptographic modules within evaluated products. All cryptographic evaluations are performed by Cryptographic and Security Testing laboratories that are accredited by the United States' National Voluntary Laboratory Accreditation Program to International Organization for Standardization/International Electrotechnical Commission 17025:2017, [General requirements for the competence of testing and calibration laboratories](#).

Protection Profiles

A Protection Profile (PP) is a technology-specific document that defines the security functionality that must be included in a Common Criteria evaluated product to mitigate specific cyber threats. PPs can be published by a recognised Common Criteria Recognition Arrangement (CCRA) scheme or by the CCRA body itself. PPs published by the CCRA body are referred to as collaborative PPs.

The ACSC recognises all PPs listed on the Common Criteria website in addition to those listed on the ACSC's website. Where a PP does not exist, an evaluation based on an Evaluation Assurance Level (EAL) may be accepted. Such evaluations are capped at EAL2+ as this represents the best balance between completion time and meaningful security assurance gains.

Evaluation documentation

Organisations choosing to use Common Criteria evaluated products can determine their suitability by reviewing their evaluation documentation. This includes the security target and certification report.

Products that are undergoing a Common Criteria evaluation will not have published evaluation documentation; however, documentation can be obtained from the ACSC if a product is being evaluated through the AISEP. For a product that is in evaluation through a foreign scheme, the product's vendor can be contacted directly for further information.

Evaluated product selection

A Common Criteria evaluation is traditionally conducted at a specified EAL; however, evaluations against a PP exist outside of this scale. Notably, while products evaluated against a PP will fulfil the Common Criteria EAL requirements, the EAL number will not be published.

Security Control: 0280; Revision: 7; Updated: Sep-19; Applicability: All

If procuring an evaluated product, a product that has completed a PP-based evaluation is selected in preference to one that has completed an EAL-based evaluation.

Delivery of evaluated products

It is important that organisations ensure that products they purchase are the actual products that are delivered. In the case of evaluated products, if the product delivered differs from an evaluated version then the assurance gained from the evaluation may not necessarily apply.

Packaging and delivery practices can vary greatly from product to product. For most evaluated products, standard commercial packaging and delivery practices are likely to be sufficient; however, in some cases more secure packaging and delivery practices, including tamper-evident seals and secure transportation, may be required. In the case of the digital delivery of evaluated products, vendor-supplied checksums can often be used to ensure the integrity of software that was delivered.

Security Control: 0285; Revision: 1; Updated: Sep-18; Applicability: All

Evaluated products are delivered in a manner consistent with any delivery procedures defined in associated evaluation documentation.

Security Control: 0286; Revision: 6; Updated: Dec-21; Applicability: S, TS

When procuring high assurance ICT equipment, the ACSC is contacted for any equipment-specific delivery procedures.

Further information

Further information on the [High Assurance Evaluation Program](#) is available from the ACSC.

Further information on the [AISEP](#) is available from the ACSC.

Further information on Common Criteria evaluated products is available on the Common Criteria's [Certified Products List](#).

Evaluated product usage

Evaluated configuration

An evaluated product is considered to be operating in an evaluated configuration if:

- functionality that it uses was in the scope of the evaluation and it is implemented in the specified manner
- only product updates that have been assessed through maintenance and re-evaluation activities (known as assurance continuity) have been applied
- the environment complies with assumptions or organisational security policies stated in the evaluation documentation.

Unevaluated configuration

An evaluated product is considered to be operating in an unevaluated configuration when it does not meet the requirements of the evaluated configuration and guidance provided in its certification report.

Patching evaluated products

In the majority of cases, the latest patched version of an evaluated product will be more secure than an older unpatched version. While the application of patches will not normally place an evaluated product into an unevaluated configuration, some vendors may include new functionality which has not been evaluated with their patches. In such cases, organisations should use their judgement to determine whether this deviation from the evaluated configuration constitutes additional security risk or not.

Installation and configuration of evaluated products

Product evaluation provides assurance that a product's security functionality will work as expected when operating in a clearly defined configuration. The scope of the evaluation specifies the security functionality that can be used and how a product is to be configured and operated. Using an evaluated product in an unevaluated configuration could result in the introduction of security risks that were not considered as part of the product's evaluation.

Security Control: 0289; Revision: 2; Updated: Sep-18; Applicability: All

Evaluated products are installed, configured, administered and operated in accordance with vendor guidance and evaluation documentation.

Security Control: 0290; Revision: 6; Updated: Dec-21; Applicability: S, TS

High assurance ICT equipment is installed, configured, administered and operated in accordance with guidance produced by the ACSC.

Use of high assurance ICT equipment in unevaluated configurations

Given the value of data being protected by high assurance ICT equipment, it should always be operated in an evaluated configuration.

Security Control: 0292; Revision: 6; Updated: Dec-21; Applicability: S, TS

High assurance ICT equipment is always operated in an evaluated configuration.

Further information

Further information on the use of ICT equipment can be found in the [Guidelines for ICT Equipment](#).

Further information on patching can be found in the system patching section of the [Guidelines for System Management](#).

Further information on the installation, configuration, administration and operation of Common Criteria products is available from vendors and in evaluation documentation.

For information on the installation, configuration, administration and operation of high assurance ICT equipment is available from the ACSC.

Guidelines for ICT Equipment

ICT equipment usage

ICT equipment management policy

Since ICT equipment is capable of processing, storing or communicating sensitive or classified data, it is important that an ICT equipment management policy is developed and implemented to ensure that ICT equipment, and the data it processes, stores or communicates, is protected in an appropriate manner.

Security Control: 1551; Revision: 0; Updated: Aug-19; Applicability: All
An ICT equipment management policy is developed and implemented.

ICT equipment register

Maintaining and regularly auditing a register of authorised ICT equipment can assist organisations in tracking legitimate ICT equipment as well as determining whether unauthorised ICT equipment has been introduced into their organisation.

Security Control: 0336; Revision: 5; Updated: Sep-21; Applicability: All
An ICT equipment register is maintained and regularly audited.

Labelling ICT equipment

Applying protective markings to ICT equipment assists to reduce the likelihood that a user will accidentally input data into it that it is not approved for processing, storing or communicating.

While text-based protective markings are typically used for labelling ICT equipment, there may be circumstances where colour-based protective markings or other marking schemes need to be used instead. In such cases, the marking scheme will need to be documented and personnel will need to be trained in its use.

Security Control: 0294; Revision: 4; Updated: Sep-18; Applicability: All
ICT equipment, with the exception of high assurance ICT equipment, is labelled with protective markings reflecting its sensitivity or classification.

Labelling high assurance ICT equipment

High assurance ICT equipment often has tamper-evident seals placed on its external surfaces. To assist users in noticing changes to these seals, and to prevent functionality being degraded, organisations should limit the use of labels on high assurance ICT equipment.

Security Control: 0296; Revision: 5; Updated: Dec-21; Applicability: S, TS
The Australian Cyber Security Centre (ACSC)'s approval is sought before applying labels to external surfaces of high assurance ICT equipment.

Classifying ICT equipment

The purpose of classifying ICT equipment is to acknowledge the sensitivity or classification of data that it is approved for processing, storing or communicating.

Classifying ICT equipment also assists in ensuring that the appropriate sanitisation, destruction and disposal processes are followed at the end of its life.

Security Control: 0293; Revision: 5; Updated: Jun-21; Applicability: All

ICT equipment is classified based on the highest sensitivity or classification of data that it is approved for processing, storing or communicating.

Handling ICT equipment

As ICT equipment can often retain sensitive or classified data, it will need to be handled, and subsequently protected, as per the sensitivity or classification of data that it displays, processes, stores or communicates; however, applying encryption to media within ICT equipment may reduce its handling requirements. Any reduction in handling requirements needs to be based on the original sensitivity or classification of data residing on media within the ICT equipment and the level of assurance in the encryption software being used to encrypt the media.

Security Control: 1599; Revision: 0; Updated: Aug-20; Applicability: All

ICT equipment is handled in a manner suitable for its sensitivity or classification.

Further information

Further information on securing ICT equipment can be found in the ICT equipment and media section of the [Guidelines for Physical Security](#).

Further information on the use of encryption to reduce handling requirements for ICT equipment can be found in the cryptographic fundamentals section of the [Guidelines for Cryptography](#).

Further information on the protection of ICT equipment can be found in the Attorney-General's Department's [Protective Security Policy Framework](#), [Physical security for entity resources](#) policy.

ICT equipment maintenance and repairs

Maintenance and repairs of high assurance ICT equipment

Due to the nature of high assurance ICT equipment, it is important that that ACSC's approval is sought before any maintenance or repairs are undertaken.

Security Control: 1079; Revision: 5; Updated: Dec-21; Applicability: S, TS

The ACSC's approval is sought before undertaking any maintenance or repairs to high assurance ICT equipment.

On-site maintenance and repairs

Undertaking unauthorised maintenance or repairs to ICT equipment could impact its integrity. As such, using appropriately cleared technicians to maintain and repair ICT equipment on site is considered the most secure approach. This ensures that if data is disclosed during the course of maintenance or repairs, the technicians are aware of the requirements to protect such data.

Organisations choosing to use uncleared technicians to maintain or repair ICT equipment should be aware of the requirement for cleared personnel to escort uncleared technicians during maintenance or repair activities.

Security Control: 0305; Revision: 6; Updated: Dec-21; Applicability: All

Maintenance and repairs of ICT equipment is carried out on site by an appropriately cleared technician.

Security Control: 0307; Revision: 2; Updated: Sep-18; Applicability: All

If an uncleared technician is used to undertake maintenance or repairs of ICT equipment, the ICT equipment and associated media is sanitised before maintenance or repair work is undertaken.

Security Control: 0306; Revision: 5; Updated: Jun-21; Applicability: All

If an uncleared technician is used to undertake maintenance or repairs of ICT equipment, the technician is escorted by someone who:

- *is appropriately cleared and briefed*

- *takes due care to ensure that data is not disclosed*
- *takes all responsible measures to ensure the integrity of the ICT equipment*
- *has the authority to direct the technician*
- *is sufficiently familiar with the ICT equipment to understand the work being performed.*

Off-site maintenance and repairs

Organisations choosing to have ICT equipment maintained or repaired off site should be aware of requirements for the external company's facilities to be approved to do so based on the sensitivity or classification of the ICT equipment.

Organisations choosing to have ICT equipment maintained or repaired off site can sanitise the ICT equipment prior to transport, and subsequent maintenance or repair activities, to lower (depending on the types of media involved) its handling requirements.

Security Control: 0310; Revision: 6; Updated: Dec-21; Applicability: All

ICT equipment maintained or repaired off site is done so in accordance with the handling requirements for the sensitivity or classification of the ICT equipment.

Inspection of ICT equipment following maintenance and repairs

Following the maintenance or repair of ICT equipment (either on site or off site), it is important that the ICT equipment is inspected to ensure that it retains its approved software configuration and that no unauthorised modifications (either accidental or deliberate) have been made by technicians.

Security Control: 1598; Revision: 0; Updated: Aug-20; Applicability: All

Following maintenance or repair activities for ICT equipment, the ICT equipment is inspected to confirm it retains its approved software configuration and that no unauthorised modifications have taken place.

Further information

Further information on the sanitisation of media can be found in the media sanitisation section of the [Guidelines for Media](#).

ICT equipment sanitisation and disposal

ICT equipment sanitisation and disposal processes and procedures

Documenting processes and supporting procedures for ICT equipment sanitisation and disposal will ensure that organisations carry out ICT equipment sanitisation and disposal in an appropriate and consistent manner.

Security Control: 0313; Revision: 5; Updated: Dec-21; Applicability: All

ICT equipment sanitisation processes, and supporting ICT equipment sanitisation procedures, are developed and implemented.

Security Control: 1550; Revision: 1; Updated: Dec-21; Applicability: All

ICT equipment disposal processes, and supporting ICT equipment disposal procedures, are developed and implemented.

Sanitisation and disposal of ICT equipment

When disposing of ICT equipment, any media in the ICT equipment should be sanitised in situ or removed and sanitised separately. Once any media has been sanitised or removed, ICT equipment can be considered sanitised. As such, the ICT equipment can then be declassified and formally authorised for release into the public domain. However, if media cannot be sanitised or removed, the ICT equipment will need to be destroyed in its entirety.

Furthermore, as part of disposal processes, removing labels and markings indicating the owner, sensitivity, classification or any other marking that can associate ICT equipment with its prior use will ensure it does not draw undue attention following its disposal.

Media typically found in ICT equipment includes:

- electrostatic memory devices, such as laser printer cartridges used in multifunction devices (MFDs)
- non-volatile magnetic memory, such as hard disks
- non-volatile semiconductor memory, such as flash cards and solid state drives
- volatile memory, such as random-access memory sticks.

Security Control: 1217; Revision: 2; Updated: Dec-21; Applicability: All

Labels and markings indicating the owner, sensitivity, classification or any other marking that can associate ICT equipment with its prior use are removed prior to its disposal.

Security Control: 0311; Revision: 5; Updated: Sep-18; Applicability: All

When disposing of ICT equipment containing media, the ICT equipment is sanitised by sanitising the media within the ICT equipment, removing the media from the ICT equipment or destroying the ICT equipment in its entirety.

Security Control: 0315; Revision: 7; Updated: Dec-21; Applicability: S, TS

When disposing of high assurance ICT equipment, it is destroyed prior to its disposal.

Security Control: 0321; Revision: 4; Updated: Dec-21; Applicability: S, TS

When disposing of ICT equipment that has been designed or modified to meet emanation security standards, the ACSC is contacted for requirements relating to its disposal.

Security Control: 0316; Revision: 3; Updated: Dec-21; Applicability: All

Following sanitisation, destruction or declassification, a formal administrative decision is made to release ICT equipment, or its waste, into the public domain.

Sanitisation and disposal of highly sensitive ICT equipment

The ACSC provides specific advice on how to dispose of ICT equipment located overseas that has processed, stored or communicated Australian Eyes Only (AUSTEO) and Australian Government Access Only (AGAO) data as it can have more severe consequences for Australian interests if not sanitised and disposed of appropriately.

Security Control: 1218; Revision: 4; Updated: Dec-21; Applicability: S, TS

ICT equipment, including associated media, that is located overseas and has processed, stored or communicated AUSTEO or AGAO data, is sanitised in situ.

Security Control: 0312; Revision: 6; Updated: Dec-21; Applicability: S, TS

ICT equipment, including associated media, that is located overseas and has processed, stored or communicated AUSTEO or AGAO data that cannot be sanitised in situ, is returned to Australia for destruction.

Sanitisation and disposal of printers and multifunction devices

When sanitising and disposing of printers and MFDs, the printer cartridge or MFD print drum should be sanitised in addition to the sanitisation or removal of any media. This can be achieved by printing random text with no blank areas on each colour printer cartridge or MFD print drum. In addition, image transfer rollers and platens can become imprinted with text and images over time and should be destroyed if any text or images have been retained. Finally, any paper jammed in the paper path should be removed.

When printer cartridges and MFD print drums cannot be sanitised due to a hardware failure, or when they are empty, there is no other option available but to destroy them. Printer ribbons cannot be sanitised and should be destroyed.

Security Control: 0317; Revision: 3; Updated: Sep-18; Applicability: All

At least three pages of random text with no blank areas are printed on each colour printer cartridge or MFD print drum.

Security Control: 1219; Revision: 2; Updated: Dec-21; Applicability: All

MFD print drums and image transfer rollers are inspected and destroyed if there is remnant toner which cannot be removed or a print is visible on the image transfer roller.

Security Control: 1220; Revision: 2; Updated: Dec-21; Applicability: All

Printer and MFD platens are inspected and destroyed if any text or images are retained on the platen.

Security Control: 1221; Revision: 1; Updated: Sep-18; Applicability: All

Printers and MFDs are checked to ensure no pages are trapped in the paper path due to a paper jam.

Security Control: 0318; Revision: 3; Updated: Sep-18; Applicability: All

When unable to sanitise printer cartridges or MFD print drums, they are destroyed as per electrostatic memory devices.

Security Control: 1534; Revision: 0; Updated: Sep-18; Applicability: All

Printer ribbons in printers and MFDs are removed and destroyed.

Sanitising televisions and computer monitors

All types of televisions and computer monitors are capable of retaining data if mitigation measures are not taken during their lifetime. Cathode Ray Tube monitors and plasma screens can be affected by burn-in while Liquid Crystal Display screens can be affected by image persistence.

Televisions and computer monitors can be visually inspected by turning up the brightness and contrast to their maximum level to determine if any data has been burnt into or persists on the screen. If burn-in or image persistence is removed by this activity, televisions and computer monitors can be considered sanitised allowing them to be declassified and formally authorised for release into the public domain. However, if burn-in or persistence is not removed through these measures, televisions and computer monitors cannot be sanitised and should be destroyed.

If the television or computer monitor cannot be powered on (e.g. due to a faulty power supply) the unit cannot be sanitised and should be destroyed.

Security Control: 1076; Revision: 2; Updated: Sep-18; Applicability: All

Televisions and computer monitors with minor burn-in or image persistence are sanitised by displaying a solid white image on the screen for an extended period of time.

Security Control: 1222; Revision: 1; Updated: Sep-18; Applicability: All

Televisions and computer monitors that cannot be sanitised are destroyed.

Sanitising network devices

Routers, switches, network interface cards and firewalls contain memory that is used in their operation. This memory can often retain network configuration data such as passwords, encryption keys and certificates. The correct method to sanitise a network device will depend on the configuration of the device and the type of memory within the device. Device-specific guidance provided in evaluation documentation, or vendor sanitisation guidance, should be consulted to determine the most appropriate method to remove data from a network device's memory.

Security Control: 1223; Revision: 6; Updated: Dec-21; Applicability: All

Memory in network devices is sanitised using the following processes, in order of preference:

- *following device-specific guidance provided in evaluation documentation*
- *following vendor sanitisation guidance*
- *loading a dummy configuration file, performing a factory reset and then reinstalling firmware.*

Sanitising fax machines

Fax machines store data such as phone number directories and pages that are ready for transmission. In addition to the sanitisation or removal of any media within fax machines, the memory should be cleared and any paper jammed in the paper path should be removed.

Security Control: 1225; Revision: 2; Updated: Sep-18; Applicability: All

The paper tray of the fax machine is removed, and a fax message with a minimum length of four pages is transmitted, before the paper tray is re-installed to allow a fax summary page to be printed.

Security Control: 1226; Revision: 2; Updated: Sep-18; Applicability: All

Fax machines are checked to ensure no pages are trapped in the paper path due to a paper jam.

Further information

Further information on evaluated products can be found in the [Guidelines for Evaluated Products](#).

Further information on the sanitisation, destruction and disposal of media can be found in the [Guidelines for Media](#).

Guidelines for Media

Media usage

Media management policy

Since media is capable of storing sensitive or classified data, it is important that a media management policy is developed and implemented to ensure that all types of media, and the data it stores, is protected in an appropriate manner. In many cases, an organisation's media management policy will be closely tied to their removable media usage policy.

Security Control: 1549; Revision: 0; Updated: Aug-19; Applicability: All
A media management policy is developed and implemented.

Removable media usage policy

Establishing a removable media usage policy can decrease the likelihood and consequence of data spills, data loss and data theft. In doing so, a removable media usage policy will likely cover the following:

- permitted types and uses of removable media
- registration and labelling of removable media
- handling and protection of removable media
- reporting of lost or stolen removable media
- sanitisation or destruction of removable media at the end of its life.

Security Control: 1359; Revision: 3; Updated: Aug-19; Applicability: All
A removable media usage policy is developed and implemented.

Removable media register

Maintaining and regularly auditing a register of removable media can assist organisations in tracking and accounting for authorised removable media as well as identifying any non-authorised removal media in use within their organisation.

Security Control: 1713; Revision: 0; Updated: Sep-21; Applicability: All
A removable media register is maintained and regularly audited.

Labelling media

Labelling media helps personnel to identify its sensitivity or classification and ensure that appropriate measures are applied to its storage, handling and use.

While text-based protective markings are typically used for labelling media, there may be circumstances where colour-based protective markings or other marking schemes need to be used instead. In such cases, the marking scheme will need to be documented and personnel will need to be trained in its use.

Security Control: 0332; Revision: 4; Updated: Sep-18; Applicability: All
Media, with the exception of internally mounted fixed media within ICT equipment, is labelled with protective markings reflecting its sensitivity or classification.

Classifying media

Media that is not correctly classified could be stored and handled inappropriately, accessed by personnel who do not have an appropriate security clearance or used with systems it is not authorised to be used with.

Security Control: 0323; Revision: 8; Updated: Dec-21; Applicability: All

Media is classified to the highest sensitivity or classification of data it stores, unless the media has been classified to a higher sensitivity or classification.

Security Control: 0337; Revision: 6; Updated: Dec-21; Applicability: All

Media is only used with systems that are authorised to process, store or communicate its sensitivity or classification.

Reclassifying media

Some activities may necessitate a change to the sensitivity or classification of media. For example, when media is connected to a system that lacks a mechanism through which read-only access can be ensured, when media is sanitised, or when data stored on media is subject to a sensitivity or classification change.

Security Control: 0325; Revision: 6; Updated: Apr-21; Applicability: All

Any media connected to a system with a higher sensitivity or classification than the media is reclassified to the higher sensitivity or classification, unless the media is read-only or the system has a mechanism through which read-only access can be ensured.

Security Control: 0330; Revision: 6; Updated: Dec-21; Applicability: All

Before reclassifying media to a lower sensitivity or classification, it is either sanitised or the data it stores is reclassified in consultation with data owners, and a formal administrative decision is made to reclassify the media.

Handling media

As media can be easily misplaced or stolen, measures should be put in place to protect data stored on it. In some cases, applying encryption to media may reduce its handling requirements. Any reduction in handling requirements will be based on the original sensitivity or classification of the media and the level of assurance in the encryption software being used to encrypt it.

Security Control: 0831; Revision: 5; Updated: Sep-18; Applicability: All

Media is handled in a manner suitable for its sensitivity or classification.

Security Control: 1059; Revision: 4; Updated: Dec-21; Applicability: All

All data stored on media is encrypted.

Sanitising media before first use

Sanitising media before first use can assist in reducing cyber supply chain risks, such as new media containing malicious code. In addition, sanitising media before first use in a different security domain can prevent potential data spills from occurring.

Security Control: 1600; Revision: 1; Updated: Apr-21; Applicability: All

Media is sanitised before it is used for the first time.

Security Control: 1642; Revision: 0; Updated: Apr-21; Applicability: All

Media is sanitised before it is reused in a different security domain.

Using media for data transfers

Organisations transferring data between systems belonging to different security domains are strongly encouraged to use write-once media. When done properly (e.g. using non-rewritable compact discs that have been finalised) this will

ensure that data from the destination system cannot be accidentally transferred, or maliciously exfiltrated, onto the media used for the data transfer and then onto another system, such as the original source system. Alternatively, if suitable write-once media is not used, the destination system should have a mechanism through which read-only access can be ensured (e.g. via a read-only device or hardware write-blocker). However, the use of read-only mechanisms is not immune to failure or compromise, therefore, rewritable media should still be sanitised following each data transfer.

It is important to note that for most non-volatile flash memory media, it will be possible to sanitise and reclassify it following a data transfer in order to allow it to be connected to other systems again. This is not possible for SECRET and TOP SECRET non-volatile flash memory media as it cannot be reclassified following sanitisation.

Security Control: 0347; Revision: 5; Updated: Apr-21; Applicability: All

When transferring data manually between two systems belonging to different security domains, write-once media is used unless the destination system has a mechanism through which read-only access can be ensured.

Security Control: 0947; Revision: 6; Updated: Apr-21; Applicability: All

When transferring data manually between two systems belonging to different security domains, rewritable media is sanitised after each data transfer.

Further information

Further information on protecting media can be found in the ICT equipment and media section of the [Guidelines for Physical Security](#).

Further information on the use of encryption to reduce handling requirements for media can be found in the cryptographic fundamentals section of the [Guidelines for Cryptography](#).

Further information on using media to transfer data between systems can be found in the [Guidelines for Data Transfers](#).

Further information on the protection of media can be found in the Attorney-General's Department's [Protective Security Policy Framework](#), [Physical security for entity resources](#) policy.

Media sanitisation

Hybrid hard drives

When sanitising hybrid hard drives, separate the non-volatile magnetic media from the circuit board containing non-volatile flash memory media and sanitise each separately.

Solid state drives

When sanitising solid state drives, the method for sanitising non-volatile flash memory media applies.

Media sanitisation processes and procedures

Using approved methods to sanitise media provides a level of assurance that, to the extent possible, no data will be left following sanitisation. The methods described in these guidelines are designed not only to prevent common data recovery practices but also to protect from those that could emerge in the future.

Security Control: 0348; Revision: 4; Updated: Dec-21; Applicability: All

Media sanitisation processes, and supporting media sanitisation procedures, are developed and implemented.

Volatile media sanitisation

When sanitising volatile media, the specified time to wait following the removal of power is based on applying a safety factor to the time recommended by research into preventing the recovery of data. If read back cannot be achieved following the overwriting of volatile media, or data persists, it will need to be destroyed.

Security Control: 0351; Revision: 6; Updated: Dec-21; Applicability: All

Volatile media is sanitised by removing its power for at least 10 minutes.

Security Control: 0352; Revision: 4; Updated: Dec-21; Applicability: S, TS

SECRET and TOP SECRET volatile media is sanitised by overwriting it at least once in its entirety with a random pattern followed by a read back for verification.

Treatment of volatile media following sanitisation

Research suggests that short-term remanence effects are likely in volatile media. For example, up to minutes at normal room temperatures and up to hours in extremely cold temperatures. Furthermore, some volatile media can suffer from long-term remanence effects resulting from physical changes due to the continuous storage of static data for extended periods of time. It is for these reasons that under certain circumstances TOP SECRET volatile media retains its classification following sanitisation.

Typical circumstances preventing the reclassification of TOP SECRET volatile media include a static cryptographic key being stored in the same memory location during every boot of a device, or a static image being displayed on a device and stored in volatile media for a period of months.

Security Control: 0835; Revision: 4; Updated: Dec-21; Applicability: TS

Following sanitisation, TOP SECRET volatile media retains its classification if it stored static data for an extended period of time, or had data repeatedly stored on or written to the same memory location for an extended period of time.

Non-volatile magnetic media sanitisation

Non-volatile magnetic media encompasses non-volatile magnetic hard drives, tape drives and floppy disks. While non-volatile magnetic tape drives and floppy disks can be sanitised by overwriting them at least once (or three times if pre-2001 or under 15 GB) in their entirety with a random pattern followed by a read back for verification, additional considerations apply to non-volatile magnetic hard drives due to their use of a host-protected area, device configuration overlay table and growth defects table.

Both the host-protected area and device configuration overlay table of non-volatile magnetic hard drives are normally not visible to a computer's Unified Extensible Firmware Interface or operating system. Therefore, any sanitisation of the readable sectors of non-volatile magnetic hard drives will leave any data contained in sectors listed in the host-protected area and device configuration overlay table untouched. Some sanitisation programs include the ability to reset non-volatile magnetic hard drives to their default state, thereby removing any host-protected areas or device configuration overlays. This allows the sanitisation program to see the entire contents of non-volatile magnetic hard drives during subsequent sanitisation processes.

Modern non-volatile magnetic hard drives automatically reallocate space for bad sectors at a hardware level. These bad sectors are maintained in what is known as the growth defects table or 'g-list'. If data was stored in a sector that was subsequently added to the growth defects table, sanitising the non-volatile magnetic hard drive will not overwrite such data. While these sectors may be considered bad by non-volatile magnetic hard drives, quite often this is due to the sectors no longer meeting expected performance norms and not due to an inability to read or write to them. The Advanced Technology Attachment (ATA) secure erase command was built into the firmware of post-2001 non-volatile magnetic hard drives and is able to access sectors that have been added to the growth defects table.

Modern non-volatile magnetic hard drives also contain a primary defects table or 'p-list'. The primary defects table contains a list of bad sectors found during post-production processes. No data is ever stored in sectors listed in the

primary defects table as they are marked as inaccessible before non-volatile magnetic hard drives are used for the first time.

Security Control: 0354; Revision: 6; Updated: Dec-21; Applicability: All

Non-volatile magnetic media is sanitised by overwriting it at least once (or three times if pre-2001 or under 15 GB) in its entirety with a random pattern followed by a read back for verification.

Security Control: 1065; Revision: 3; Updated: Dec-21; Applicability: All

The host-protected area and device configuration overlay table are reset prior to the sanitisation of non-volatile magnetic hard drives.

Security Control: 1067; Revision: 4; Updated: Dec-21; Applicability: All

The ATA secure erase command is used, in addition to block overwriting software, to ensure the growth defects table of non-volatile magnetic hard drives is overwritten.

Treatment of non-volatile magnetic media following sanitisation

Due to concerns with the sanitisation processes for non-volatile magnetic media, SECRET and TOP SECRET non-volatile magnetic media retains its classification following sanitisation.

Security Control: 0356; Revision: 6; Updated: Dec-21; Applicability: S, TS

Following sanitisation, SECRET and TOP SECRET non-volatile magnetic media retains its classification.

Non-volatile erasable programmable read-only memory media sanitisation

When sanitising non-volatile erasable programmable read-only memory (EPROM), three times the manufacturer's specification for ultraviolet erasure time should be applied to provide additional certainty in sanitisation processes.

Security Control: 0357; Revision: 5; Updated: Dec-21; Applicability: All

Non-volatile EPROM media is sanitised by applying three times the manufacturer's specified ultraviolet erasure time and then overwriting it at least once in its entirety with a random pattern followed by a read back for verification.

Non-volatile electrically erasable programmable read-only memory media sanitisation

A single overwrite with a random pattern is considered suitable for sanitising non-volatile electrically erasable programmable read-only memory (EEPROM) media.

Security Control: 0836; Revision: 3; Updated: Dec-21; Applicability: All

Non-volatile EEPROM media is sanitised by overwriting it at least once in its entirety with a random pattern followed by a read back for verification.

Treatment of non-volatile erasable and electrically erasable programmable read-only memory media following sanitisation

As little research has been conducted into the recovery of data from non-volatile EPROM and EEPROM media, SECRET and TOP SECRET EPROM and EEPROM media retains its classification following sanitisation.

Security Control: 0358; Revision: 6; Updated: Dec-21; Applicability: S, TS

Following sanitisation, SECRET and TOP SECRET non-volatile EPROM and EEPROM media retains its classification.

Non-volatile flash memory media sanitisation

For non-volatile flash memory media, a technique known as wear levelling ensures that writes are distributed evenly across each memory block. This feature necessitates non-volatile flash memory media being overwritten with a random pattern twice as this helps to ensure that all memory blocks are overwritten.

Security Control: 0359; Revision: 4; Updated: Dec-21; Applicability: All

Non-volatile flash memory media is sanitised by overwriting it at least twice in its entirety with a random pattern followed by a read back for verification.

Treatment of non-volatile flash memory media following sanitisation

Due to the use of wear levelling in non-volatile flash memory media, and the potentially for bad memory blocks, it is possible that not all memory blocks will be overwritten during sanitisation processes. For this reason, SECRET and TOP SECRET non-volatile flash memory media retains its classification following sanitisation.

Security Control: 0360; Revision: 6; Updated: Dec-21; Applicability: S, TS

Following sanitisation, SECRET and TOP SECRET non-volatile flash memory media retains its classification.

Media that cannot be successfully sanitised

In some cases, sanitisation processes will be unsuccessful due to faulty or damaged media. In such cases, the faulty or damaged media will need to be destroyed prior to its disposal.

Security Control: 1735; Revision: 0; Updated: Dec-21; Applicability: All

Faulty or damaged media that cannot be successfully sanitised is destroyed prior to its disposal.

Further information

Further information on sanitising ICT equipment can be found in the ICT equipment sanitisation and disposal section of the [Guidelines for ICT Equipment](#).

Further information on recoverability of data from volatile media can be found in the [Data Remanence in Semiconductor Devices](#) paper.

Further information on the random-access memory testing tool [MemTest86](#) can be obtained from PassMark Software.

Further information on the graphics card random-access memory testing tools [MemtestG80](#) and [MemtestCL](#) can be obtained from their GitHub projects.

Further information on HDDerase is available from the [Center for Memory and Recording Research](#) at the University of California San Diego. HDDerase is capable of calling the ATA secure erase command as well as resetting the host-protected area and device configuration overlay table on non-volatile magnetic media.

Further information on reliably erasing data from solid state drives can be found in the [Reliably Erasing Data From Flash-Based Solid State Drives](#) paper.

Media destruction

Media destruction processes and procedures

Documenting processes and supporting procedures for media destruction will ensure that organisations carry out media destruction in an appropriate and consistent manner.

Security Control: 0363; Revision: 3; Updated: Dec-21; Applicability: All

Media destruction processes, and supporting media destruction procedures, are developed and implemented.

Media that cannot be sanitised

Some media types are incapable of being sanitised. As such, they will need to be destroyed prior to their disposal.

Security Control: 0350; Revision: 5; Updated: Dec-21; Applicability: All

The following media types are destroyed prior to their disposal:

- microfiche and microfilm
- optical discs
- programmable read-only memory
- read-only memory
- other types of media that cannot be sanitised.

Media destruction equipment

When physically destroying media, using approved equipment can provide a level of assurance that the data it stores is actually destroyed.

Approved equipment includes destruction equipment listed in the Security Construction and Equipment Committee (SCEC)'s [Security Equipment Evaluated Products List](#), and the Australian Security Intelligence Organisation (ASIO)'s Security Equipment Guide (SEG)-009, [Optical Media Shredders](#) and SEG-018, [Destructors](#). ASIO's SEG-009 and SEG-018 are available from the Protective Security Policy GovTEAMS community or ASIO by email.

If using degaussers to destroy media, the United States' National Security Agency maintains an [Evaluated Products List for Magnetic Degaussers](#).

Security Control: 1361; Revision: 1; Updated: Sep-18; Applicability: All
SCEC or ASIO approved equipment is used when destroying media.

Security Control: 1160; Revision: 2; Updated: Aug-20; Applicability: All
If using degaussers to destroy media, degaussers evaluated by the United States' National Security Agency are used.

Media destruction methods

The destruction methods below are designed to ensure that recovery of data is impossible or impractical.

Security Control: 1517; Revision: 0; Updated: Sep-18; Applicability: All
Equipment that is capable of reducing microform to a fine powder, with resultant particles not showing more than five consecutive characters per particle upon microscopic inspection, is used to destroy microfiche and microfilm.

Security Control: 1722; Revision: 0; Updated: Dec-21; Applicability: All
Electrostatic memory devices are destroyed using either furnace/incinerator, hammer mill, disintegrator or grinder/sander destruction methods.

Security Control: 1723; Revision: 0; Updated: Dec-21; Applicability: All
Magnetic floppy disks are destroyed using either furnace/incinerator, hammer mill, disintegrator, cutting or degausser destruction methods.

Security Control: 1724; Revision: 0; Updated: Dec-21; Applicability: All
Magnetic hard disks are destroyed using either furnace/incinerator, hammer mill, disintegrator, grinder/sander or degausser destruction methods.

Security Control: 1725; Revision: 0; Updated: Dec-21; Applicability: All
Magnetic tapes are destroyed using either furnace/incinerator, hammer mill, disintegrator, cutting or degausser destruction methods.

Security Control: 1726; Revision: 0; Updated: Dec-21; Applicability: All
Optical disks are destroyed using either furnace/incinerator, hammer mill, disintegrator, grinder/sander or cutting destruction methods.

Security Control: 1727; Revision: 0; Updated: Dec-21; Applicability: All

Semiconductor memory is destroyed using either furnace/incinerator, hammer mill or disintegrator destruction methods.

Security Control: 0368; Revision: 7; Updated: Dec-21; Applicability: All

Media destroyed using either a hammer mill, disintegrator, grinder/sander or cutting destruction method result in media waste particles no larger than 9 mm.

Treatment of media waste particles

Following the destruction of SECRET and TOP SECRET media, normal accounting and auditing processes and procedures do not apply. However, depending on the destruction method used, and the resulting media waste particle size, it may still need to be stored and handled as classified waste.

Security Control: 1728; Revision: 0; Updated: Dec-21; Applicability: S

The resulting media waste particles from the destruction of SECRET media is stored and handled as OFFICIAL if less than or equal to 3 mm, PROTECTED if greater than 3 mm and less than or equal to 6 mm, or SECRET if greater than 6 mm and less than or equal to 9 mm.

Security Control: 1729; Revision: 0; Updated: Dec-21; Applicability: TS

The resulting media waste particles from the destruction of TOP SECRET media is stored and handled as OFFICIAL if less than or equal to 3 mm, or SECRET if greater than 3 mm and less than or equal to 9 mm.

Degaussing magnetic media

Degaussing magnetic media changes its properties, resulting in data being permanently corrupted. In doing so, it is important that a degausser of suitable magnetic field strength and magnetic orientation is used.

Coercivity (the resistance of magnetic material to change) varies between magnetic media types, brands and models. Care needs to be taken when degaussing magnetic media since a degausser of insufficient magnetic field strength will not be effective. In addition, since 2006 perpendicular magnetic media has progressively replaced longitudinal magnetic media. As some older degaussers are only capable of destroying longitudinal magnetic media, care needs to be taken to ensure that a degausser with a suitable magnetic orientation is used. The United States' National Security Agency provides further information on the common types of magnetic media and their associated coercivity ratings.

Finally, to ensure that degaussers are being used in the correct manner to effectively destroy magnetic media, product-specific directions provided by degausser manufacturers should be followed.

Security Control: 0361; Revision: 4; Updated: Dec-21; Applicability: All

Magnetic media is destroyed using a degausser with a suitable magnetic field strength and magnetic orientation.

Security Control: 0362; Revision: 3; Updated: Sep-18; Applicability: All

Any product-specific directions provided by degausser manufacturers are followed.

Security Control: 1641; Revision: 1; Updated: Dec-21; Applicability: All

Following destruction of magnetic media using a degausser, it is physically damaged (such as by deforming the internal platters of hard drives) prior to its disposal.

Supervision of destruction

To verify that media is appropriately destroyed, destruction processes need to be supervised by at least one person cleared to the sensitivity or classification of the media being destroyed.

Security Control: 0370; Revision: 5; Updated: Dec-21; Applicability: All

The destruction of media is performed under the supervision of at least one person cleared to its sensitivity or classification.

Security Control: 0371; Revision: 4; Updated: Dec-21; Applicability: All

Personnel supervising the destruction of media supervise its handling to the point of destruction and ensure that the destruction is completed successfully.

Supervision of accountable material destruction

The successful destruction of media storing accountable material is more important than for other media. As such, its destruction should be supervised by at least two personnel who sign a destruction certificate afterwards.

Security Control: 0372; Revision: 5; Updated: Dec-21; Applicability: O, P, S, TS

The destruction of media storing accountable material is performed under the supervision of at least two personnel cleared to its sensitivity or classification.

Security Control: 0373; Revision: 4; Updated: Dec-21; Applicability: O, P, S, TS

Personnel supervising the destruction of media storing accountable material supervise its handling to the point of destruction, ensure that the destruction is completed successfully and sign a destruction certificate afterwards.

Outsourcing media destruction

National Association for Information Destruction AAA certified destruction services with endorsements can be used for the outsourced destruction of media, as specified in ASIO's Protective Security Circular (PSC)-167, [External destruction of security classified information](#). ASIO's PSC-167 is available from the Protective Security Policy GovTEAMS community or ASIO by email.

Security Control: 0840; Revision: 3; Updated: Sep-18; Applicability: O, P, S

When outsourcing the destruction of media to an external destruction service, a National Association for Information Destruction AAA certified destruction service with endorsements, as specified in ASIO's PSC-167, is used.

Security Control: 0839; Revision: 3; Updated: Dec-21; Applicability: O, P, S, TS

The destruction of media storing accountable material is not outsourced.

Further information

Further information on the destruction of ICT equipment can be found in the ICT equipment sanitisation and disposal section of the [Guidelines for ICT Equipment](#).

Further information on approved degaussers is available in the United States' National Security Agency's [Evaluated Products List for Magnetic Degaussers](#).

Further information approved destruction equipment is available in the SCEC's [Security Equipment Evaluated Products List](#).

Media disposal

Media disposal processes and procedures

Documenting processes and supporting procedures for media disposal will ensure that organisations carry out media disposal in an appropriate and consistent manner.

Security Control: 0374; Revision: 3; Updated: Dec-21; Applicability: All

Media disposal processes, and supporting media disposal procedures, are developed and implemented.

Disposal of media

Before media can be released into the public domain, it needs to be sanitised, destroyed or declassified. As sanitised, destroyed or declassified media still presents a security risk, albeit very minor, an appropriate authority needs to formally authorise its release into the public domain. Furthermore, as part of disposal processes, removing labels and

markings indicating the owner, sensitivity, classification or any other marking that can associate media with its prior use will ensure it does not draw undue attention following its disposal.

Security Control: 0378; Revision: 4; Updated: Dec-21; Applicability: All

Labels and markings indicating the owner, sensitivity, classification or any other marking that can associate media with its prior use are removed prior to its disposal.

Security Control: 0375; Revision: 6; Updated: Dec-21; Applicability: All

Following sanitisation, destruction or declassification, a formal administrative decision is made to release media, or its waste, into the public domain.

Further information

Further information on the disposal of ICT equipment can be found in the ICT equipment sanitisation and disposal section of the [Guidelines for ICT Equipment](#).

Guidelines for System Hardening

Operating system hardening

Standard Operating Environments

Allowing users to setup, configure and maintain their own workstations or servers can create an inconsistent environment where particular workstations or servers are more vulnerable than others. This type of environment can easily allow an adversary to gain an initial foothold on a network.

A Standard Operating Environment (SOE) is a standardised implementation of an operation system and its applications that is designed to ensure a consistent and secure baseline. When SOEs are obtained from third parties, such as service providers, there are additional cyber supply chain risks that should be considered, such as the accidental or deliberate inclusion of malicious content or configurations. To reduce the likelihood of such occurrences, organisations should endeavour to obtain their SOEs from trusted sources while also scanning them for malicious content and configurations before being used.

As the configuration of operating environments will naturally change over time (e.g. patches are applied, configurations are changed, and applications are added or removed) it is essential that SOEs are reviewed and updated at least annually to ensure that an up-to-date baseline is maintained.

Security Control: 1406; Revision: 2; Updated: Aug-20; Applicability: All
SOEs are used for workstations and servers.

Security Control: 1608; Revision: 0; Updated: Aug-20; Applicability: All
SOEs provided by third parties are scanned for malicious content and configurations before being used.

Security Control: 1588; Revision: 0; Updated: Aug-20; Applicability: All
SOEs are reviewed and updated at least annually.

Operating system releases and versions

Newer releases of operating systems often introduce improvements in security functionality. This can make it more difficult for an adversary to craft reliable exploits for security vulnerabilities they discover. Using older releases of operating systems, especially those no longer supported by vendors, exposes organisations to exploitation techniques that have since been mitigated in newer releases. In addition, 64-bit versions of operating systems support additional security functionality that 32-bit versions lack.

Note, for organisations implementing only Maturity Level Two of the [Essential Eight Maturity Model](#), security control 1407 is not applicable.

Security Control: 1407; Revision: 4; Updated: Sep-21; Applicability: All
The latest release, or the previous release, of operating systems are used for workstations, servers and network devices.

Security Control: 1408; Revision: 3; Updated: Sep-18; Applicability: All
When developing a Microsoft Windows SOE, the 64-bit version of the operating system is used.

Operating system configuration

When operating systems are deployed in their default state it can lead to an insecure operating environment allowing an adversary to gain an initial foothold on a network. Many settings exist within operating systems to allow them to be configured in a secure state to minimise this security risk. The Australian Cyber Security Centre (ACSC) and vendors often produce hardening guides to assist in securely configuring various operating systems.

Note, for organisations implementing only Maturity Level Two of the [Essential Eight Maturity Model](#), security controls 1654-1655 are not applicable.

Security Control: 1409; Revision: 1; Updated: Sep-18; Applicability: All

ACSC and vendor guidance is implemented to assist in hardening the configuration of operating systems.

Security Control: 0383; Revision: 6; Updated: Sep-18; Applicability: All

Default operating system accounts are disabled, renamed or have their passphrase changed.

Security Control: 0380; Revision: 8; Updated: Sep-21; Applicability: All

Unneeded operating system accounts, software, components, services and functionality are disabled or removed.

Security Control: 0341; Revision: 4; Updated: Dec-21; Applicability: All

Automatic execution features for removable media are disabled.

Security Control: 1654; Revision: 0; Updated: Sep-21; Applicability: All

Internet Explorer 11 is disabled or removed.

Security Control: 1655; Revision: 0; Updated: Sep-21; Applicability: All

.NET Framework 3.5 (includes .NET 2.0 and 3.0) is disabled or removed.

Security Control: 1584; Revision: 1; Updated: Sep-21; Applicability: All

Unprivileged users are prevented from bypassing, disabling or modifying security functionality of operating systems.

Security Control: 1491; Revision: 2; Updated: Sep-21; Applicability: All

Unprivileged users are prevented from running script execution engines in Microsoft Windows, including:

- *Windows Script Host (cscript.exe and wscript.exe)*
- *PowerShell (powershell.exe, powershell_ise.exe and pwsh.exe)*
- *Command Prompt (cmd.exe)*
- *Windows Management Instrumentation (wmic.exe)*
- *Microsoft Hypertext Markup Language (HTML) Application Host (mshta.exe).*

Local administrator accounts

When local administrator accounts are used with common account names and passphrases, it can allow an adversary that compromises these credentials on one workstation or server to easily transfer across a network to other workstations or servers.

Security Control: 1410; Revision: 1; Updated: Sep-18; Applicability: All

Local administrator accounts are disabled; alternatively, passphrases that are random and unique for each device's local administrator account are used.

Security Control: 1469; Revision: 1; Updated: Sep-18; Applicability: All

Unique domain accounts with local administrative privileges, but without domain administrative privileges, are used for workstation and server management.

Application management

Users' ability to install any application can be exploited by an adversary using social engineering in order to convince them to install a malicious application. One way to manage this security risk, while also removing burden from system administrators, is to allow users the ability to install approved applications from organisation-managed software repositories or from trusted application marketplaces. Furthermore, to prevent users from removing security functionality, or breaking system functionality, users should not have the ability to uninstall or disable approved software.

Security Control: 1592; Revision: 0; Updated: Aug-20; Applicability: All

Users do not have the ability to install unapproved software.

Security Control: 0382; Revision: 6; Updated: Aug-20; Applicability: All

Users do not have the ability to uninstall or disable approved software.

Application control

Application control mechanisms can be an effective way to not only preventing malicious code from executing on workstations and servers, but also to ensure only approved applications can be installed. When developing application control rulesets, determining approved executables (e.g. .exe and .com files), software libraries (e.g. .dll and .ocx files), scripts (e.g. .ps1, .bat, .cmd, .vbs and .js files), installers (e.g. .msi, .msp and .mst files), compiled HTML (e.g. .chm), HTML applications (e.g. .hta), control panel applets (e.g. .cpl) and drivers based on business requirements is a more secure method than simply approving those currently residing on a workstation or server. Furthermore, it is preferable that organisations define their own application control rulesets, rather than relying on those from application control vendors, and validate them on an annual or more frequent basis.

In implementing application control solutions, organisations should use a reliable method, or combination of methods, such as cryptographic hash rules, publisher certificate rules or path rules. Depending on the method(s) chosen, further system hardening may be required to ensure that application control solutions or application control rulesets cannot be bypassed by an adversary.

Note, for organisations implementing only Maturity Level Two of the [Essential Eight Maturity Model](#), security controls 1656, 1658, 1582, 1544, 1659 and 1662-1663 are not applicable.

Security Control: 0843; Revision: 9; Updated: Sep-21; Applicability: All

Application control is implemented on workstations.

Security Control: 1490; Revision: 3; Updated: Sep-21; Applicability: All

Application control is implemented on internet-facing servers.

Security Control: 1656; Revision: 0; Updated: Sep-21; Applicability: All

Application control is implemented on non-internet-facing servers.

Security Control: 1657; Revision: 0; Updated: Sep-21; Applicability: All

Application control restricts the execution of executables, software libraries, scripts, installers, compiled HTML, HTML applications and control panel applets to an organisation-approved set.

Security Control: 1658; Revision: 0; Updated: Sep-21; Applicability: All

Application control restricts the execution of drivers to an organisation-approved set.

Security Control: 0955; Revision: 6; Updated: Apr-20; Applicability: All

Application control is implemented using cryptographic hash rules, publisher certificate rules or path rules.

Security Control: 1582; Revision: 1; Updated: Sep-21; Applicability: All

Application control rulesets are validated on an annual or more frequent basis.

Security Control: 1471; Revision: 2; Updated: Apr-20; Applicability: All

When implementing application control using publisher certificate rules, both publisher names and product names are used.

Security Control: 1392; Revision: 2; Updated: Apr-20; Applicability: All

When implementing application control using path rules, file system permissions are configured to prevent unauthorised modification of folder and file permissions, folder contents (including adding new files) and individual files that are approved to execute.

Security Control: 1544; Revision: 2; Updated: Sep-21; Applicability: All

Microsoft's 'recommended block rules' are implemented.

Security Control: 1659; Revision: 0; Updated: Sep-21; Applicability: All

Microsoft's 'recommended driver block rules' are implemented.

Security Control: 0846; Revision: 7; Updated: Apr-20; Applicability: All

All users (with the exception of privileged users when performing specific administrative activities) cannot disable, bypass or be exempted from application control.

Security Control: 1660; Revision: 0; Updated: Sep-21; Applicability: All

Allowed and blocked executions on workstations are logged.

Security Control: 1661; Revision: 0; Updated: Sep-21; Applicability: All

Allowed and blocked executions on internet-facing servers are logged.

Security Control: 1662; Revision: 0; Updated: Sep-21; Applicability: All

Allowed and blocked executions on non-internet-facing servers are logged.

Security Control: 0957; Revision: 8; Updated: Sep-21; Applicability: All

Application control event logs including the name of the file, the date/time stamp and the username of the user associated with the event.

Security Control: 1663; Revision: 0; Updated: Sep-21; Applicability: All

Application control event logs are centrally stored and protected from unauthorised modification and deletion, monitored for signs of compromise, and actioned when cyber security events are detected.

Exploit protection

An adversary who develops exploits for Microsoft Windows will be more successful in exploiting security vulnerabilities when exploit production functional in the operating system hasn't been enabled.

Security Control: 1492; Revision: 1; Updated: Sep-21; Applicability: All

Microsoft's exploit protection functionality is implemented on workstations and servers.

PowerShell

PowerShell is a powerful scripting language developed by Microsoft to provide an integrated interface for automated system administration. As such, it is an important part of system administrator toolkits due to its ubiquity and ease with which it can be used to fully control operating systems; however, it is also a dangerous exploitation tool in the hands of an adversary.

In order to prevent attacks leveraging security vulnerabilities in earlier PowerShell versions, Windows PowerShell 2.0 should be disabled or removed from operating systems. Additionally, PowerShell's language mode should be set to Constrained Language Mode to achieve a balance between security and functionality.

Finally, logging functionality available in PowerShell, such as module logging, script block logging and transcription, can provide invaluable information for incident responders following cyber security incidents that involved PowerShell being used for malicious purposes.

Note, for organisations implementing only Maturity Level Two of the [Essential Eight Maturity Model](#), security controls 1621-1622 and 1665 are not applicable.

Security Control: 1621; Revision: 1; Updated: Sep-21; Applicability: All

Windows PowerShell 2.0 is disabled or removed.

Security Control: 1622; Revision: 0; Updated: Oct-20; Applicability: All

PowerShell is configured to use Constrained Language Mode.

Security Control: 1623; Revision: 0; Updated: Oct-20; Applicability: All

PowerShell is configured to use module logging, script block logging and transcription functionality.

Security Control: 1624; Revision: 0; Updated: Oct-20; Applicability: All

PowerShell script block logs are protected by Protected Event Logging functionality.

Security Control: 1664; Revision: 0; Updated: Sep-21; Applicability: All

Blocked PowerShell script executions are logged.

Security Control: 1665; Revision: 0; Updated: Sep-21; Applicability: All

PowerShell event logs are centrally stored and protected from unauthorised modification and deletion, monitored for signs of compromise, and actioned when cyber security events are detected.

Host-based Intrusion Prevention System

Many security products rely on signatures to detect malicious code. This approach is only effective when malicious code has already been profiled and signatures are available. Unfortunately, an adversary can easily create variants of known malicious code to bypass traditional signature-based detection mechanisms. A Host-based Intrusion Prevention System (HIPS) can use behaviour-based detection to assist in identifying and blocking anomalous behaviour such as process injection, keystroke logging, driver loading and call hooking, as well as detecting malicious code that has yet to be identified by security vendors.

Security Control: 1341; Revision: 2; Updated: Sep-18; Applicability: All

A HIPS is implemented on workstations.

Security Control: 1034; Revision: 6; Updated: Sep-18; Applicability: All

A HIPS is implemented on high value servers such as authentication servers, Domain Name System servers, web servers, file servers and email servers.

Software firewall

Traditional network firewalls often fail to prevent the propagation of malicious code on a network, or an adversary from exfiltrating data, as they only control which ports or protocols can be used between different network segments. Many forms of malicious code are designed specifically to take advantage of this by using common protocols such as Hypertext Transfer Protocol, Hypertext Transfer Protocol Secure, Simple Mail Transfer Protocol and Domain Name System. Software firewalls are more effective than traditional network firewalls as they can control which applications and services can communicate to and from workstations and servers. As such, a software firewall should be used to limit both inbound and outbound network connections to approved applications and services that are required by workstations and servers.

Security Control: 1416; Revision: 2; Updated: Sep-18; Applicability: All

A software firewall is implemented on workstations and servers to limit both inbound and outbound network connections.

Antivirus software

When vendors develop software they may make coding mistakes that lead to security vulnerabilities. An adversary can take advantage of this by developing malicious code to exploit any security vulnerabilities that have not been detected and remedied by vendors. As significant time and effort is often involved in developing functioning and reliable exploits, an adversary will often attempt to reuse their exploits as much as possible. While exploits may have been previously identified by security vendors, they often remain viable against organisations that do not have antivirus software in place to detect them.

Security Control: 1417; Revision: 3; Updated: Sep-21; Applicability: All

Antivirus software is implemented on workstations and servers and configured with:

- *signature-based detection enabled and set to a high level*
- *heuristic-based detection enabled and set to a high level*

- *ransomware protection measures enabled*
- *detection signatures checked for currency and updated on at least a daily basis*
- *automatic and regular scanning configured for all fixed disks and removable media.*

Security Control: 1390; Revision: 3; Updated: Dec-21; Applicability: All
Antivirus software has reputation rating functionality enabled.

Device access control software

Device access control software can be used to prevent unauthorised removable media and devices (e.g. smartphones, tablets, Bluetooth devices, wireless devices and 4G/5G dongles) from connecting to workstations and servers via external communication interfaces (e.g. Universal Serial Bus, Bluetooth and Near Field Communication). This can assist in preventing the introduction of malicious code or the exfiltration of data. In addition, an adversary can connect devices to locked workstations and servers via an external communication interface that allows Direct Memory Access (DMA). In doing so, the adversary can gain access to encryption keys or write any contents they want to memory (such as malicious code). The best defence against this security vulnerability is to disable access to external communication interfaces that allow DMA (e.g. FireWire, ExpressCard and Thunderbolt).

Security Control: 1418; Revision: 3; Updated: Dec-21; Applicability: All
Unauthorised removable media and devices are prevented from being connected to workstations and servers via the use of device access control software or by disabling external communication interfaces in operating systems.

Security Control: 0345; Revision: 6; Updated: Dec-21; Applicability: All
External communication interfaces that allow DMA are disabled.

Security Control: 0343; Revision: 5; Updated: Dec-21; Applicability: All
Removable media is prevented from being written to via the use of device access control software if there is no business requirement for its use.

Further information

Further information on the use of removable media can be found in the media usage section of the [Guidelines for Media](#).

Further information on patching operating systems can be found in the system patching section of the [Guidelines for System Management](#).

Further information on logging and auditing of operating system events can be found in the event logging and auditing section of the [Guidelines for System Monitoring](#).

Further information on securely configuring Microsoft Windows operating systems can be found in the ACSC's [Hardening Microsoft Windows 10 version 21H1 Workstations](#) publication.

Further information on end of support for Microsoft Windows operating systems can be found in the following ACSC publications:

- [End of Support for Microsoft Windows 10](#)
- [End of Support for Microsoft Windows Server 2008 and Windows Server 2008 R2](#).

Further information on securely configuring Linux workstations and servers can be found in the ACSC's [Hardening Linux Workstations and Servers](#) publication.

Further information on implementing application control can be found in the ACSC's [Implementing Application Control](#) publication.

Further information on Microsoft's [recommended block rules](#) and [recommended driver block rules](#) are available from Microsoft.

Further information on Microsoft's [exploit protection functionality](#) is available from Microsoft.

Further information on the use of PowerShell can be found in the ACSC's [Securing PowerShell in the Enterprise](#) publication.

Further information on [the use of PowerShell by blue teams](#) is available from Microsoft while further information on obtaining [greater visibility through PowerShell logging](#) is available from FireEye.

Further information on independent testing of antivirus software is available from [AV-Comparatives](#) and [AV-TEST](#).

Application hardening

Application selection

When selecting applications it is important that organisations preference vendors that have demonstrated a commitment to secure coding practices and have a strong track record of maintaining the security of their applications. This will assist not only with hardening applications but also increase the likelihood that vendors will release timely patches to remediate any security vulnerabilities found in their applications.

Security Control: 0938; Revision: 4; Updated: Sep-18; Applicability: All

Applications are chosen from vendors that have made a commitment to secure development and maintenance practices.

Application versions

Newer versions of applications often introduce improvements in security functionality. This can make it more difficult for an adversary to craft reliable exploits for security vulnerabilities they discover. Using older versions of applications, especially key business applications such as office productivity suites, web browsers and their extensions, email clients, Portable Document Format (PDF) software, and security products exposes organisations to exploitation techniques that have since been mitigated in newer versions of applications.

Security Control: 1467; Revision: 2; Updated: Sep-21; Applicability: All

The latest releases of office productivity suites, web browsers and their extensions, email clients, PDF software, and security products are used when present within SOEs.

Security Control: 1483; Revision: 0; Updated: Sep-18; Applicability: All

The latest releases of web server software, server applications that store important data, and other internet-accessible server applications are used when present within SOEs.

Hardening application configurations

By default, many applications enable functionality that is not required by users while security functionality may be disabled or set at a low level. This is especially risky for key business applications such as office productivity suites, web browsers and their extensions, email clients, PDF software, and security products that are likely to be targeted by an adversary. To assist in minimising this security risk, the ACSC produces guidance to assist in securely configuring key business applications. Furthermore, to assist in securely configuring their applications, vendors may provide their own security guides.

Security Control: 1486; Revision: 1; Updated: Sep-21; Applicability: All

Web browsers do not process Java from the internet.

Security Control: 1485; Revision: 1; Updated: Sep-21; Applicability: All

Web browsers do not process web advertisements from the internet.

Security Control: 1666; Revision: 0; Updated: Sep-21; Applicability: All

Internet Explorer 11 does not process content from the internet.

Security Control: 1667; Revision: 0; Updated: Sep-21; Applicability: All

Microsoft Office is blocked from creating child processes.

Security Control: 1668; Revision: 0; Updated: Sep-21; Applicability: All

Microsoft Office is blocked from creating executable content.

Security Control: 1669; Revision: 0; Updated: Sep-21; Applicability: All

Microsoft Office is blocked from injecting code into other processes.

Security Control: 1542; Revision: 0; Updated: Jan-19; Applicability: All

Microsoft Office is configured to prevent activation of Object Linking and Embedding packages.

Security Control: 1670; Revision: 0; Updated: Sep-21; Applicability: All

PDF software is blocked from creating child processes.

Security Control: 1412; Revision: 3; Updated: Sep-21; Applicability: All

ACSC or vendor hardening guidance for web browsers, Microsoft Office and PDF software is implemented.

Security Control: 1470; Revision: 4; Updated: Sep-21; Applicability: All

Any unrequired functionality in web browsers, Microsoft Office and PDF software is disabled.

Security Control: 1235; Revision: 3; Updated: Sep-21; Applicability: All

The use of web browser, Microsoft Office and PDF software add-ons is restricted to organisation approved add-ons.

Security Control: 1601; Revision: 0; Updated: Aug-20; Applicability: All

If supported, Microsoft's Attack Surface Reduction rules are implemented.

Security Control: 1585; Revision: 1; Updated: Sep-21; Applicability: All

Web browsers, Microsoft Office and PDF software security settings cannot be changed by users.

Microsoft Office macros

Microsoft Office files can contain embedded code (known as a macro) written in the Visual Basic for Applications programming language. A macro can contain a series of commands that can be coded or recorded, and replayed at a later time to automate repetitive tasks. Macros are powerful tools that can be easily created by users to greatly improve their productivity; however, an adversary can also create macros to perform a variety of malicious activities, such as assisting to compromise workstations in order to exfiltrate or deny access to data. To reduce this security risk, organisations should disable Microsoft Office macros for users that do not have a demonstrated business requirement and secure their use for the remaining users that do.

Note, for organisations implementing only Maturity Level Two of the [Essential Eight Maturity Model](#), security controls 1674, 1487, 1675-1676 and 1678 are not applicable.

Security Control: 1671; Revision: 0; Updated: Sep-21; Applicability: All

Microsoft Office macros are disabled for users that do not have a demonstrated business requirement.

Security Control: 1488; Revision: 1; Updated: Sep-21; Applicability: All

Microsoft Office macros in files originating from the internet are blocked.

Security Control: 1672; Revision: 0; Updated: Sep-21; Applicability: All

Microsoft Office macro antivirus scanning is enabled.

Security Control: 1673; Revision: 0; Updated: Sep-21; Applicability: All

Microsoft Office macros are blocked from making Win32 API calls.

Security Control: 1674; Revision: 0; Updated: Sep-21; Applicability: All

Only Microsoft Office macros running from within a sandboxed environment, a Trusted Location or that are digitally signed by a trusted publisher are allowed to execute.

Security Control: 1487; Revision: 1; Updated: Sep-21; Applicability: All

Only privileged users responsible for validating that Microsoft Office macros are free of malicious code can write to and modify content within Trusted Locations.

Security Control: 1675; Revision: 0; Updated: Sep-21; Applicability: All

Microsoft Office macros digitally signed by an untrusted publisher cannot be enabled via the Message Bar or Backstage View.

Security Control: 1676; Revision: 0; Updated: Sep-21; Applicability: All

Microsoft Office's list of trusted publishers is validated on an annual or more frequent basis.

Security Control: 1489; Revision: 0; Updated: Sep-18; Applicability: All

Microsoft Office macro security settings cannot be changed by users.

Security Control: 1677; Revision: 0; Updated: Sep-21; Applicability: All

Allowed and blocked Microsoft Office macro executions are logged.

Security Control: 1678; Revision: 0; Updated: Sep-21; Applicability: All

Microsoft Office macro event logs are centrally stored and protected from unauthorised modification and deletion, monitored for signs of compromise, and actioned when cyber security events are detected.

Further information

Further information on patching applications can be found in the system patching section of the [Guidelines for System Management](#).

Further information on securely configuring Microsoft Office can be found in the ACSC's [Hardening Microsoft 365, Office 2021, Office 2019 and Office 2016](#) publication.

Further information on configuring Microsoft Office macro settings can be found in the ACSC's [Microsoft Office Macro Security](#) publication.

Authentication hardening

Account and authentication types

The guidance within this section is equally applicable to all account types. This includes unprivileged accounts, privileged accounts, break glass accounts and service accounts. In addition, the guidance is equally applicable to interactive authentication and non-interactive authentication.

Authenticating to systems

Before access to a system and its resources is granted to a user, it is essential that they are authenticated. This can be achieved via multi-factor authentication, such as a username along with a passphrase and security key, or via single-factor authentication, such as a username and passphrase.

Security Control: 1546; Revision: 0; Updated: Aug-19; Applicability: All

Users are authenticated before they are granted access to a system and its resources.

Multi-factor authentication

Multi-factor authentication uses two or more authentication factors to confirm a user's identity. This may include:

- something a user knows, such as a password

- something a user has, such as a security key, smart card, mobile phone or physical one-time password token
- something a user is, such as a fingerprint or their facial geometry.

Note, however, that if something a user knows is written down, or typed into a file and stored as plaintext, this becomes something that a user has rather than something a user knows.

Privileged users, users of remote access solutions and users with access to important data repositories are more likely to be targeted by an adversary due to their level of access. For this reason, it is especially important that multi-factor authentication is used for these accounts. In addition, multi-factor authentication is vital to any system administration activities as it can limit the consequences of a compromise by preventing or slowing an adversary's ability to gain unrestricted access to assets. In this regard, multi-factor authentication can be implemented as part of jump server authentication where assets being administered do not support multi-factor authentication themselves.

When implementing multi-factor authentication, several different authentication factors can be implemented. Unfortunately, some authentication factors such as biometrics or codes sent via Short Message Service, Voice over Internet Protocol or email are more susceptible to compromise than others. For this reason, authentication factors that involve something a user has is recommended for use as part of multi-factor authentication. Furthermore, for increased security, the use of verifier impersonation resistant authentication factors are recommended to protect against real-time phishing attacks.

The benefit of implementing multi-factor authentication can be diminished when credentials are reused on other systems. For example, when usernames and passphrases used as part of multi-factor authentication for remote access are the same as those used for corporate workstations. In such circumstances, if an adversary had compromised the device used for remote access, they could capture the username and passphrase for reuse against a corporate workstation that does not require the use of multi-factor authentication.

Note, for organisations implementing only Maturity Level Two of the [Essential Eight Maturity Model](#), security controls 1505, 1682 and 1684 are not applicable.

Security Control: 0974; Revision: 6; Updated: Sep-21; Applicability: All

Multi-factor authentication is used to authenticate unprivileged users of systems.

Security Control: 1173; Revision: 4; Updated: Sep-21; Applicability: All

Multi-factor authentication is used to authenticate privileged users of systems.

Security Control: 1504; Revision: 1; Updated: Sep-21; Applicability: All

Multi-factor authentication is used by an organisation's users if they authenticate to their organisation's internet-facing services.

Security Control: 1679; Revision: 0; Updated: Sep-21; Applicability: All

Multi-factor authentication is used by an organisation's users if they authenticate to third-party internet-facing services that process, store or communicate their organisation's sensitive data.

Security Control: 1680; Revision: 0; Updated: Sep-21; Applicability: All

Multi-factor authentication (where available) is used by an organisation's users if they authenticate to third-party internet-facing services that process, store or communicate their organisation's non-sensitive data.

Security Control: 1681; Revision: 0; Updated: Sep-21; Applicability: All

Multi-factor authentication is enabled by default for non-organisational users (but users can choose to opt out) if they authenticate to an organisation's internet-facing services.

Security Control: 1505; Revision: 1; Updated: Sep-21; Applicability: All

Multi-factor authentication is used to authenticate users accessing important data repositories.

Security Control: 1401; Revision: 5; Updated: Sep-21; Applicability: All

Multi-factor authentication uses either: something users have and something users know, or something users have that is unlocked by something users know or are.

Security Control: 1682; Revision: 0; Updated: Sep-21; Applicability: All

Multi-factor authentication is verifier impersonation resistant.

Security Control: 1559; Revision: 1; Updated: Dec-21; Applicability: All

Passwords used for multi-factor authentication are a minimum of 6 characters, unless more stringent requirements apply.

Security Control: 1560; Revision: 1; Updated: Dec-21; Applicability: S

Passwords used for multi-factor authentication on SECRET systems are a minimum of 8 characters.

Security Control: 1561; Revision: 1; Updated: Dec-21; Applicability: TS

Passwords used for multi-factor authentication on TOP SECRET systems are a minimum of 10 characters.

Security Control: 1357; Revision: 1; Updated: Sep-18; Applicability: All

When multi-factor authentication is implemented, none of the authentication factors on their own can be used for single-factor authentication to another system.

Security Control: 1683; Revision: 0; Updated: Sep-21; Applicability: All

Successful and unsuccessful multi-factor authentications are logged.

Security Control: 1684; Revision: 0; Updated: Sep-21; Applicability: All

Multi-factor authentication event logs are centrally stored and protected from unauthorised modification and deletion, monitored for signs of compromise, and actioned when cyber security events are detected.

Single-factor authentication

A significant threat to the compromise of accounts is credential cracking tools. When an adversary gains access to a list of usernames and hashed credential from a system they can attempt to recover username and credential pairs by comparing the hashes of known credentials with the hashed credentials they have gained access to. By finding a match an adversary will know the credential associated with a given username.

In order to reduce this security risk, organisations should implement multi-factor authentication. Note, while single-factor authentication is no longer considered suitable for protecting sensitive or classified data, it may not be possible to implement multi-factor authentication on some systems. In such cases, organisations will need to increase the time on average it takes an adversary to compromise a credential by continuing to increase its length over time. Such increases in length can be balanced against useability through the use of passphrases rather than passwords. In cases where systems don't support passphrases, and as an absolute last resort, the strongest password length and complexity supported by a system will need to be implemented.

Security Control: 0417; Revision: 5; Updated: Oct-19; Applicability: All

When systems cannot support multi-factor authentication, single-factor authentication using passphrases is implemented instead.

Security Control: 0421; Revision: 8; Updated: Dec-21; Applicability: All

Passphrases used for single-factor authentication are at least 4 random words with a total minimum length of 14 characters, unless more stringent requirements apply.

Security Control: 1557; Revision: 2; Updated: Dec-21; Applicability: S

Passphrases used for single-factor authentication on SECRET systems are at least 5 random words with a total minimum length of 17 characters.

Security Control: 0422; Revision: 8; Updated: Dec-21; Applicability: TS

Passphrases used for single-factor authentication on TOP SECRET systems are at least 6 random words with a total minimum length of 20 characters.

Security Control: 1558; Revision: 1; Updated: Apr-20; Applicability: All

Passphrases used for single-factor authentication:

- are not constructed from song lyrics, movies, literature or any other publicly available material
- do not form a real sentence in a natural language
- are not a list of categorised words.

Security Control: 1596; Revision: 0; Updated: Aug-20; Applicability: All

Passphrases used for single-factor authentication cannot be used to authenticate to multiple different systems.

Setting and resetting credentials for user accounts

When credentials for users are set or reset on their behalf, it is important that a user's identity is sufficiently verified beforehand (e.g. by the user physically presenting themselves and their pass to a service desk or known colleague, or by the user answering a set of challenge-response questions). Following the verification of the user's identity, credentials should be randomly generated and provided to the user via a secure communications channel. Subsequently, users should reset their credential on first use to ensure that it is not known by anyone else.

Security Control: 1227; Revision: 4; Updated: Aug-20; Applicability: All

Passwords/passphrases set or reset on users' behalf are randomly generated.

Security Control: 1593; Revision: 0; Updated: Aug-20; Applicability: All

Users provide sufficient evidence to verify their identity when collecting a password/passphrase for their account.

Security Control: 1594; Revision: 0; Updated: Aug-20; Applicability: All

Passwords/passphrases are provided to users via a secure communications channel or, if not possible, split into parts with part being provided to the user and part provided to the user's supervisor.

Security Control: 1595; Revision: 0; Updated: Aug-20; Applicability: All

Users that do not set their own initial password/passphrase are required to change it on first use.

Setting and resetting credentials for service accounts

To provide additional security and credential management functionality for service accounts, Microsoft introduced group Managed Service Accounts in Microsoft Windows Server 2012. In doing so, service accounts that are created as group Managed Service Accounts do not require manual credential management by system administrators, as the operating system automatically manages the credentials. This ensures that service account credentials are not misplaced or forgotten, and that they are automatically changed on a regular basis.

Security Control: 1619; Revision: 0; Updated: Oct-20; Applicability: All

Service accounts are created as group Managed Service Accounts.

Account lockouts

Locking an account after a specified number of failed logon attempts reduces the likelihood of successful credential spraying attacks; however, care should be taken as implementing account lockout functionality can increase the likelihood of a denial of service. Alternatively, some systems may be configured to automatically slowdown repeated failed logon attempts (known as logon rate limiting) rather than locking accounts. Implementing multi-factor authentication is also an effective way of reducing the likelihood of successful credential spraying attacks.

Security Control: 1403; Revision: 2; Updated: Oct-19; Applicability: All

Accounts are locked out after a maximum of five failed logon attempts.

Security Control: 0431; Revision: 2; Updated: Sep-18; Applicability: All

Repeated account lockouts are investigated before reauthorising access.

Account unlocks

To reduce the likelihood of social engineering being used to compromise accounts, users should provide sufficient evidence to verify their identity when requesting an account unlock.

Security Control: 0976; Revision: 6; Updated: Aug-20; Applicability: All

Users provide sufficient evidence to verify their identity when requesting an account unlock.

Insecure authentication methods

Authentication methods need to resist theft, interception, duplication, forgery, unauthorised access and unauthorised modification. For example, Local Area Network (LAN) Manager and NT LAN Manager authentication methods use weak hashing algorithms. As such, credentials used as part of LAN Manager authentication and NT LAN Manager authentication (i.e. NTLMv1, NTLMv2 and NTLM2) can easily be compromised. Instead, organisations should use Kerberos for authentication within Microsoft Windows environments and ensure all privileged accounts are members of the Protected Users security group.

Security Control: 1603; Revision: 0; Updated: Aug-20; Applicability: All

Authentication methods susceptible to replay attacks are disabled.

Security Control: 1055; Revision: 4; Updated: Oct-20; Applicability: All

LAN Manager and NT LAN Manager authentication methods are disabled.

Security Control: 1620; Revision: 0; Updated: Oct-20; Applicability: All

Privileged accounts are members of the Protected Users security group.

Protecting credentials

Storing credentials with a system that it grants access to increases the likelihood of an adversary gaining access to the system. For example, a credential should never be written down and stuck to a laptop or computer monitor while security keys, smartcards or one-time password tokens should never be left with computers or in laptop bags. Furthermore, obscuring credentials as they are entered into systems can assist in protecting them against screen scrapers and shoulder surfers.

If storing credentials on a system, sufficient protection should be implemented to prevent them from being compromised. For example, credentials can be stored in a password vault or hardware security module, while credentials stored in a database can be hashed, salted and stretched. In addition, security functionality, such as Windows Defender Credential Guard and Windows Defender Remote Credential Guard, can be enabled to provide additional protection for credentials.

Note, for organisations implementing only Maturity Level Two of the [Essential Eight Maturity Model](#), security control 1686 is not applicable.

Security Control: 1685; Revision: 0; Updated: Sep-21; Applicability: All

Credentials for local administrator accounts and service accounts are unique, unpredictable and managed.

Security Control: 0418; Revision: 4; Updated: Oct-19; Applicability: All

Credentials are stored separately from systems to which they grant access.

Security Control: 1597; Revision: 0; Updated: Aug-20; Applicability: All

Credentials are obscured as they are entered into systems.

Security Control: 1402; Revision: 5; Updated: Aug-20; Applicability: All

Stored passwords/passphrases are protected by ensuring they are hashed, salted and stretched.

Security Control: 1686; Revision: 0; Updated: Sep-21; Applicability: All

Windows Defender Credential Guard and Windows Defender Remote Credential Guard are enabled.

Security Control: 1590; Revision: 0; Updated: Aug-20; Applicability: All

Passwords/passphrases are changed if:

- *they are directly compromised*
- *they are suspected of being compromised*
- *they appear in online data breach databases*
- *they are discovered stored in the clear on a network*
- *they are discovered being transferred in the clear across a network*
- *membership of a shared account changes*
- *they have not been changed in the past 12 months.*

Session termination

Implementing measures to automatically terminate user sessions outside of business hours after an appropriate period of inactivity, followed by a workstation reboot, can assist in both system maintenance activities as well as removing any adversaries that may have compromised a system but failed to gain persistence.

Security Control: 0853; Revision: 1; Updated: Aug-20; Applicability: All

Outside of business hours, and after an appropriate period of inactivity, user sessions are terminated and workstations are rebooted.

Session and screen locking

Session and screen locking prevents unauthorised access to a system which a user has already authenticated to.

Security Control: 0428; Revision: 7; Updated: Jun-21; Applicability: All

Systems are configured with a session or screen lock that:

- *activates after a maximum of 15 minutes of user inactivity, or if manually activated by the user*
- *conceals all session content on the screen*
- *ensures that the screen does not enter a power saving state before the session or screen lock is activated*
- *requires the user to reauthenticate to unlock the system*
- *denies users the ability to disable the session or screen locking mechanism.*

Logon banner

Displaying a logon banner to users before access is granted to a system reminds them of their security responsibilities. Logon banners may cover topics such as:

- the sensitivity or classification of the system
- access to the system being restricted to authorised users
- acceptable usage and security policies for the system
- the user's agreement to abide by abovementioned policies
- legal ramifications of violating the abovementioned policies
- details of monitoring and auditing activities
- a point of contact for any questions.

Security Control: 0408; Revision: 4; Updated: Sep-18; Applicability: All

Systems have a logon banner that requires users to acknowledge and accept their security responsibilities before access is granted.

Security Control: 0979; Revision: 4; Updated: Sep-18; Applicability: All

Legal advice is sought on the exact wording of logon banners.

Further information

Further information on authorisations, security clearances and briefings for system access can be found in the access to systems and their resources section of the [Guidelines for Personnel Security](#).

Further information on restricting administrative privileges can be found in the ACSC's [Restricting Administrative Privileges](#) publication.

Further information on implementing multi-factor authentication can be found in the ACSC's [Implementing Multi-Factor Authentication](#) publication.

Further information on mitigating the use of stolen credentials can be found in the ACSC's [Mitigating the Use of Stolen Credentials](#) publication.

Further information on [randomly generating passphrases](#) (preferably using five dice rolls and the long word list) is available from the Electronic Frontier Foundation while a [random dice roller](#) is available from RANDOM.ORG.

Virtualisation hardening

Containerisation

Containers allow for versatile deployment of systems, and can be used to quickly scale systems. However, they are still systems that run software and should be treated as any other system. Application of security controls in a containerised environment may take a different form when compared to other types of systems. For example, patching operating systems on workstations may be actioned differently to ensuring that a patched image is being used for a container, however the principle is the same. In general, the same security risks that apply to non-containerised systems would likely apply to containerised systems.

Functional separation between computing environments

Software-based isolation mechanisms are commonly used to share a physical server's hardware among multiple computing environments. The benefits of using software-based isolation mechanisms to share a physical server's hardware include increasing the range of activities that it can be used for and maximising the utilisation of its hardware.

A computing environment could consist of an entire operating system installed in a virtual machine where the isolation mechanism is a hypervisor, as is commonly used in cloud services providing Infrastructure as a Service. Alternatively, a computing environment could consist of an application which uses the shared kernel of the underlying operating system of the physical server where the isolation mechanisms are application containers or application sandboxes, as is commonly used in cloud services providing Platform as a Service. The logical separation of data within a single application, which is commonly used in cloud services providing Software as a Service, is not considered to be the same as multiple computing environments.

An adversary who has compromised a single computing environment, or who legitimately controls a single computing environment, might exploit a misconfiguration or security vulnerability in the isolation mechanism to compromise other computing environments on the same physical server, or compromise the underlying operating system of the physical server.

Security Control: 1460; Revision: 2; Updated: Aug-20; Applicability: All

When using a software-based isolation mechanism to share a physical server's hardware, the isolation mechanism is from a vendor that uses secure coding practices and, when security vulnerabilities have been identified, develops and distributes patches in a timely manner.

Security Control: 1604; Revision: 0; Updated: Aug-20; Applicability: All

When using a software-based isolation mechanism to share a physical server's hardware, the configuration of the isolation mechanism is hardened by removing unneeded functionality and restricting access to the administrative interface used to manage the isolation mechanism.

Security Control: 1605; Revision: 0; Updated: Aug-20; Applicability: All

When using a software-based isolation mechanism to share a physical server's hardware, the underlying operating system running on the server is hardened.

Security Control: 1606; Revision: 0; Updated: Aug-20; Applicability: All

When using a software-based isolation mechanism to share a physical server's hardware, patches are applied to the isolation mechanism and underlying operating system in a timely manner.

Security Control: 1607; Revision: 0; Updated: Aug-20; Applicability: All

When using a software-based isolation mechanism to share a physical server's hardware, integrity and log monitoring are performed for the isolation mechanism and underlying operating system in a timely manner.

Security Control: 1461; Revision: 4; Updated: Dec-21; Applicability: S, TS

When using a software-based isolation mechanism to share a physical server's hardware for SECRET or TOP SECRET workloads, the physical server and all computing environments running on the physical server are of the same classification and within the same security domain.

Further information

Further information on hypervisor security can be found in National Institute of Standards and Technology Special Publication 800-125A Rev. 1, [Security Recommendations for Server-based Hypervisor Platforms](#).

Further information on container security can be found in National Institute of Standards and Technology Special Publication 800-190, [Application Container Security Guide](#).

Guidelines for System Management

System administration

System administration of cloud services

System administration of cloud services brings unique challenges when compared to system administration of on-premise assets. Notably, responsibility for system administration of cloud services is often shared between service providers and organisations. As the technology stack and system administration processes implemented by service providers are often opaque to organisations, organisations should consider a service provider's control plane to operate within a different security domain. As such, the security controls below may require adjustment.

System administration processes and procedures

A key component of system administration is ensuring that privileged actions are performed using approved system administration processes supported by system administration procedures. This will ensure that privileged actions are undertaken in a repeatable and accountable manner.

Security Control: 0042; Revision: 5; Updated: Dec-21; Applicability: All

System administration processes, and supporting system administration procedures, are developed and implemented.

Separate privileged operating environments

One of the greatest threats to the security of a network as a whole is the compromise of the operating environment used for administration activities. Providing a separate privileged operating environment for privileged users, in addition to their unprivileged operating environment, provides greater assurance that privileged activities and credentials will not be compromised.

Using different physical machines is considered the most secure solution to separate privileged and unprivileged operating environments; however, a risk-based approach may determine that a virtualisation-based solution is sufficient. In such cases, the virtualised unprivileged operating environment should be run from within either a physical or virtualised privileged operating environment.

Security Control: 1380; Revision: 5; Updated: Sep-21; Applicability: All

Privileged users use separate privileged and unprivileged operating environments.

Security Control: 1687; Revision: 0; Updated: Sep-21; Applicability: All

Privileged operating environments are not virtualised within unprivileged operating environments.

Security Control: 1688; Revision: 0; Updated: Sep-21; Applicability: All

Unprivileged accounts cannot login to privileged operating environments.

Security Control: 1689; Revision: 0; Updated: Sep-21; Applicability: All

Privileged accounts (excluding local administrator accounts) cannot login to unprivileged operating environments.

Security Control: 1381; Revision: 2; Updated: Sep-18; Applicability: All

Dedicated administrator workstations used for privileged tasks are prevented from communicating to assets not related to administrative activities.

Security Control: 1383; Revision: 2; Updated: Sep-18; Applicability: All

All administrative infrastructure including, but not limited to, administrator workstations and jump servers are hardened.

Dedicated administration zones and communication restrictions

Administration security can be improved by segregating administrator workstations from the wider network. This can be achieved a number of ways, such as via the use of Virtual Local Area Networks, firewalls, network access controls and Internet Protocol Security Server and Domain Isolation. It is recommended that segmentation and segregation be applied regardless of whether privileged users have physically separate administrator workstations or not.

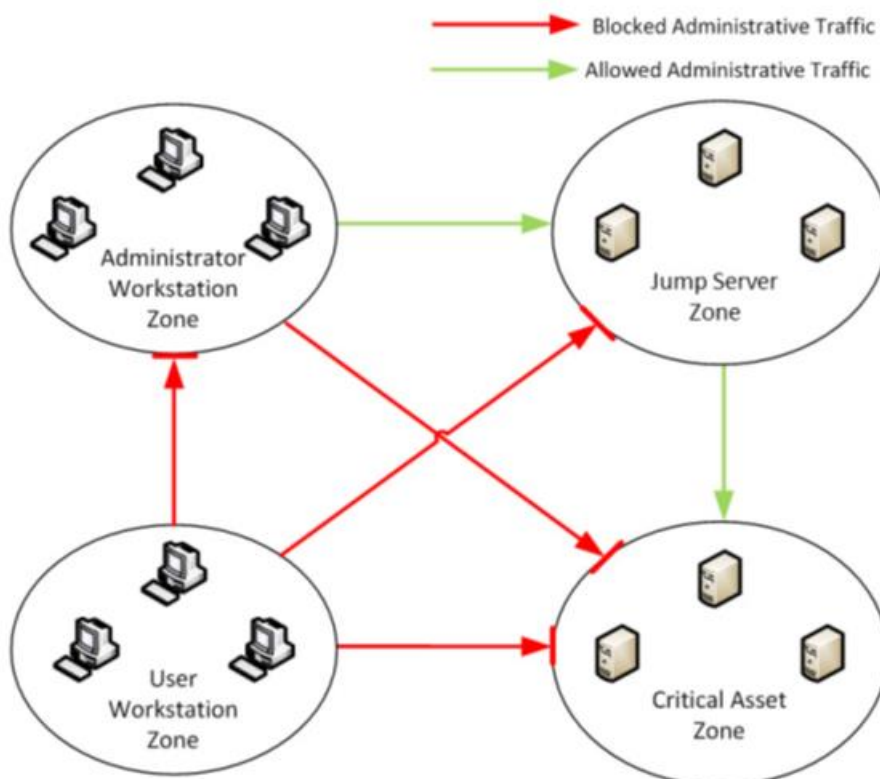
Security Control: 1385; Revision: 2; Updated: Sep-18; Applicability: All

Administrator workstations are placed into a separate network zone to user workstations.

Restriction of management traffic flows

Limiting the flow of management traffic to only network zones explicitly required to communicate with each other can reduce the consequences of a network compromise and make it easier to detect if it does occur. Furthermore, although user workstations will have a need to communicate with critical assets such as web servers or domain controllers in order to function, it is highly unlikely that they will need to send or receive management traffic to these assets.

The following diagram outlines how management traffic filtering could be implemented between a network comprising different network zones. The only flows of management traffic allowed are those between the 'Administrator Workstation Zone' and the 'Jump Server Zone' as well as the 'Jump Server Zone' and the 'Critical Asset Zone'. All other traffic is blocked as there is no reason for management traffic to flow between the other network zones.



Security Control: 1386; Revision: 4; Updated: Oct-19; Applicability: All

Management traffic is only allowed to originate from network zones that are used to administer systems and applications.

Jump servers

A jump server (also known as a jump host or jump box) is used to manage resources in a separate security domain. The use of jump servers as a form of management proxy can be an effective way of simplifying and securing privileged activities. Implementing a jump server can yield the following benefits:

- an efficient and effective focal point to perform multi-factor authentication
- a single place to store and patch management tools
- simplified implementation of management traffic filtering
- a focal point for logging, monitoring and alerting.

In a typical scenario, if a privileged user wanted to perform administrative activities they would connect directly to the target server using Remote Desktop Protocol or Secure Shell. However, in a jump server setup, the privileged user would first connect and authenticate to the jump server then use Remote Desktop Protocol, Secure Shell or remote administration tools to access the target server.

When implementing a jump server, it is recommended that organisations implement multi-factor authentication, enforce strict device communication restrictions and harden administrative infrastructure, otherwise a jump server will yield little security benefit.

Security Control: 1387; Revision: 2; Updated: Sep-21; Applicability: All
Administrative activities are conducted through jump servers.

Security Control: 1388; Revision: 1; Updated: Sep-18; Applicability: All
Jump servers are prevented from communicating to assets and sending and receiving traffic not related to administrative activities.

Further information

Further information on the use of privileged accounts can be found in the access to systems and their resources section of the [Guidelines for Personnel Security](#).

Further information on multi-factor authentication for system administration can be found in the authentication hardening section of the [Guidelines for System Hardening](#).

Further information on network segmentation can be found in the network design and configuration section of the [Guidelines for Networking](#).

Further information on system administration can be found in the Australian Cyber Security Centre (ACSC)'s [Secure Administration](#) publication.

Further information on mitigating the use of stolen credentials can be found in the ACSC's [Mitigating the Use of Stolen Credentials](#) publication.

Further information can also be found in Microsoft's [Mitigating Pass-the-Hash \(PtH\) Attacks and Other Credential Theft Techniques, Version 1 and 2](#) publication.

System patching

Patching approaches

Patches for security vulnerabilities are provided by vendors in many forms, such as:

- fixes that can be applied to pre-existing application versions
- fixes incorporated into new applications or drivers that require pre-existing versions to be replaced

- fixes that require the overwriting of firmware on ICT equipment.

When patches are not available

When patches are not available for security vulnerabilities there are a number of approaches that can be undertaken to reduce security risks. In priority order this includes resolving the security vulnerability, preventing exploitation of the security vulnerability, containing the exploitation of the security vulnerability or detecting exploitation of the security vulnerability.

Security vulnerabilities might be resolved by:

- disabling the functionality associated with the security vulnerability
- engaging a software developer to resolve the security vulnerability
- changing to different software or ICT equipment with a more responsive vendor.

Exploitation of security vulnerabilities might be prevented by:

- applying external input sanitisation
- applying filtering or verification on output
- applying additional access controls that prevent access to the security vulnerability
- configuring firewall rules to limit access to the security vulnerability.

Exploitation of security vulnerabilities might be contained by:

- applying firewall rules limiting outward traffic that is likely in the event of an exploitation
- applying mandatory access control preventing the execution of exploitation code
- setting file system permissions preventing exploitation code from being written to disk.

Exploitation of security vulnerabilities might be detected by:

- deploying a Host-based Intrusion Prevention System
- monitoring logging alerts
- using other mechanisms for the detection of exploits using the known security vulnerability.

Patch management processes and procedures

Applying patches or updates is critical to ensuring the security of applications, drivers, operating systems and firmware in workstations, servers, mobile devices, network devices and all other ICT equipment. To assist in this, suitable sources of information should be monitored for information about new patches or updates.

Security Control: 1143; Revision: 8; Updated: Dec-21; Applicability: All

Patch management processes, and supporting patch management procedures, are developed and implemented.

Security Control: 1493; Revision: 2; Updated: Jun-21; Applicability: All

Software registers are maintained and regularly audited for workstations, servers, mobile devices, network devices and all other ICT equipment.

Security Control: 1643; Revision: 0; Updated: Jun-21; Applicability: All

Software registers contain versions and patch histories of applications, drivers, operating systems and firmware.

When to patch security vulnerabilities

There are multiple information sources (such as news outlets, security researchers and vendors) that organisations can use to assess the applicability and impact of security vulnerabilities (such as if public exploit code is available or if the security vulnerability is already being exploited by an adversary) in the context of their environment.

Once a patch or update is released by a vendor, it should be applied in a timeframe that is commensurate with the likelihood of targeting by an adversary in the context of the organisation's environment. Doing so ensures that resources are spent in an effective and efficient manner by focusing effort on the most significant security vulnerabilities first.

If a patch or update is released for high assurance ICT equipment, the ACSC will conduct an assessment of the patch or update and may revise the ICT equipment's usage guidance. If a patch or update for high assurance ICT equipment is approved for deployment, the ACSC will inform organisations of the timeframe in which it is to be deployed.

If no patches or updates are immediately available for security vulnerabilities, vendor mitigations may provide the only effective protection until patches or updates become available. These vendor mitigations may be published in conjunction with, or soon after, security vulnerability announcements. Vendor mitigations may include disabling the vulnerable functionality within the operating system, application or device, or restricting or blocking access to the vulnerable service using firewalls or other access controls.

Note, for organisations implementing only Maturity Level Two of the [Essential Eight Maturity Model](#), security controls 1692 and 1696 are not applicable.

Security Control: 1690; Revision: 0; Updated: Sep-21; Applicability: All

Patches, updates or vendor mitigations for security vulnerabilities in internet-facing services are applied within two weeks of release, or within 48 hours if an exploit exists.

Security Control: 1691; Revision: 0; Updated: Sep-21; Applicability: All

Patches, updates or vendor mitigations for security vulnerabilities in office productivity suites, web browsers and their extensions, email clients, PDF software, and security products are applied within two weeks of release.

Security Control: 1692; Revision: 0; Updated: Sep-21; Applicability: All

Patches, updates or vendor mitigations for security vulnerabilities in office productivity suites, web browsers and their extensions, email clients, PDF software, and security products are applied within 48 hours if an exploit exists.

Security Control: 1693; Revision: 0; Updated: Sep-21; Applicability: All

Patches, updates or vendor mitigations for security vulnerabilities in other applications are applied within one month of release.

Security Control: 1694; Revision: 0; Updated: Sep-21; Applicability: All

Patches, updates or vendor mitigations for security vulnerabilities in operating systems of internet-facing services are applied within two weeks of release, or within 48 hours if an exploit exists.

Security Control: 1695; Revision: 0; Updated: Sep-21; Applicability: All

Patches, updates or vendor mitigations for security vulnerabilities in operating systems of workstations, servers and network devices are applied within two weeks of release.

Security Control: 1696; Revision: 0; Updated: Sep-21; Applicability: All

Patches, updates or vendor mitigations for security vulnerabilities in operating systems of workstations, servers and network devices are applied within 48 hours if an exploit exists.

Security Control: 1697; Revision: 0; Updated: Sep-21; Applicability: All

Patches, updates or vendor mitigations for security vulnerabilities in drivers and firmware are applied within two weeks of release, or within 48 hours if an exploit exists.

Security Control: 0300; Revision: 7; Updated: Sep-21; Applicability: S, TS

High assurance ICT equipment is only patched or updated when approved by the ACSC using methods and timeframes prescribed by the ACSC.

How to patch security vulnerabilities

To ensure that patches are applied consistently across an organisation's workstation and server fleet, it is essential that organisations use a centralised and managed approach. This will assist in ensuring the integrity and authenticity of patches being applied to workstations and servers.

Security Control: 0298; Revision: 7; Updated: Oct-19; Applicability: All

A centralised and managed approach is used to patch or update applications and drivers.

Security Control: 0303; Revision: 6; Updated: Sep-18; Applicability: All

An approach for patching or updating applications and drivers that ensures the integrity and authenticity of patches or updates, as well as the processes used to apply them, is used.

Security Control: 1497; Revision: 0; Updated: Sep-18; Applicability: All

An automated mechanism is used to confirm and record that deployed application and driver patches or updates have been installed, applied successfully and remain in place.

Security Control: 1498; Revision: 1; Updated: Oct-19; Applicability: All

A centralised and managed approach is used to patch or update operating systems and firmware.

Security Control: 1499; Revision: 0; Updated: Sep-18; Applicability: All

An approach for patching or updating operating systems and firmware that ensures the integrity and authenticity of patches or updates, as well as the processes used to apply them, is used.

Security Control: 1500; Revision: 0; Updated: Sep-18; Applicability: All

An automated mechanism is used to confirm and record that deployed operating system and firmware patches or updates have been installed, applied successfully and remain in place.

Scanning for missing patches

To ensure that patches have been applied across an organisation's workstation and server fleet, it is essential that organisations scanning for missing patches on a regular basis. Ideally, vulnerability scanning should take place at half the frequency in which patches need to be applied. For example, if patches are applied fortnightly then vulnerability scanning should be undertaken weekly.

Security Control: 1698; Revision: 0; Updated: Sep-21; Applicability: All

A vulnerability scanner is used at least daily to identify missing patches or updates for security vulnerabilities in internet-facing services.

Security Control: 1699; Revision: 0; Updated: Sep-21; Applicability: All

A vulnerability scanner is used at least weekly to identify missing patches or updates for security vulnerabilities in office productivity suites, web browsers and their extensions, email clients, PDF software, and security products.

Security Control: 1700; Revision: 0; Updated: Sep-21; Applicability: All

A vulnerability scanner is used at least fortnightly to identify missing patches or updates for security vulnerabilities in other applications.

Security Control: 1701; Revision: 0; Updated: Sep-21; Applicability: All

A vulnerability scanner is used at least daily to identify missing patches or updates for security vulnerabilities in operating systems of internet-facing services.

Security Control: 1702; Revision: 0; Updated: Sep-21; Applicability: All

A vulnerability scanner is used at least weekly to identify missing patches or updates for security vulnerabilities in operating systems of workstations, servers and network devices.

Security Control: 1703; Revision: 0; Updated: Sep-21; Applicability: All

A vulnerability scanner is used at least weekly to identify missing patches or updates for security vulnerabilities in drivers and firmware.

Cessation of support

When applications, operating systems and ICT equipment reach their cessation date for support, organisations will find it increasingly difficult to protect against security vulnerabilities as patches, or other forms of support, will not be made available by vendors. While the cessation date for support for operating systems is generally advised many years in advance by vendors, other applications and ICT equipment may cease to receive support immediately after a newer version is released by a vendor.

Note, for organisations implementing only Maturity Level Two of the [Essential Eight Maturity Model](#), security control 0304 is not applicable.

Security Control: 1704; Revision: 0; Updated: Sep-21; Applicability: All

Internet-facing services, office productivity suites, web browsers and their extensions, email clients, PDF software, Adobe Flash Player, and security products that are no longer supported by vendors are removed.

Security Control: 0304; Revision: 6; Updated: Sep-21; Applicability: All

Applications that are no longer supported by vendors are removed.

Security Control: 1501; Revision: 1; Updated: Sep-21; Applicability: All

Operating systems that are no longer supported by vendors are replaced.

Further information

Further information on patching evaluated products can be found in the evaluated product usage section of the [Guidelines for Evaluated Products](#).

Further information on patching security vulnerabilities can be found in the ACSC's [Assessing Security Vulnerabilities and Applying Patches](#) publication.

Change management

Identifying the need for change

The need for change can be identified in various ways, including:

- identification of security vulnerabilities or cyber threats
- users identifying problems or a need for system enhancements
- upgrades or patches for software or ICT equipment
- vendors notifying the end of life for software or ICT equipment
- the implementation of new software or ICT equipment
- organisational or business process changes
- other continuous improvement activities.

Change management processes and procedures

The use of change management processes ensures that changes to systems are made in an accountable manner with appropriate consultation and approval. Furthermore, change management processes provides an opportunity for the security impact of any changes to systems to be considered.

In implementing changes to systems, it is important that change management procedures clearly articulate the steps to be taken for each part of change management processes.

Security Control: 1211; Revision: 4; Updated: Dec-21; Applicability: All

Change management processes, and supporting change management procedures, are developed and implemented covering:

- *identification and documentation of requests for change*
- *approval required for changes to be made*
- *assessment of potential security impacts*
- *notification of any planned disruptions or outages*
- *implementation and testing of approved changes*
- *the maintenance of system and security documentation.*

Data backup and restoration

Digital preservation policy

Developing and implementing a digital preservation policy as part of digital continuity planning can assist in ensuring the long term integrity and availability of important data is maintained. Especially when taking into account the potential for data degradation and media, hardware and software obsolesce.

Security Control: 1510; Revision: 1; Updated: Aug-19; Applicability: All

A digital preservation policy is developed and implemented.

Data backup and restoration processes and procedures

Having data backup and restoration processes and procedures is an important part of business continuity and disaster recovery planning. Such activities will also form an integral part of an overarching digital preservation policy.

Security Control: 1547; Revision: 1; Updated: Dec-21; Applicability: All

Data backup processes, and supporting data backup procedures, are developed and implemented.

Security Control: 1548; Revision: 1; Updated: Dec-21; Applicability: All

Data restoration processes, and supporting data restoration procedures, are developed and implemented.

Performing and retaining backups

When performing backups, all important data, software and configuration settings for software, network devices and other ICT equipment should be captured on a regular basis. This will ensure that should a system fall victim to a ransomware attack, important data will not be lost and that business operations will have reduced downtime.

Furthermore, to prevent backups from being retained for an insufficient amount of time to allow for the recovery of data, organisations are strongly encouraged to store backups for a sufficient period of time to meet business continuity requirements.

Security Control: 1511; Revision: 2; Updated: Sep-21; Applicability: All

Backups of important data, software and configuration settings are performed and retained in a coordinated and resilient manner in accordance with business continuity requirements.

Backup access and modification

To mitigate the likelihood of data becoming unavailable due to accidental or malicious modification or deletion of backups, organisations should ensure that backups are sufficiently protected from unauthorised modification or deletion through appropriate access controls.

Note, for organisations implementing only Maturity Level Two of the [Essential Eight Maturity Model](#), security controls 1706 and 1708 are not applicable.

Security Control: 1705; Revision: 0; Updated: Sep-21; Applicability: All

Unprivileged accounts, and privileged accounts (excluding backup administrators) cannot access other account's backups.

Security Control: 1706; Revision: 0; Updated: Sep-21; Applicability: All

Unprivileged accounts, and privileged accounts (excluding backup administrators) can't access their own account's backups.

Security Control: 1707; Revision: 0; Updated: Sep-21; Applicability: All

Unprivileged accounts, and privileged accounts (excluding backup administrators), are prevented from modifying or deleting backups.

Security Control: 1708; Revision: 0; Updated: Sep-21; Applicability: All

Backup administrators (excluding backup break glass accounts), are prevented from modifying or deleting backups.

Testing restoration of backups

To ensure that backups can be restored when the need arises, and that any dependencies can be identified and managed, it is important that restoration of systems, software and important data is routinely tested in a coordinated manner as part of disaster recovery exercises.

Security Control: 1515; Revision: 2; Updated: Sep-21; Applicability: All

Restoration of systems, software and important data from backups is tested in a coordinated manner as part of disaster recovery exercises.

Further information

Further information on business continuity can be found in the service continuity for online services section of the [Guidelines for Networking](#).

Further information on [preserving digital information](#) is available from the National Archives of Australia.

Guidelines for System Monitoring

Event logging and auditing

Event logging policy

By developing an event logging policy, taking into consideration any shared responsibilities between organisations and their service providers, an organisation can improve their chances of detecting malicious behaviour on systems and networks. Such an event logging policy would cover events to be logged, logging facilities to be used, event log retention periods and how event logs will be protected.

Security Control: 0580; Revision: 6; Updated: Aug-19; Applicability: All

An event logging policy is developed and implemented.

Centralised logging facility

A centralised logging facility can be used to correlate event logs from multiple sources. This functionality may be provided by a Security Information and Event Management solution.

Security Control: 1405; Revision: 1; Updated: Sep-18; Applicability: All

A centralised logging facility is implemented and systems are configured to save event logs to the centralised logging facility as soon as possible after each event occurs.

Security Control: 0988; Revision: 5; Updated: Sep-18; Applicability: All

An accurate time source is established and used consistently across systems and network devices to assist with the correlation of events.

Events to be logged

The following list of events can assist in monitoring the security posture of systems, detecting malicious behaviour and contributing to investigations following cyber security incidents.

Security Control: 0584; Revision: 2; Updated: Sep-18; Applicability: All

For any system requiring authentication, logon, failed logon and logoff events are logged.

Security Control: 0582; Revision: 6; Updated: Aug-20; Applicability: All

The following events are logged for operating systems:

- access to important data and processes
- application crashes and any error messages
- attempts to use special privileges
- changes to accounts
- changes to security policy
- changes to system configurations
- Domain Name System and Hypertext Transfer Protocol requests
- failed attempts to access data and system resources
- service failures and restarts
- system startup and shutdown

- *transfer of data to and from external media*
- *user or group management*
- *use of special privileges.*

Security Control: 1536; Revision: 0; Updated: Sep-18; Applicability: All

The following events are logged for web applications:

- *attempted access that is denied*
- *crashes and any error messages*
- *search queries initiated by users.*

Security Control: 1537; Revision: 1; Updated: Jun-21; Applicability: All

The following events are logged for databases:

- *access to particularly important data*
- *addition of new users, especially privileged users*
- *any query containing comments*
- *any query containing multiple embedded queries*
- *any query or database alerts or failures*
- *attempts to elevate privileges*
- *attempted access that is successful or unsuccessful*
- *changes to the database structure*
- *changes to user roles or database permissions*
- *database administrator actions*
- *database logons and logoffs*
- *modifications to data*
- *use of executable commands.*

Event log details

For each event logged, sufficient detail needs to be recorded in order for the event log to be useful.

Security Control: 0585; Revision: 4; Updated: Sep-18; Applicability: All

For each event logged, the date and time of the event, the relevant user or process, the event description, and the ICT equipment involved are recorded.

Event log protection

Effective event log protection and storage, from the time they are created to the time they are destroyed, ensures the integrity, availability and non-repudiation of captured event logs.

Security Control: 0586; Revision: 4; Updated: Sep-18; Applicability: All

Event logs are protected from unauthorised access, modification and deletion.

Event log retention

Since event logs can contribute to investigations following cyber security incidents, they should ideally be retained for the life of a system, and potentially longer. However, the minimum retention requirement for these records under the National Archives of Australia (NAA)'s [Administrative Functions Disposal Authority Express Version 2](#) publication is seven years.

Security Control: 0859; Revision: 3; Updated: Jan-20; Applicability: All

Event logs are retained for a minimum of 7 years in accordance with the NAA's Administrative Functions Disposal Authority Express Version 2 publication.

Security Control: 0991; Revision: 4; Updated: Sep-18; Applicability: All

Domain Name System and proxy logs are retained for at least 18 months.

Event log auditing processes and procedures

Auditing of event logs is an integral part of maintaining the security posture of systems. Such activities can help detect and attribute any violations of security policy, including cyber security incidents.

Security Control: 0109; Revision: 7; Updated: Dec-21; Applicability: All

Event log auditing processes, and supporting event log auditing procedures, are developed and implemented covering the scope and schedule of audits, what constitutes a violation of security policy, and actions to be taken when violations are detected, including reporting requirements.

Security Control: 1228; Revision: 2; Updated: Sep-18; Applicability: All

Events are correlated across event logs to prioritise audits and focus investigations.

Further information

Further information on event logging associated with a cyber security incident can be found in the [Guidelines for Cyber Security Incidents](#).

Further information on event logging and forwarding can be found in the Australian Cyber Security Centre's [Windows Event Logging and Forwarding](#) publication.

Further information on retaining event logs can be found in the NAA's [Administrative Functions Disposal Authority Express Version 2](#) publication.

Guidelines for Software Development

Application development

Types of application development

These guidelines are applicable to both traditional application development activities as well as mobile application development activities.

Development environments

Segregating development, testing and production environments can limit the spread of malicious code and minimises the likelihood of faulty code in a production environment.

Security Control: 0400; Revision: 5; Updated: Aug-20; Applicability: All
Development, testing and production environments are segregated.

Security Control: 1419; Revision: 1; Updated: Sep-18; Applicability: All
Development and modification of software only takes place in development environments.

Security Control: 1420; Revision: 3; Updated: Jun-21; Applicability: All
Data in production environments is not used in testing or development environments unless the testing or development environments are secured to the same level as the production environments.

Security Control: 1422; Revision: 3; Updated: Sep-18; Applicability: All
Unauthorised access to the authoritative source for software is prevented.

Secure software design

Threat modelling is an important part of secure software design as it assists with the identification of at risk software components, thereby enabling mitigating security controls to be identified to reduce security risks.

Security Control: 1238; Revision: 3; Updated: Sep-18; Applicability: All
Threat modelling and other secure design techniques are used to ensure that threats to software and mitigations to those threats are identified and accounted for.

Software bill of materials

A software bill of materials is a list of open source and commercial software components that are used in the development of software. This can assist in providing greater cyber supply chain transparency for consumers of the software by allowing for easier identification and management of security risks associated with individual software components used by software.

Security Control: 1730; Revision: 0; Updated: Dec-21; Applicability: All
A software bill of materials is produced and made available to consumers of software.

Secure programming practices

Once a secure software design has been identified, secure programming practices should be followed during software development activities.

Security Control: 0401; Revision: 4; Updated: Oct-19; Applicability: All

Platform-specific secure programming practices are used when developing software, including using the lowest privilege needed to achieve a task, checking return values of all system calls, validating all inputs and encrypting all communications.

Software testing

Software testing can lessen the risk of security vulnerabilities in software being introduced into a production environment. Software testing can be performed using both static testing, such as code analysis, as well as dynamic testing, such as input validation and fuzzing. Vulnerability scanning tools can also assist in the detection of known security vulnerabilities, such as out of date or vulnerable dependencies. Using an independent party for software testing will remove any bias that can occur when a software developer tests their own software.

Security Control: 0402; Revision: 3; Updated: Sep-18; Applicability: All

Software is tested for security vulnerabilities by software developers, as well as an independent party, before it is used in a production environment.

Vulnerability disclosure program

Implementing a vulnerability disclosure program, based on responsible disclosure, can assist organisations, vendors and service providers to improve the security of their products and services as it provides a way for security researchers, customers and members of the public to responsibly notify them of potential security vulnerabilities in a coordinated manner. Furthermore, following the verification and resolution of a reported security vulnerability, it can assist organisations, vendors and service providers in notifying their customers of any security vulnerabilities that have been discovered in their products and services and any recommended security patches, updates or mitigations.

A vulnerability disclosure program should include processes and procedures for receiving, verifying, resolving and reporting on security vulnerabilities disclosed by both internal and external sources. In support of this, a vulnerability disclosure policy should be made publicly available that covers:

- the purpose of the vulnerability disclosure program
- the types of security research that are allowed
- the types of security research that are not allowed
- how to report potential security vulnerabilities
- the actions that will be taken on receiving notification of potential security vulnerabilities and indicative timeframes for these actions
- any expectations regarding the public disclosure of verified security vulnerabilities
- any recognition finders of verified security vulnerabilities will receive.

Finally, the Australian Cyber Security Centre (ACSC) encourages security researchers, customers and members of the public to responsibly report security vulnerabilities directly with organisations, vendors and service providers. However, the ACSC recognises that this is not always practical, initial attempts at communication may be unsuccessful or the person making the report may not wish to do so directly. In such cases, security vulnerabilities can be reported to the ACSC as an independent coordinator.

Security Control: 1616; Revision: 0; Updated: Aug-20; Applicability: All

A vulnerability disclosure program is implemented to assist with the secure development and maintenance of products and services.

Security Control: 1717; Revision: 0; Updated: Dec-21; Applicability: All

A 'security.txt' file is hosted for all internet-facing organisational domains to assist in the responsible disclosure of security vulnerabilities in organisations' products and services.

Further information

Further information on a secure development life cycle model, known as [The Trustworthy Computing Security Development Lifecycle](#), is available from Microsoft.

Further information on [cyber supply chain transparency](#) and the recommended content for a software bill of materials is available in the United States' National Telecommunications and Information Administration's [The Minimum Elements For a Software Bill of Materials \(SBOM\)](#).

Further information on [secure programming practices](#) is available from the Carnegie Mellon University's Software Engineering Institute.

Further information on implementing a vulnerability disclosure program can be found in:

- Google's [Starting a Vulnerability Disclosure Program](#)
- European Union Agency for Cybersecurity's [Good Practice Guide on Vulnerability Disclosure](#)
- Netherland's National Cyber Security Centre's [Coordinated Vulnerability Disclosure: The Guideline](#)
- Carnegie Mellon University's [The CERT Guide to Coordinated Vulnerability Disclosure](#)
- International Organization for Standardization/International Electrotechnical Commission 29147:2018, [Information technology – Security techniques – Vulnerability disclosure](#)
- International Organization for Standardization/International Electrotechnical Commission 30111:2019, [Information technology – Security techniques – Vulnerability handling processes](#).

Further information on [recommended contents for 'security.txt' files](#) is available to assist organisations with their implementation.

Further information on [reporting security vulnerabilities](#) to the ACSC as an independent coordinator is available from the ACSC.

Web application development

Protecting web applications

Even when a web application only contains public data, there remains a need to protect the integrity and availability of the data processed by the web application and the system it is hosted on.

Web application frameworks

Web application frameworks can be leveraged by software developers to enhance the security of a web application while decreasing development time. These resources can assist software developers to securely implement complex components such as session management, input handling and cryptographic operations.

Security Control: 1239; Revision: 3; Updated: Sep-18; Applicability: All

Robust web application frameworks are used to aid in the development of secure web applications.

Web application interactions

Hypertext Transfer Protocol Secure (HTTPS) is Hypertext Transfer Protocol using Transport Layer Security (TLS) encryption. The use of HTTPS for web applications ensures that not only are individuals' interactions with web applications kept confidential, but the integrity of their interactions are also maintained.

Security Control: 1552; Revision: 0; Updated: Oct-19; Applicability: All

All web application content is offered exclusively using HTTPS.

Web application input handling

Most web application security vulnerabilities are caused by the lack of secure input handling. It is essential that web applications do not trust any input such as the website address and its parameters, Hypertext Markup Language (HTML) form data, cookie values and request headers without validating or sanitising it. Examples of validation and sanitisation include:

- ensuring a telephone form field contains only numerals
- ensuring data used in a Structured Query Language query is sanitised properly
- ensuring Unicode input is handled appropriately.

Security Control: 1240; Revision: 2; Updated: Sep-18; Applicability: All

Validation and/or sanitisation is performed on all input handled by a web application.

Web application output encoding

The likelihood of cross-site scripting and other content injection attacks can be reduced through the use of contextual output encoding. The most common example of output encoding is the use of HTML entities. Performing HTML entity encoding causes potentially dangerous HTML characters such as '<', '>' and '&' to be converted into their encoded equivalents '<', '>' and '&'.

Output encoding is particularly useful where external data sources, which may not be subject to the same level of input filtering, are output to users.

Security Control: 1241; Revision: 3; Updated: Sep-18; Applicability: All

Output encoding is performed on all output produced by a web application.

Web browser-based security controls

Web browser-based security controls such as Content-Security-Policy, Hypertext Transfer Protocol Strict Transport Security (HSTS) and X-Frame-Options can be leveraged by web applications to help protect themselves and their users. This is achieved via the use of security policy in response headers which users' web browsers apply according to the defined security policy. Since the security controls are applied via response headers, it makes it possible to apply the security controls to legacy or proprietary web applications where changes to the source code are impractical.

Security Control: 1424; Revision: 3; Updated: Oct-19; Applicability: All

Web applications implement Content-Security-Policy, HSTS and X-Frame-Options response headers.

Open Web Application Security Project

The Open Web Application Security Project (OWASP) provides a comprehensive resource to consult when developing web applications.

Security Control: 0971; Revision: 7; Updated: Apr-19; Applicability: All

The OWASP Application Security Verification Standard is followed when developing web applications.

Further information

Further information on auditing of web applications can be found in the event logging and auditing section of the [Guidelines for System Monitoring](#).

Further information on implementing TLS can be found in the Transport Layer Security section of the [Guidelines for Cryptography](#).

Further information on web application security can be found in the following ACSC publications:

- [*Implementing Certificates, TLS, HTTPS and Opportunistic TLS*](#)
- [*Protecting Web Applications and Users*](#)
- [*Securing Content Management Systems*](#).

Further information on web application security is available in the OWASP [*Application Security Verification Standard*](#).

Guidelines for Database Systems

Database servers

Protecting database server contents

Database server contents can be protected from unauthorised access (e.g. by the physical theft of a database server or failure to sanitise database server hardware before disposal) through the use of encryption.

Security Control: 1425; Revision: 1; Updated: Sep-18; Applicability: All

Hard disks of database servers are encrypted using full disk encryption.

Functional separation between database servers and web servers

Placing databases used by web applications on the same physical server as a web server can expose them to an increased possibility of compromise by an adversary.

Security Control: 1269; Revision: 2; Updated: Sep-18; Applicability: All

Database servers and web servers are functionally separated, physically or virtually.

Communications between database servers and web servers

Data communicated between database servers and web applications, especially over the internet, is susceptible to capture by an adversary.

Security Control: 1277; Revision: 3; Updated: Jun-21; Applicability: All

Data communicated between database servers and web applications is encrypted.

Network environment

Placing database servers on the same network segment as an organisation's workstations and allowing them to communicate with other network resources exposes them to an increased possibility of compromise by an adversary. Alternatively, in cases where databases will only be accessed from their own database server, allowing remote access to the database server poses an unnecessary security risk.

Security Control: 1270; Revision: 2; Updated: Sep-18; Applicability: All

Database servers that require network connectivity are placed on a different network segment to an organisation's workstations.

Security Control: 1271; Revision: 2; Updated: Jan-20; Applicability: All

Network access controls are implemented to restrict database server communications to strictly defined network resources such as web servers, application servers and storage area networks.

Security Control: 1272; Revision: 1; Updated: Sep-18; Applicability: All

If only local access to a database is required, networking functionality of database management system (DBMS) software is disabled or directed to listen solely to the localhost interface.

Separation of production, test and development database servers

Using production database servers for test and development activities could result in accidental damage to their integrity or contents.

Security Control: 1273; Revision: 2; Updated: Sep-18; Applicability: All

Test and development environments do not use the same database servers as production environments.

Further information

Further information on developing Standard Operating Environments for database servers can be found in the operating system hardening section of the [Guidelines for System Hardening](#).

Further information on patching operating systems of database servers can be found in the system patching section of the [Guidelines for System Management](#).

Further information on using cryptography can be found in the [Guidelines for Cryptography](#).

Database management system software

Temporary installation files and logs

DBMS software will often leave behind temporary installation files and logs during the installation process, in case a database administrator needs to troubleshoot a failed installation. These files, which can include passphrases in the clear, could be valuable to an adversary.

Security Control: 1245; Revision: 2; Updated: Sep-18; Applicability: All

All temporary installation files and logs are removed after DBMS software has been installed.

Hardening and configuration

Poorly configured DBMS software could provide an opportunity for an adversary to gain unauthorised access to database content. To assist organisations in deploying DBMS software, vendors often provide guidance on how to securely configure their DBMS software. Furthermore, DBMS software is often installed with most features enabled by default.

Security Control: 1246; Revision: 2; Updated: Sep-18; Applicability: All

DBMS software is configured according to vendor guidance.

Security Control: 1247; Revision: 2; Updated: Sep-18; Applicability: All

DBMS software features, stored procedures, accounts and databases that are not required are disabled or removed.

Restricting privileges

If DBMS software operating as a local administrator or root account is compromised by an adversary, it can present a significant security risk to the underlying operating system.

DBMS software is also often capable of accessing files that it has read access to on the database server. For example, an adversary using a Structured Query Language (SQL) injection could use the command `LOAD DATA LOCAL INFILE 'etc/passwd' INTO TABLE Users` or `SELECT load_file("/etc/passwd")` to access the contents of a Linux password file. Disabling the ability of the DBMS software to read local files from a server will prevent such SQL injection from succeeding. This could be performed, for example, by disabling use of the 'LOAD DATA LOCAL INFILE' command.

Security Control: 1249; Revision: 2; Updated: Sep-18; Applicability: All

DBMS software is configured to run as a separate account with the minimum privileges needed to perform its functions.

Security Control: 1250; Revision: 1; Updated: Sep-18; Applicability: All

The account under which DBMS software runs has limited access to non-essential areas of the database server's file system.

Security Control: 1251; Revision: 2; Updated: Sep-18; Applicability: All

The ability of DBMS software to read local files from a server is disabled.

Database administrator accounts

DBMS software often comes pre-configured with default database administrator accounts and passphrases that are listed in vendor documentation. These default database administrator accounts should be disabled, renamed or have their passphrases changed.

When sharing database administrator accounts for the performance of administrative activities, any actions undertaken will not be attributable to an individual database administrator. This can hinder investigations relating to an attempted, or successful, intrusion. Furthermore, database administrator accounts shared across different databases can exacerbate any compromise of a database administrator account by an adversary.

When creating new database administrator accounts, the accounts are often allocated all privileges available to system administrators. Most database administrators will only need a subset of all available privileges to undertake their authorised duties.

Security Control: 1260; Revision: 2; Updated: Sep-18; Applicability: All

Default database administrator accounts are disabled, renamed or have their passphrases changed.

Security Control: 1262; Revision: 1; Updated: Sep-18; Applicability: All

Database administrators have unique and identifiable accounts.

Security Control: 1261; Revision: 2; Updated: Sep-18; Applicability: All

Database administrator accounts are not shared across different databases.

Security Control: 1263; Revision: 3; Updated: Sep-21; Applicability: All

Database administrator accounts are used exclusively for administrative activities, with standard database accounts used for general purpose interactions with databases.

Security Control: 1264; Revision: 1; Updated: Sep-18; Applicability: All

Database administrator access is restricted to defined roles rather than accounts with default administrative permissions, or all permissions.

Further information

Further information on authenticating users can be found in the authentication hardening section of the [Guidelines for System Hardening](#).

Further information on patching DBMS software can be found in the system patching section of the [Guidelines for System Management](#).

Databases

Database register

Without knowledge of all the databases in an organisation, and the data they contain, an organisation will be unable to appropriately protect their assets.

Security Control: 1243; Revision: 4; Updated: Aug-19; Applicability: All

A database register is maintained and regularly audited.

Protecting databases

Databases can be protected from unauthorised copying and subsequent offline analysis by applying file-based access controls to database files.

Security Control: 1256; Revision: 3; Updated: Sep-18; Applicability: All

File-based access controls are applied to database files.

Protecting authentication credentials in databases

Storing authentication credentials such as usernames and passphrases as plaintext in databases poses a significant security risk. An adversary that manages to gain access to a database's contents could extract these authentication credentials to gain access to users' accounts. In addition, it is possible that a user could have reused a username and passphrase for their workstation posing an additional security risk.

Security Control: 1252; Revision: 3; Updated: Jun-19; Applicability: All

Passphrases stored in databases are hashed with a uniquely salted Australian Signals Directorate Approved Cryptographic Algorithm.

Protecting database contents

Database administrators and database users should know the sensitivity or classification associated with a database and its contents to ensure that sufficient security controls are applied. In cases where all of a database's contents are the same sensitivity or classification an organisation may choose to classify the entire database at this level. Alternatively, in cases where a database's contents are of varying sensitivity or classification levels, and database users have differing levels of access to such data, an organisation may choose to apply classifications at a more granular level within the database.

Limiting database user's ability to access, insert, modify or remove content from databases based on their work duties ensures the need-to-know principle is applied and the likelihood of unauthorised modifications is reduced.

Security Control: 0393; Revision: 8; Updated: Jun-21; Applicability: All

Databases and their contents are classified based on the sensitivity or classification of data that they contain.

Security Control: 1255; Revision: 3; Updated: Sep-18; Applicability: All

Database users' ability to access, insert, modify and remove content in databases is restricted based on their work duties.

Security Control: 1268; Revision: 1; Updated: Sep-18; Applicability: All

The need-to-know principle is enforced for database contents through the application of minimum privileges, database views and database roles.

Aggregation of database contents

Where concerns exist that the sum, or aggregation, of separate pieces of data from within databases could lead to an adversary determining more sensitive or classified data, database views in combination with database user access roles should be implemented. Alternatively, the data of concern could be separated by implementing multiple databases, each with restricted data sets. If implemented properly, this will ensure an adversary cannot access the sum of data components leading to the aggregated data.

Security Control: 1258; Revision: 2; Updated: Jun-21; Applicability: All

Where concerns exist that the sum, or aggregation, of separate pieces of data from within databases could lead to a database user determining more sensitive or classified data, database views in combination with database user access roles are implemented.

Separation of production, test and development databases

Using data from production databases in test or development databases could result in inadequate protection being applied to the data.

Security Control: 1274; Revision: 5; Updated: Jun-21; Applicability: All

Data in production databases is not used in testing or development databases unless the testing or development environments are secured to the same level as the production environment.

Web application interaction with databases

SQL injection is a significant threat to the confidentiality, integrity and availability of database contents. SQL injections can allow an adversary to steal data from databases, modify database contents, delete an entire database or even in some circumstances gain control of the underlying database server. Furthermore, when database queries from web applications fail they may display detailed error information about the database schema to users of the web application. This can be used by an adversary to tailor SQL injection attempts.

Security Control: 1275; Revision: 1; Updated: Sep-18; Applicability: All

All queries to databases from web applications are filtered for legitimate content and correct syntax.

Security Control: 1276; Revision: 2; Updated: Sep-18; Applicability: All

Parameterised queries or stored procedures are used for database interaction instead of dynamically generated queries.

Security Control: 1278; Revision: 2; Updated: Sep-18; Applicability: All

Web applications are designed to provide as little error information as possible to users about database schemas.

Further information

Further information on logging and auditing of database events can be found in the event logging and auditing section of the [Guidelines for System Monitoring](#).

Guidelines for Email

Email usage

Email usage policy

There are many security risks associated with the use of email that are often overlooked by users. Documenting these security risks, and associated mitigations, in an email usage policy will inform users of precautions to take when using email.

Security Control: 0264; Revision: 3; Updated: Aug-19; Applicability: All
An email usage policy is developed and implemented.

Webmail services

When users access non-approved webmail services they are effectively bypassing email content filtering controls as well as other security controls that may have been implemented for an organisation's email gateways and servers. While web content filtering controls may mitigate some security risks (e.g. some forms of malicious attachments), they are unlikely to address specific security risks relating to emails (e.g. spoofed email contents).

Security Control: 0267; Revision: 7; Updated: Mar-19; Applicability: All
Access to non-approved webmail services is blocked.

Protective markings for emails

Implementing protective markings for emails ensures that appropriate security controls are applied to data, and also helps to prevent unauthorised data being released into the public domain. In doing so, it is important that protective markings reflect the highest sensitivity or classification of the subject, body and attachments of emails.

Security Control: 0270; Revision: 6; Updated: Jun-21; Applicability: All
Protective markings are applied to emails and reflect the highest sensitivity or classification of the subject, body and attachments.

Protective marking tools

Requiring user involvement in the marking of emails ensures a conscious decision by users, thereby lessening the chance of incorrectly marked emails. In addition, allowing users to select only protective markings for which a system is authorised to process, store or communicate lessens the chance of users inadvertently over-classifying an email. This also serves to remind users of the maximum sensitivity or classification of data permitted on a system.

Email content filters may only check the most recent protective marking applied to an email. Therefore, when users are responding to or forwarding an email, requiring a protective marking which is at least as high as that of the email they received will help email content filters prevent emails being sent to systems that are not authorised to handle the original sensitivity or classification of the email.

Security Control: 0271; Revision: 3; Updated: Mar-19; Applicability: All
Protective marking tools do not automatically insert protective markings into emails.

Security Control: 0272; Revision: 4; Updated: Mar-19; Applicability: All
Protective marking tools do not allow users to select protective markings that a system has not been authorised to process, store or communicate.

Security Control: 1089; Revision: 4; Updated: Mar-19; Applicability: All

Protective marking tools do not allow users replying to or forwarding an email to select a protective marking that is lower than previously used for the email.

Handling emails with inappropriate, invalid or missing protective markings

It is important that email servers are configured to block emails with inappropriate protective markings. For example, blocking inbound and outbound emails with a protective marking higher than the sensitivity or classification of the receiving system will prevent a data spill from occurring. In doing so, it is important to inform recipients of blocked inbound emails, and the sender of blocked outbound emails, that this has occurred.

If an email is received with an invalid or missing protective marking it may still be passed to its intended recipients; however, the recipients will have an obligation to determine the appropriate protective marking for the email if it is to be responded to, forwarded or printed. If unsure, the sender of the original email should be contacted to seek clarification of handling requirements.

Security Control: 0565; Revision: 4; Updated: Mar-19; Applicability: All

Email servers are configured to block, log and report emails with inappropriate protective markings.

Security Control: 1023; Revision: 5; Updated: Mar-19; Applicability: All

The intended recipients of any blocked inbound emails, and the sender of any blocked outbound emails, are notified.

Email distribution lists

Often the membership and nationality of members of email distribution lists is unknown. Therefore, users sending emails with Australian Eyes Only, Australian Government Access Only or Releasable To data to distribution lists could accidentally cause a data spill.

Security Control: 0269; Revision: 4; Updated: Jun-21; Applicability: S, TS

Emails containing Australian Eyes Only, Australian Government Access Only or Releasable To data are only sent to named recipients and not to groups or distribution lists unless the nationality of all members of the distribution lists can be confirmed.

Further information

Further information on the Australian Government's email protective marking standard can be found in the Attorney-General's Department's [Protective Security Policy Framework](#), [Sensitive and classified information](#) policy.

Email gateways and servers

Centralised email gateways

Without a centralised email gateway it is difficult to deploy Sender Policy Framework (SPF), DomainKeys Identified Mail (DKIM) and protective marking checks.

Security Control: 0569; Revision: 3; Updated: Sep-18; Applicability: All

Email is routed through a centralised email gateway.

Security Control: 0571; Revision: 5; Updated: Mar-19; Applicability: All

When users send email from outside their network, an authenticated and encrypted channel is configured to allow email to be routed via a centralised email gateway.

Email gateway maintenance activities

An adversary will often avoid using an organisation's primary email gateway when sending malicious emails. This is because backup and alternative email gateways are often poorly maintained in terms of patches and email content

filtering controls. As such, it is important that extra effort is made to ensure that backup and alternative email gateways are maintained to the same standard as the primary email gateway.

Security Control: 0570; Revision: 4; Updated: Sep-18; Applicability: All

Where backup or alternative email gateways are in place, they are maintained at the same standard as the primary email gateway.

Open relay email servers

An open relay email server (or open mail relay) is a server that is configured to allow anyone on the internet to send emails through that email server. Such configurations are highly undesirable as spammers and worms can exploit them.

Security Control: 0567; Revision: 4; Updated: Mar-19; Applicability: All

Email servers only relay emails destined for or originating from their domains.

Email server transport encryption

Emails can be intercepted anywhere between originating email servers and destination email servers. Enabling Transport Layer Security (TLS) on email servers will mitigate the compromise of email traffic, with the exception of cryptanalysis of email traffic.

Implementing opportunistic TLS encryption can protect email traffic while ensuring email servers remain compatible with other email servers due to the use of opportunistic TLS encryption. However, opportunistic TLS for email is susceptible to downgrade attacks. Mail Transfer Agent Strict Transport Security (MTA-STS) allows domain owners to indicate to other email servers that emails should only be sent if satisfactory TLS encryption is negotiated prior to transfer.

Implementing MTA-STS reduces the opportunity for downgrade attacks during email transfer and provides email server operators with visibility when downgrade attacks are attempted. TLS reporting supports the implementation of MTA-STS by providing a mechanism for a domain owner to publish a location where other email server operators can submit reports about their success or failure trying to initiate encrypted sessions when sending email to the specified domain.

Security Control: 0572; Revision: 4; Updated: Sep-21; Applicability: All

Opportunistic TLS encryption is enabled on email servers that make incoming or outgoing email connections over public network infrastructure.

Security Control: 1589; Revision: 1; Updated: Sep-21; Applicability: All

MTA-STS is enabled to prevent the transfer of unencrypted emails between complying servers.

Sender Policy Framework

SPF aids in the detection of spoofed emails by specifying a list of domains that are allowed to send emails. If an email server is not in the SPF record for a domain, SPF verification will fail.

Security Control: 0574; Revision: 4; Updated: Oct-19; Applicability: All

SPF is used to specify authorised email services (or lack thereof) for all domains.

Security Control: 1183; Revision: 1; Updated: Sep-18; Applicability: All

A hard fail SPF record is used when specifying email servers.

Security Control: 1151; Revision: 3; Updated: Oct-19; Applicability: All

SPF is used to verify the authenticity of incoming emails.

Security Control: 1152; Revision: 3; Updated: Mar-19; Applicability: All

Incoming emails that fail SPF checks are blocked or marked in a manner that is visible to the recipients.

DomainKeys Identified Mail

DKIM enables the detection of spoofed email contents. This is achieved by DKIM records specifying the public key used to sign an email's contents. Specifically, if the signed digest in the email header does not match the signed contents of the email, verification will fail.

Security Control: 0861; Revision: 2; Updated: Mar-19; Applicability: All

DKIM signing is enabled on emails originating from an organisation's domains.

Security Control: 1026; Revision: 5; Updated: Jan-20; Applicability: All

DKIM signatures on received emails are verified.

Security Control: 1027; Revision: 4; Updated: Sep-18; Applicability: All

Email distribution list software used by external senders is configured such that it does not break the validity of the sender's DKIM signature.

Domain-based Message Authentication, Reporting and Conformance

Domain-based Message Authentication, Reporting and Conformance (DMARC) enables a domain owner to specify what action receiving email servers should take if they receive an email that fails SPF or DKIM checks. This includes 'reject' (the email is rejected), 'quarantine' (the email is marked as spam) or 'none' (no action is taken).

DMARC also provides a reporting feature which enables a domain owner to receive reports on the actions taken by receiving email servers. While this feature does not mitigate malicious emails sent to the domain owner's organisation, it can give the domain owner some visibility of attempts by adversaries to spoof their organisation's domains.

Security Control: 1540; Revision: 1; Updated: Oct-19; Applicability: All

DMARC records are configured for all domains such that emails are rejected if they fail SPF or DKIM checks.

Email content filtering

Content filtering performed on email bodies and attachments provides a defence-in-depth approach to preventing malicious content being introduced into a network. Specific guidance on implementing email content filtering can be found in the Australian Cyber Security Centre (ACSC)'s [Malicious Email Mitigation Strategies](#) publication.

Security Control: 1234; Revision: 3; Updated: Mar-19; Applicability: All

Email content filtering controls are implemented for email bodies and attachments.

Blocking suspicious emails

Blocking specific types of emails reduces the likelihood of phishing emails entering an organisation's network.

Security Control: 1502; Revision: 1; Updated: Mar-19; Applicability: All

Emails arriving via an external connection where the source address uses an internal domain name are blocked at the email gateway.

Undeliverable messages

Undeliverable or bounce emails are commonly sent by receiving email servers when an email cannot be delivered, usually because the destination address is invalid. Due to the common spamming practice of spoofing sender addresses, this often results in a large amount of bounce emails being sent to an innocent third party. Sending bounces only to senders that can be verified via SPF, or other trusted means, avoids contributing to this problem and allows trusted parties to receive legitimate bounce messages.

Security Control: 1024; Revision: 4; Updated: Sep-18; Applicability: All

Notification of undeliverable, bounced or blocked emails are only sent to senders that can be verified via SPF or other trusted means.

Further information

Further information on content filtering can be found in the content filtering section of the [Guidelines for Gateways](#).

Further information on email content filtering can be found in the ACSC's [Malicious Email Mitigation Strategies](#) publication.

Further information on implementing SPF, DKIM and DMARC can be found in the ACSC's [How to Combat Fake Emails](#) publication.

Further information on implementing opportunistic TLS encryption for email servers can be found in the ACSC's [Implementing Certificates, TLS, HTTPS and Opportunistic TLS](#) publication.

Further information on engaging the services of email service providers for marketing or filtering purposes can be found in the ACSC's [Marketing and Filtering Email Service Providers](#) publication.

Further information on email security is available from the National Institute of Standards and Technology (NIST):

- NIST Special Publication (SP) 800-45 Rev. 2, [Guidelines on Electronic Mail Security](#)
- NIST SP 800-177 Rev. 1, [Trustworthy Email](#)
- NIST SP 1800-6, [Domain Name System-Based Electronic Mail Security](#).

Guidelines for Networking

Network design and configuration

Network documentation

It is important that network documentation accurately depicts the current state of a network. This typically includes network devices such as firewalls, data diodes, intrusion detection and prevention systems, routers, switches, and critical servers and services. Furthermore, as this documentation could be used by an adversary to assist in compromising a network, it is important that it is appropriately protected.

Security Control: 0516; Revision: 4; Updated: Sep-18; Applicability: All

Network documentation includes a high-level network diagram showing all connections into the network; a logical network diagram showing all network devices, critical servers and services; and the configuration of all network devices.

Security Control: 0518; Revision: 4; Updated: Sep-18; Applicability: All

Network documentation is updated as network configuration changes are made and includes a 'current as at [date]' or equivalent statement.

Security Control: 1178; Revision: 3; Updated: Sep-18; Applicability: All

Network documentation provided to a third party, or published in public tender documentation, only contains details necessary for other parties to undertake contractual services.

Network segmentation and segregation

Network segmentation and segregation is one of the most effective security controls to prevent an adversary from propagating through a network and accessing target data after they have gained initial access. Technologies to enforce network segmentation and segregation also contain logging functionality that can be valuable in detecting an intrusion and, in the event of a compromise, isolating compromised devices from the rest of a network.

Network segmentation and segregation involves separating a network into multiple functional network zones with a view to protecting important data and critical services. For example, one network zone may contain user workstations while another network zone contains authentication servers. Network segmentation and segregation also assists in the creation and maintenance of network access control lists.

Security Control: 1181; Revision: 4; Updated: Jun-21; Applicability: All

Networks are divided into multiple functional network zones according to the sensitivity or criticality of data or services.

Security Control: 1577; Revision: 0; Updated: Jul-20; Applicability: All

Organisation networks are segregated from service provider networks.

Using Virtual Local Area Networks

Virtual Local Area Networks (VLANs) can be used to implement network segmentation and segregation as long as the networks belong to the same security domain. In such cases, if a data spill occurs the impact will be lesser than if a data spill occurred between two networks of different classifications or between an organisation's network and public network infrastructure. Should organisations choose to risk manage implementing VLANs between networks belonging to different security domains, such as at the same classification, additional security controls relating to not using VLAN trunking and terminating VLANs on separate physical network interfaces of networks devices will apply.

For the purposes of this section, Multiprotocol Label Switching is considered to be equivalent to VLANs and is subject to the same controls.

Security Control: 1532; Revision: 2; Updated: Dec-21; Applicability: All

VLANs are not used to separate network traffic between organisations' networks and public network infrastructure.

Security Control: 0529; Revision: 6; Updated: Dec-21; Applicability: All

VLANs are not used to separate network traffic between networks belonging to different security domains.

Security Control: 1364; Revision: 3; Updated: Dec-21; Applicability: All

Network devices managing VLANs terminate VLANs belonging to different security domains on separate physical network interfaces.

Security Control: 0535; Revision: 6; Updated: Dec-21; Applicability: All

Network devices managing VLANs belonging to different security domains do not share VLAN trunks.

Security Control: 0530; Revision: 6; Updated: Dec-21; Applicability: All

Network devices managing VLANs are administered from the most trusted security domain.

Using Internet Protocol version 6

Internet Protocol version 6 (IPv6) functionality can introduce additional security risks to a network. As such, organisations using Internet Protocol version 4 (IPv4)-based networks should disable IPv6 functionality until it is intended to be used to assist in minimising the attack surface of the network and ensure that any IPv6 functionality that is not intended to be used cannot be exploited.

To aid in the transition from IPv4 to IPv6, numerous tunnelling protocols have been developed that are designed to allow interoperability between the protocols. Disabling IPv6 tunnelling protocols on network devices and ICT equipment that do not explicitly require such functionality will prevent an adversary bypassing traditional network defences by encapsulating IPv6 data inside IPv4 packets.

Stateless Address Autoconfiguration is a method of stateless Internet Protocol (IP) address configuration in IPv6 networks. Notably, it reduces the ability of an organisation to maintain effective logs of IP address assignment on a network. For this reason, stateless IP addressing should be avoided.

Security Control: 0521; Revision: 5; Updated: Sep-18; Applicability: All

IPv6 functionality is disabled in dual-stack network devices and ICT equipment unless it is being used.

Security Control: 1186; Revision: 3; Updated: Sep-18; Applicability: All

IPv6 capable network security devices are used on IPv6 and dual-stack networks.

Security Control: 1428; Revision: 1; Updated: Sep-18; Applicability: All

Unless explicitly required, IPv6 tunnelling is disabled on all network devices and ICT equipment.

Security Control: 1429; Revision: 2; Updated: Jan-20; Applicability: All

IPv6 tunnelling is blocked by network security devices at externally-connected network boundaries.

Security Control: 1430; Revision: 2; Updated: Jun-21; Applicability: All

Dynamically assigned IPv6 addresses are configured with Dynamic Host Configuration Protocol version 6 in a stateful manner with lease data stored in a centralised logging facility.

Network access controls

If an adversary has limited opportunities to connect to a network, they have limited opportunities to compromise that network. Network access controls not only prevent unauthorised access to a network but also prevent users carelessly connecting a network to another network.

Network access controls are also useful in segregating data for specific users with a need-to-know or limiting the flow of data between network segments. For example, computer management traffic can be permitted between workstations and systems used for administration purposes but not permitted between standard user workstations.

Security Control: 0520; Revision: 6; Updated: Sep-18; Applicability: All

Network access controls are implemented on networks to prevent the connection of unauthorised network devices.

Security Control: 1182; Revision: 3; Updated: Sep-18; Applicability: All

Network access controls are implemented to limit traffic within and between network segments to only those that are required for business purposes.

Network device register

Maintaining and regularly auditing a register of authorised network devices can assist in determining whether devices such as switches, routers, wireless access points and internet dongles on a network or connected directly to workstations are rogue or not. The use of automated discovery and mapping tools can assist in this process.

Security Control: 1301; Revision: 2; Updated: Aug-19; Applicability: All

A network device register is maintained and regularly audited.

Default accounts for network devices

Network devices can come pre-configured with default credentials. For example, wireless access points with an account named 'admin' and a passphrase of 'admin' or 'password'. Ensuring default accounts are disabled, renamed or have their passphrase changed can assist in reducing the likelihood of their exploitation by an adversary.

Security Control: 1304; Revision: 2; Updated: Sep-18; Applicability: All

Default accounts for network devices are disabled, renamed or have their passphrase changed.

Disabling unused physical ports on network devices

Disabling unused physical ports on network devices such as switches, routers and wireless access points reduces the opportunity for an adversary to connect to a network if they can gain physical access to network devices.

Security Control: 0534; Revision: 2; Updated: Sep-18; Applicability: All

Unused physical ports on network devices are disabled.

Functional separation between servers

Implementing functional separation between servers can reduce the security risk that a server compromised by an adversary will pose an increased security risk to other servers.

Security Control: 0385; Revision: 6; Updated: Sep-18; Applicability: All

Servers maintain effective functional separation with other servers allowing them to operate independently.

Security Control: 1479; Revision: 0; Updated: Sep-18; Applicability: All

Servers minimise communications with other servers at both the network and file system level.

Management traffic

Implementing security measures specifically for management traffic provides another layer of defence on a network should an adversary find an opportunity to connect to that network. This also makes it more difficult for an adversary to enumerate a network.

Security Control: 1006; Revision: 6; Updated: Sep-18; Applicability: All

Security measures are implemented to prevent unauthorised access to network management traffic.

Use of Simple Network Management Protocol

The Simple Network Management Protocol (SNMP) can be used to monitor the status of network devices such as switches, routers and wireless access points. The first two iterations of SNMP were inherently insecure as they used

trivial authentication methods. Furthermore, changing all default SNMP community strings on network devices and limiting access to read-only access is strongly encouraged.

Security Control: 1311; Revision: 2; Updated: Sep-18; Applicability: All
SNMP version 1 and 2 are not used on networks.

Security Control: 1312; Revision: 2; Updated: Sep-18; Applicability: All
All default SNMP community strings on network devices are changed and have write access disabled.

Using Network-based Intrusion Detection and Prevention Systems

A Network-based Intrusion Detection System (NIDS) or Network-based Intrusion Prevention System (NIPS), when configured correctly and supported by suitable processes and resources, can be an effective way of identifying and responding to known intrusion profiles.

In addition, generating alerts for data flows that contravene any rule in a firewall rule set can help security personnel respond to suspicious or malicious traffic entering a network due to a failure or configuration change to firewalls.

Security Control: 1028; Revision: 7; Updated: Aug-20; Applicability: All
NIDS or NIPS are deployed in all gateways between an organisation's networks and other networks they do not manage.

Security Control: 1030; Revision: 7; Updated: Jun-21; Applicability: All
NIDS or NIPS in gateways are located immediately inside the outermost firewall and configured to generate a log entry, and an alert, for any data flows that contravene any rule in firewall rule sets.

Security Control: 1185; Revision: 3; Updated: Sep-18; Applicability: All
When deploying NIDS or NIPS in non-internet gateways, they are configured to monitor unusual patterns of behaviour or traffic flows rather than internet-based communication protocol signatures.

Blocking anonymity network traffic

Inbound network connections from anonymity networks (such as Tor, Tor2web and I2P) to an organisation's internet-facing services can be used by adversaries for reconnaissance and malware delivery purposes with minimal risk of detection and attribution. As such, this traffic should be blocked provided it will not meaningfully impact accessibility for legitimate users. For example, some organisations might choose to support anonymous connections to their websites to cater for individuals who want to remain anonymous for privacy reasons. In such cases, it is suggested that traffic from anonymity networks be logged and monitored instead. Additionally, outbound network connections to anonymity networks can be used by malware for command and control or data exfiltration and should be blocked given they rarely have legitimate business uses.

Security Control: 1627; Revision: 0; Updated: Nov-20; Applicability: All
Inbound network connections from anonymity networks to internet-facing services are blocked.

Security Control: 1628; Revision: 0; Updated: Nov-20; Applicability: All
Outbound network connections to anonymity networks are blocked.

Further information

Further information on wireless networks can be found in the wireless networks section of these guidelines.

Further information on functional separation of servers using virtualisation can be found in the virtualisation hardening section of the [Guidelines for System Hardening](#).

Further information on implementing network segmentation and segregation for administration purposes can be found in the system administration section of the [Guidelines for System Management](#).

Further information on event logging and auditing can be found in the event logging and auditing section of the [Guidelines for System Monitoring](#).

Further information on gateways can be found in the [Guidelines for Gateways](#).

Further information on network segmentation and segregation can be found in the Australian Cyber Security Centre (ACSC)'s [Implementing Network Segmentation and Segregation](#) publication.

Further information on network plans can be found in the United States' National Security Agency's [Manageable Network Plan Guide \(version 4.0\)](#) publication.

Further information on blocking anonymity network traffic can be found in the ACSC's [Defending Against the Malicious Use of the Tor Network](#) publication.

Further information on Domain Name Systems can be found in the ACSC's [Domain Name System Security for Domain Owners](#) and [Domain Name System Security for Domain Resolvers](#) publications.

Wireless networks

Choosing wireless devices

Wireless devices that have been certified against a Wi-Fi Alliance certification program provide an organisation with the assurance that they conform to wireless standards. Deploying wireless devices that are guaranteed to be interoperable with other wireless devices will prevent problems on a wireless network.

Security Control: 1314; Revision: 2; Updated: Sep-21; Applicability: All
All wireless devices are Wi-Fi Alliance certified.

Wireless networks for public access

When an organisation provides a wireless network for the general public, connecting such a wireless network to, or sharing infrastructure with, any other network creates an additional entry point for an adversary to target connected networks to steal data or disrupt services.

Security Control: 0536; Revision: 6; Updated: Sep-18; Applicability: All
Wireless networks provided for the general public to access are segregated from all other networks.

Administrative interfaces for wireless access points

Administrative interfaces allow users to modify the configuration and security settings of wireless access points. Often wireless access points, by default, allow users to access the administrative interface over methods such as fixed network connections, wireless network connections and serial connections. Disabling the administrative interface for wireless network connections on wireless access points will assist in preventing unauthorised connections.

Security Control: 1315; Revision: 2; Updated: Sep-18; Applicability: All
The administrative interface on wireless access points is disabled for wireless network connections.

Default settings

Some wireless access points and wireless devices come with a default Service Set Identifier (SSID) and/or weak default configuration settings. As the default SSIDs of wireless access points are often documented in internet forums, along with default accounts and passphrases, it is important to change the default SSID of wireless access points along with default passphrases and weak configuration settings for all wireless devices.

When changing the default SSID, it is important that the new SSID does not bring undue attention to an organisation's wireless network. In doing so, the SSID of a wireless network should not be readily associated with an organisation, the location of their premises or the functionality of the wireless network.

A method commonly recommended to lower the profile of a wireless network is disabling SSID broadcasting. While this ensures that the existence of the wireless networks is not broadcast overtly using beacon frames, the SSID is still

broadcast in probe requests, probe responses, association requests and re-association requests. As such, it is easy to determine the SSID of the wireless network by capturing these requests and responses. By disabling SSID broadcasting, organisations will make it more difficult for users to connect to a wireless network. Furthermore, an adversary could configure a malicious wireless access point to broadcast the same SSID as the hidden SSID used by a legitimate wireless network, thereby fooling users or devices into automatically connecting to the adversary's malicious wireless access point instead. In doing so, the adversary could steal authentication credentials in order to gain access to the legitimate wireless network. For these reasons, it is recommended organisations enable SSID broadcasting.

Security Control: 1316; Revision: 2; Updated: Sep-18; Applicability: All

The default SSID of wireless access points is changed.

Security Control: 1317; Revision: 2; Updated: Sep-18; Applicability: All

The SSID of a non-public wireless network is not readily associated with an organisation, the location of their premises or the functionality of the wireless network.

Security Control: 1318; Revision: 2; Updated: Sep-18; Applicability: All

SSID broadcasting is enabled on wireless networks.

Security Control: 1709; Revision: 0; Updated: Sep-21; Applicability: All

Default accounts and passphrases of wireless devices are changed.

Security Control: 1710; Revision: 0; Updated: Sep-21; Applicability: All

Configuration settings for wireless devices are hardened.

Static addressing

Assigning static IP addresses for devices accessing wireless networks can prevent a rogue device when connecting to a wireless network from being assigned a routable IP address. However, some adversaries will be able to determine IP addresses of legitimate users and use this information to guess or spoof valid IP address ranges for wireless networks. Configuring devices to use static IP addresses introduces a management overhead without any tangible security benefit.

Security Control: 1319; Revision: 2; Updated: Sep-18; Applicability: All

Static addressing is not used for assigning IP addresses on wireless networks.

Media Access Control address filtering

Devices that connect to wireless networks generally have a unique Media Access Control (MAC) address. As such, it is possible to use MAC address filtering on wireless access points to restrict which devices can connect to a wireless network. While this approach will introduce a management overhead, it can prevent rogue devices from connecting to a wireless network. However, some adversaries will be able to determine valid MAC addresses of legitimate users already on a wireless network. Adversaries can then use this information to spoof valid MAC addresses and gain access to the wireless network. MAC address filtering introduces a management overhead without any tangible security benefit.

Security Control: 1320; Revision: 2; Updated: Sep-18; Applicability: All

MAC address filtering is not used to restrict which devices can connect to wireless networks.

Confidentiality and integrity of wireless network traffic

As wireless networks are often capable of being accessed from outside the perimeter of secured spaces, all wireless network traffic requires suitable cryptographic protection. For this purpose it is recommended that Wi-Fi Protected Access 3 (WPA3) be used as it provides equivalent or greater security than its predecessor Wi-Fi Protected Access 2 (WPA2). WPA3 has also prohibited the use of various outdated and insecure cipher suites.

WPA3-Enterprise supports three enterprise modes of operation: enterprise only mode, transition mode and 192-bit mode. Preference is given to WPA3-Enterprise 192-bit mode as this mode incorporates changes that satisfy Commercial National Security Algorithm Suite requirements and ensures no algorithms with known weaknesses are used. However, if any other WPA3-Enterprise modes are used then Authentication and Key Management suite 00-0F-AC:1 should be disabled (if this option is available).

Security Control: 1332; Revision: 3; Updated: Sep-21; Applicability: All

WPA3-Enterprise 192-bit mode is used to protect the confidentiality and integrity of all wireless network traffic.

802.1X authentication

WPA3-Enterprise uses 802.1X authentication which requires the use of an Extensible Authentication Protocol (EAP). A number of EAP methods supported by both WPA2 and WPA3 are available.

Extensible Authentication Protocol-Transport Layer Security (EAP-TLS) is considered one of the most secure EAP methods and is widely supported. It uses a Public Key Infrastructure to secure communications between devices and a Remote Access Dial-In User Service (RADIUS) server through the use of X.509 certificates. While EAP-TLS provides strong mutual authentication, it requires an organisation to have established a Public Key Infrastructure. This involves deploying their own certificate authority and issuing certificates, or purchasing certificates from a commercial certificate authority, for every device that accesses the wireless network. While this introduces additional costs and management overheads, the security advantages are significant.

Security Control: 1321; Revision: 2; Updated: Sep-21; Applicability: All

802.1X authentication with EAP-TLS, using X.509 certificates, is used for mutual authentication; with all other EAP methods disabled on supplicants and authentication servers.

Security Control: 1711; Revision: 0; Updated: Sep-21; Applicability: All

User identity confidentiality is used if available with EAP-TLS implementations.

Evaluation of 802.1X authentication implementation

The security of 802.1X authentication is dependent on four main elements and how they interact with each other. These four elements include supplicants, authenticators, wireless access points and authentication servers. To provide assurance that these elements have been implemented correctly, they should have completed an evaluation.

Security Control: 1322; Revision: 4; Updated: Sep-21; Applicability: All

Evaluated supplicants, authenticators, wireless access points and authentication servers are used in wireless networks.

Generating and issuing certificates for authentication

When issuing a certificate to a device in order to access a wireless network, organisations should be aware that it could be stolen by malicious code. Once compromised, the certificate could be used on other devices to gain unauthorised access to the wireless network it was issued for. Organisations should also be aware that in only issuing a certificate to a device, any actions taken by a user will only be attributable to a device and not a specific user.

When issuing a certificate to a user in order to access a wireless network, it can be in the form of a certificate that is stored on a device or a certificate that is stored within a smart card. Issuing certificates on smart cards provides increased security, but at a higher cost. Specifically, a user is more likely to notice a missing smart card and alert their security team, who are then able to revoke the credentials on the RADIUS server, which can minimise the time an adversary has access to the wireless network. In addition, to reduce the likelihood of a stolen smart card from being used to gain unauthorised access to a wireless network, multi-factor authentication can be implemented through the use of personal identification numbers on smart cards. This is particularly important when a smart card grants a user any form of administrative access.

Security Control: 1324; Revision: 3; Updated: Aug-19; Applicability: All

Certificates are generated using an evaluated certificate authority solution or hardware security module.

Security Control: 1323; Revision: 3; Updated: Sep-21; Applicability: All

Certificates are required for both devices and users accessing wireless networks.

Security Control: 1327; Revision: 2; Updated: Sep-21; Applicability: All

Certificates are protected by encryption, user authentication, and both logical and physical access controls.

Caching 802.1X authentication outcomes

When 802.1X authentication is used, a shared secret key known as the Pairwise Master Key (PMK) is generated upon successful authentication of a device. This PMK is then capable of being cached to assist with fast roaming between wireless access points. When a device roams away from a wireless access point that it has authenticated to, it will not need to perform a full re-authentication should it roam back while the cached PMK remains valid. To further assist with roaming, wireless access points can be configured to pre-authenticate a device to other neighbouring wireless access points that the device might roam to. Although requiring full authentication for a device each time it roams between wireless access points is ideal, organisations can choose to use PMK caching and pre-authentication if they have a business requirement for fast roaming. If PMK caching is used, the PMK caching period should not be set to greater than 1440 minutes (24 hours).

Security Control: 1330; Revision: 1; Updated: Sep-18; Applicability: All

The PMK caching period is not set to greater than 1440 minutes (24 hours).

Fast Basic Service Set Transition

The WPA3 standard specifies support for Fast Basic Service Set Transition (FT) (802.11r). FT is a feature designed to improve user mobility and combat lag introduced by the need to authenticate to each wireless access point. However, FT requires authenticators to request and send keys to other authenticators within a security domain. If any of these keys are intercepted, all security properties are lost. Therefore, it is imperative that communications are appropriately secured. As such, FT should be disabled unless it can be confirmed that authenticator-to-authenticator communications are secured by a suitable ASD Approved Cryptographic Protocol that provides confidentiality, integrity and mutual authentication.

Security Control: 1712; Revision: 0; Updated: Sep-21; Applicability: All

The use of FT (802.11r) is disabled unless authenticator-to-authenticator communications are secured by an ASD Approved Cryptographic Protocol.

Remote Authentication Dial-In User Service authentication

Separate to the 802.1X authentication process is the RADIUS authentication process that occurs between authenticators and a RADIUS server. RADIUS is what is known as an authentication, authorisation and accounting protocol, and is intended to mediate network access. However, RADIUS is not secure enough to be used without protection. To protect credentials communicated between authenticators and a RADIUS server, communications should be encapsulated with an additional layer of encryption, such as RADIUS over Internet Protocol Security or RADIUS over Transport Layer Security.

Security Control: 1454; Revision: 2; Updated: Sep-21; Applicability: All

Communications between authenticators and a RADIUS server are encapsulated with an additional layer of encryption using RADIUS over Internet Protocol Security or RADIUS over Transport Layer Security.

Interference between wireless networks

Where multiple wireless networks are deployed in close proximity, there is the potential for interference to impact the availability of a wireless network, especially when operating on commonly used 802.11b/g (2.4 GHz) default channels of 1 and 11. Sufficiently separating wireless networks through the use of frequency separation can help reduce this security risk. This can be achieved by using wireless networks that are configured to operate on channels that minimise overlapping frequencies or by using both 802.11b/g (2.4 GHz) channels and 802.11n (5 GHz) channels. It is important to

note though, if implementing a mix of 2.4 GHz and 5 GHz channels, not all devices may be compatible with 802.11n and able to connect to 5 GHz channels.

Security Control: 1334; Revision: 2; Updated: Sep-18; Applicability: All

Wireless networks implement sufficient frequency separation from other wireless networks.

Protecting management frames on wireless networks

An effective denial of service can be performed by exploiting unprotected management frames using inexpensive commercial hardware. The 802.11 standard provides no protection for management frames and therefore does not prevent spoofing or denial of service activities. However, the 802.11w amendment specifically addresses the protection of management frames on wireless networks and should be enabled for WPA2, in WPA3 this feature is built into the standard.

Security Control: 1335; Revision: 1; Updated: Sep-18; Applicability: All

Wireless access points enable the use of the 802.11w amendment to protect management frames.

Wireless network footprint

Instead of deploying a small number of wireless access points that broadcast on high power, a greater number of wireless access points that use less broadcast power can be deployed to achieve the desired footprint. This has the benefit of providing service continuity should a wireless access point become unserviceable. In such a case, the output power of nearby wireless access points can be increased to cover the footprint gap until the unserviceable wireless access point can be replaced.

In addition to minimising the output power of wireless access points to reduce the footprint of a wireless network, the use of Radio Frequency (RF) shielding can be used for an organisation's facilities. While expensive, this will limit the wireless communications to areas under the control of an organisation. RF shielding on an organisation's facilities has the added benefit of preventing the jamming of wireless networks from outside of the facilities in which wireless networks are operating.

Security Control: 1338; Revision: 1; Updated: Sep-18; Applicability: All

Instead of deploying a small number of wireless access points that broadcast on high power, a greater number of wireless access points that use less broadcast power are deployed to achieve the desired footprint.

Security Control: 1013; Revision: 6; Updated: Dec-21; Applicability: S, TS

The effective range of wireless communications outside an organisation's area of control is limited by implementing RF shielding on facilities in which SECRET or TOP SECRET wireless networks are used.

Further information

Further information on implementing segregation using VLANs can be found in the network design and configuration section of these guidelines.

Further information on selecting evaluated products can be found in the evaluated product acquisition section of the [Guidelines for Evaluated Products](#).

Further information on encryption for wireless networks can be found in the [Guidelines for Cryptography](#).

Further information on [Wi-Fi technologies](#) and associated [certification programs](#) are available from the Wi-Fi Alliance.

Service continuity for online services

Cloud-based hosting of online services

Using a cloud service provider can allow an organisation to build highly resilient online services due to the increased computing resources, bandwidth and multiple separate physical sites made available by the cloud provider. Organisations can achieve the same results using their own infrastructure; however, this may require significant upfront costs and may still result in a limited capability to scale dynamically to meet increased demand. In case of a denial-of-service attack, cloud-based hosting can also provide segregation from self-hosted or other cloud hosted services ensuring that other systems, such as email services, are not affected.

Security Control: 1437; Revision: 4; Updated: Dec-21; Applicability: All

A cloud service provider is used for hosting online services.

Location policies for online services

When using cloud service providers, organisations will need to consider whether they should lock their data to specific regions or availability zones. In doing so, organisations that specify locking policies will have an expectation that their data won't be relocated to different regions or availability zones by the cloud service provider.

Security Control: 1578; Revision: 1; Updated: Dec-21; Applicability: All

Organisations are notified by cloud service providers of any change to configured regions or availability zones for online services.

Availability planning and monitoring for online services

It is important that the connectivity between organisations and their cloud service providers meets organisational requirements for bandwidth, latency and reliability. To support this, organisations and cloud service providers should discuss and document any specific network requirements, performance characteristics or planned responses to availability failures, especially when requirements for high availability exist. This includes whether network connections between organisations and cloud service providers will use dedicated communication links, or connect over the internet, and whether any secondary communications links will provide sufficient capacity to maintain operational requirements should the primary communication link become unavailable.

Furthermore, capacity monitoring should be performed in order to manage workloads and monitor the health of online services. This can be achieved through continuous and real-time monitoring of metrics such as latency, jitter, packet loss, throughput and availability. In addition, feedback should be provided to cloud service providers when performance does not meet service level agreement targets. To assist with this, anomaly detection can be performed through network telemetry that is integrated into security monitoring tools.

Security Control: 1579; Revision: 1; Updated: Dec-21; Applicability: All

Cloud service providers' ability to dynamically scale resources due to a genuine spike in demand or a denial-of-service attack is tested as part of capacity planning processes for online services.

Security Control: 1580; Revision: 1; Updated: Dec-21; Applicability: All

Where a high availability requirement exists for online services, the services are architected to automatically transition between availability zones.

Security Control: 1441; Revision: 3; Updated: Dec-21; Applicability: All

Where a requirement for high availability exists for online services, a denial of service mitigation service is used.

Security Control: 1581; Revision: 1; Updated: Dec-21; Applicability: All

Organisations perform continuous real-time monitoring of the availability of online services.

Using content delivery networks

Similar to cloud-based hosting, the use of content delivery networks (CDNs) and denial of service mitigation services can allow an organisation to create highly resilient online services by leveraging the large bandwidth, geographically dispersed hosting locations, traffic scrubbing and other security controls offered by CDN and denial of service mitigation service providers.

The use of CDNs is particularly effective when serving static, bandwidth intensive media such as images, sound or video files. However, the services offered by a CDN can include more than basic content hosting such as web response caching, load balancing, web application security controls or denial of service mitigations.

Care should be taken when configuring the use of a CDN or denial of service mitigation service to ensure that the IP address of the organisation's web server is not identifiable by an adversary as this could allow for protections to be bypassed. Additionally, appropriate network security controls should be applied to only allow communication between an organisation's server, the CDN or denial of service mitigation service provider and the authorised management environment.

Security Control: 1438; Revision: 2; Updated: Dec-21; Applicability: All

Where a high availability requirement exists for website hosting, CDNs that cache websites are used.

Security Control: 1439; Revision: 2; Updated: Dec-21; Applicability: All

If using a CDN, disclosing the IP address of the web server under the organisation's control (referred to as the origin server) is avoided and access to the origin server is restricted to the CDN and an authorised management network.

Denial of service strategies

Denial-of-service attacks are designed to disrupt or degrade online services such as website, email and Domain Name System services. To achieve this goal, adversaries may use a number of approaches to deny access to legitimate users of online services:

- using multiple computers to direct a large volume of unwanted network traffic at online services in an attempt to consume all available network bandwidth
- using multiple computers to direct tailored traffic at online services in an attempt to consume the processing resources of online services
- hijacking online services in an attempt to redirect legitimate users away from those services to other services that the adversary controls.

Although an organisation cannot avoid being targeted by denial-of-service attacks, there are a number of measures they can implement to prepare for and potentially reduce the impact if targeted. This includes engaging with their cloud service providers to identify the denial of service detection technologies that may be available for use. For example, real-time capacity reporting dashboards, that provide out-of-band and real-time alerts based on organisation-defined thresholds, can assist with the rapid identification of denial-of-service attacks. In addition, not all online services or functionality offered by an organisation may be business critical. Understanding what services can be offered with reduced functionality, deprioritised, disabled or lived without can help an organisation reduce or eliminate the impact on other more essential services or free up resources to respond to more critical services first.

Overall, preparing for denial-of-service attacks before they occur is by far the best strategy as it is very difficult to respond once they begin and efforts at this stage are unlikely to be effective.

Security Control: 1431; Revision: 3; Updated: Dec-21; Applicability: All

Denial-of-service attack prevention and mitigation strategies are discussed with cloud service providers, specifically:

- *their capacity to withstand denial-of-service attacks*
- *any costs likely to be incurred as a result of denial-of-service attacks*

- thresholds for notification of denial-of-service attacks
- thresholds for turning off online services during denial-of-service attacks
- pre-approved actions that can be undertaken during denial-of-service attacks
- denial-of-service attack prevention arrangements with upstream service providers to block malicious traffic as far upstream as possible.

Security Control: 1458; Revision: 2; Updated: Dec-21; Applicability: All

The functionality and quality of online services, how to maintain such functionality, and what functionality can be lived without during a denial-of-service attack, are determined and documented.

Domain name registrar locking

The use of domain name registrar locking can prevent a denial of service caused by unauthorised deletion or transfer of a domain, or other unauthorised modification of a domain's registration details.

Security Control: 1432; Revision: 2; Updated: Dec-21; Applicability: All

Domain names for online services are protected via registrar locking and confirming domain registration details are correct.

Monitoring with real-time alerting for online services

Organisations should perform automated monitoring of online services with real-time alerting to ensure that a denial-of-service attack is detected and responded to as soon as possible.

Security Control: 1435; Revision: 2; Updated: Dec-21; Applicability: All

Availability monitoring with real-time alerting is implemented for online services to detect denial-of-service attacks and measure their impact.

Segregation of critical online services

Denial-of-service attacks are typically focused on highly visible online services, such as an organisation's core website, in order to have a publicly noticeable impact. By segregating online services (e.g. having one internet connection for email and internet access and a separate connection for web hosting services) the impact of a denial-of-service attack can be limited to just a targeted service.

Security Control: 1436; Revision: 2; Updated: Dec-21; Applicability: All

Critical online services are segregated from other online services that are more likely to be targeted.

Preparing for service continuity

Depending on the nature of a denial-of-service attack, replacing a full-featured website with a minimal impact static version can help provide a level of service which would otherwise not be possible.

An organisation's standard full-featured website may have higher processing or resource demands due to database integration or the presence of large media files such as high-resolution images or videos. These additional resource requirements may make the website more susceptible to denial-of-service attacks.

Security Control: 1518; Revision: 1; Updated: Dec-21; Applicability: All

A static version of a website is pre-prepared that requires minimal processing and bandwidth in order to facilitate at least a basic level of service when under a denial-of-service attack.

Further information

Further information on mitigating denial-of-service attacks can be found in the ACSC's [Preparing for and Responding to Denial-of-Service Attacks](#) publication.

Guidelines for Cryptography

Cryptographic fundamentals

Purpose of cryptography

The purpose of cryptography is to provide confidentiality, integrity, authentication and non-repudiation of data. Confidentiality protects data by making it unreadable to all but authorised users, integrity protects data from accidental or deliberate manipulation, authentication ensures that a person or entity is who they claim to be, and non-repudiation provides proof that a user performed an action and prevents them from denying that they did so.

Using encryption

Encryption of data at rest can be used to reduce the handling requirements for ICT equipment and media while encryption of data in transit can be used to provide protection for sensitive or classified data communicated over public network infrastructure.

When organisations use encryption for data at rest, or data in transit, they are not reducing the sensitivity or classification of data. However, as the data is encrypted, the consequences of the encrypted data being accessed by an adversary is considered to be less. Therefore, handling requirements applied to the encrypted data can be reduced. As the sensitivity or classification of the unencrypted data does not change, additional layers of encryption cannot be used to further lower physical and handling requirements.

Additional cryptographic requirements

These guidelines describe the general use of cryptography. The Australian Signals Directorate (ASD) may specify additional requirements in Australian Communications Security Instructions and other cyber security-related publications for cryptographic equipment or encryption software. Such requirements supplement these guidelines and where conflicts occur take precedence.

International standards for cryptographic modules

International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) 19790:2012, [Information technology – Security techniques – Security requirements for cryptographic modules](#), and ISO/IEC 24759:2017, [Information technology – Security techniques – Test requirements for cryptographic modules](#), are international standards for the design and validation of hardware and software cryptographic modules.

Federal Information Processing Standard (FIPS) 140-3, [Security Requirements for Cryptographic Modules](#) and National Institute of Standards and Technology (NIST) Special Publication (SP) 180-140, [FIPS 140-3 Derived Test Requirements \(DTR\): CMVP Validation Authority Updates to ISO/IEC 24759](#) are United States standards based upon ISO/IEC 19790:2012 and ISO/IEC 24759:2017.

High Assurance Cryptographic Equipment

High Assurance Cryptographic Equipment (HACE) can be used to protect SECRET and TOP SECRET data. HACE is designed to lower the handling requirements for SECRET and TOP SECRET data using cryptography. Due to the sensitive nature of HACE, all communications security and equipment-specific doctrine produced by the Australian Cyber Security Centre (ACSC) must be complied with when using HACE.

Encrypting data at rest

When encryption is applied to data it provides an additional layer of defence. Encryption does not change the sensitivity or classification of the data, but when encryption is used the handling requirements for ICT equipment and removable media may be reduced. In doing so, it is important that full disk encryption is used as it provides a greater level of protection than file-based encryption. This is due to the fact that while file-based encryption may encrypt individual files, there is the possibility that unencrypted copies of files may be left in temporary locations used by an operating system.

Security Control: 0457; Revision: 8; Updated: Dec-21; Applicability: O, P

Encryption software that has completed a Common Criteria evaluation against a Protection Profile is used when encrypting media that contains OFFICIAL: Sensitive or PROTECTED data.

Security Control: 0460; Revision: 11; Updated: Dec-21; Applicability: S, TS

HACE is used when encrypting media that contains SECRET or TOP SECRET data.

Security Control: 0459; Revision: 4; Updated: Dec-21; Applicability: All

Full disk encryption, or partial encryption where access controls will only allow writing to the encrypted partition, is implemented when encrypting data at rest.

Encrypting highly sensitive data at rest

Due to the sensitivities associated with Australian Eyes Only (AUSTEO) and Australian Government Access Only (AGAO) data, it needs to be encrypted when at rest.

Security Control: 1080; Revision: 3; Updated: Jun-21; Applicability: S, TS

In addition to any encryption already in place, an ASD Approved Cryptographic Algorithm (AACA) is used to encrypt AUSTEO and AGAO data when at rest on a system.

Data recovery

To ensure that access to encrypted data is not lost due to the loss, damage or failure of an encryption key, it is important that where practical cryptographic equipment and encryption software provides a means of data recovery.

Security Control: 0455; Revision: 2; Updated: Sep-18; Applicability: All

Where practical, cryptographic equipment and encryption software provides a means of data recovery to allow for circumstances where the encryption key is unavailable due to loss, damage or failure.

Handling encrypted ICT equipment and media

When a user authenticates to encryption functionality for ICT equipment or media storing encrypted data, the encrypted data becomes accessible. At such a time, the ICT equipment or media should be handled according to its original sensitivity or classification. Once the user deauthenticates from encryption functionality (e.g. shuts down a device, activates a lock screen) the ICT equipment or media can return to potentially being handled at a lower level.

Security Control: 0462; Revision: 6; Updated: Jun-21; Applicability: All

When a user authenticates to encryption functionality for ICT equipment or media storing encrypted data, it is treated in accordance with its original sensitivity or classification until such a time that the user deauthenticates from the encryption functionality.

Encrypting data in transit

Where insufficient security exists for the protection of data communicated in the clear over network infrastructure, or via wireless networks, encryption is required to protect the data from unauthorised access or manipulation. For example, when sensitive or classified data is communicated over networks not authorised to communicate the data in

the clear, when sensitive or classified data is communicated outside of appropriately secure areas, or when sensitive or classified data is communicated over public network infrastructure.

Security Control: 0465; Revision: 8; Updated: Dec-21; Applicability: O, P

Cryptographic equipment or encryption software that has completed a Common Criteria evaluation against a Protection Profile is used to protect OFFICIAL: Sensitive or PROTECTED data when communicated over insufficiently secure networks, outside of appropriately secure areas or via public network infrastructure.

Security Control: 0467; Revision: 10; Updated: Dec-21; Applicability: S, TS

HACE is used to protect SECRET and TOP SECRET data when communicated over insufficiently secure networks, outside of appropriately secure areas or via public network infrastructure.

Encrypting highly sensitive data in transit

Due to the sensitivities associated with AUSTEO and AGAO data, it needs to be encrypted when being communicated across network infrastructure.

Security Control: 0469; Revision: 4; Updated: Jun-21; Applicability: S, TS

In addition to any encryption already in place, an ASD Approved Cryptographic Protocol (AACP) is used to protect AUSTEO and AGAO data when communicated across network infrastructure.

Further information

Further information on selecting evaluated products can be found in the evaluated product acquisition section of the [Guidelines for Evaluated Products](#).

Further information on the protection of ICT equipment and media can be found in the Attorney-General's Department's [Protective Security Policy Framework](#), [Physical security for entity resources](#) policy.

Further information on security requirements for cryptographic modules can be found in:

- ISO/IEC 19790:2012, [Information technology – Security techniques – Security requirements for cryptographic modules](#)
- FIPS 140-3, [Security Requirements for Cryptographic Modules](#).

Further information on the [evaluation of cryptographic modules](#), including testing requirements, can be found in:

- ISO/IEC 24759:2017, [Information technology – Security techniques – Test requirements for cryptographic modules](#)
- NIST SP 800-140, [FIPS 140-3 Derived Test Requirements \(DTR\): CMVP Validation Authority Updates to ISO/IEC 24759](#).

ASD Approved Cryptographic Algorithms

High assurance cryptographic algorithms

High assurance cryptographic algorithms, which are not covered in this section, can be used for the protection of SECRET and TOP SECRET data if they are suitably implemented in HACE. Further information on high assurance cryptographic algorithms can be obtained from the ACSC.

ASD Approved Cryptographic Algorithms

There is no guarantee of an algorithm's resistance against currently unknown attacks. However, the algorithms listed in this section have been extensively scrutinised by industry and academic communities in a practical and theoretical setting and have not been found to be susceptible to any feasible attacks. There have been some cases where

theoretically impressive security vulnerabilities have been found; however, these results are not of practical application.

AACAs fall into three categories: asymmetric/public key algorithms, hashing algorithms and symmetric encryption algorithms.

The approved asymmetric/public key algorithms are:

- Diffie-Hellman (DH) for agreeing on encryption session keys
- Digital Signature Algorithm (DSA) for digital signatures
- Elliptic Curve Diffie-Hellman (ECDH) for key exchange
- Elliptic Curve Digital Signature Algorithm (ECDSA) for digital signatures
- Rivest-Shamir-Adleman (RSA) for digital signatures and passing encryption session keys or similar keys.

The only approved hashing algorithm is Secure Hashing Algorithm 2 (SHA-2) (i.e. SHA-224, SHA-256, SHA-384 and SHA-512).

The only approved symmetric encryption algorithm is Advanced Encryption Standard (AES) using key lengths of 128, 192 and 256 bits.

Where there is a range of key sizes for an algorithm, some of the smaller key sizes are not approved as they do not provide an adequate safety margin against possible future attacks. For example, advances in integer factorisation methods could render smaller RSA moduli vulnerable.

Using ASD Approved Cryptographic Algorithms

If cryptographic equipment or software implements unapproved algorithms, it is possible that these algorithms could be used without a user's knowledge. In combination with an assumed level of security confidence, this can represent a security risk. As such, organisations can ensure that only AACAs or high assurance cryptographic algorithms can be used by disabling all unapproved algorithms (which is preferred) or advising users not to use the unapproved algorithms via usage policies.

Security Control: 0471; Revision: 7; Updated: Dec-21; Applicability: All

Only AACAs or high assurance cryptographic algorithms are used by cryptographic equipment and software.

Approved asymmetric/public key algorithms

DH and DSA are vulnerable to different attacks than ECDH and ECDSA. As a result, ECDH and ECDSA offer more effective security per bit increase. This leads to smaller data requirements which in turn means that elliptic curve variants have become de facto global standards. For reduced data cost, and to promote interoperability, ECDH and ECDSA should be used when possible.

Security Control: 0994; Revision: 6; Updated: Dec-21; Applicability: All

ECDH and ECDSA are used in preference to DH and DSA.

Using Diffie-Hellman

A modulus of 2048 bits for correctly implemented DH provides 112 bits of effective security strength. Taking into account projected technological advances, it is assessed that 112 bits of effective security strength will remain secure until 2030.

When DH in a prime field is used, the prime modulus impacts the security of the algorithm. The security considerations when creating such a prime modulus can be found in NIST SP 800-56A Rev. 3, along with a collection of commonly used secure moduli.

Security Control: 0472; Revision: 5; Updated: Dec-20; Applicability: O, P

When using DH for agreeing on encryption session keys, a modulus of at least 2048 bits is used.

Security Control: 1629; Revision: 1; Updated: Dec-21; Applicability: All

When using DH for agreeing on encryption session keys, a modulus and associated parameters are selected according to NIST SP 800-56A Rev. 3.

Using the Digital Signature Algorithm

A modulus of 2048 bits for correctly implemented DSA provides 112 bits of effective security strength. Taking into account projected technological advances, it is assessed that 112 bits of effective security strength will remain secure until 2030.

Security Control: 0473; Revision: 5; Updated: Dec-20; Applicability: O, P

When using DSA for digital signatures, a modulus of at least 2048 bits is used.

Security Control: 1630; Revision: 1; Updated: Dec-21; Applicability: All

When using DSA for digital signatures, a modulus and associated parameters are generated according to FIPS 186-4.

Using Elliptic Curve Cryptography

The curve used within an elliptic curve algorithm impacts the security of the algorithm. Only approved curves should be used.

Security Control: 1446; Revision: 2; Updated: Dec-21; Applicability: All

When using elliptic curve cryptography, a curve from FIPS 186-4 is used.

Using Elliptic Curve Diffie-Hellman

When using a curve from FIPS 186-4, a base point order and key size of at least 224 bits for correctly implemented ECDH provides 112 bits of effective security strength. Security of a curve selected from another source cannot be assumed to have the same security using base point order and key size alone.

Security Control: 0474; Revision: 5; Updated: Dec-20; Applicability: O, P

When using ECDH for agreeing on encryption session keys, a base point order and key size of at least 224 bits is used.

Using the Elliptic Curve Digital Signature Algorithm

When using a curve from FIPS 186-4, a base point order and key size of 224 bits for correctly implemented ECDSA provides 112 bits of effective security strength. Security of a curve selected from another source cannot be assumed to have the same security using base point order and key size alone.

Security Control: 0475; Revision: 5; Updated: Dec-20; Applicability: O, P

When using ECDSA for digital signatures, a base point order and key size of at least 224 bits is used.

Using Rivest-Shamir-Adleman

A modulus of 2048 bits for correctly implemented RSA provides 112 bits of effective security strength. Taking into account projected technological advances, it is assessed that 112 bits of effective security strength will remain secure until 2030.

Security Control: 0476; Revision: 6; Updated: Dec-20; Applicability: O, P

When using RSA for digital signatures, and passing encryption session keys or similar keys, a modulus of at least 2048 bits is used.

Security Control: 0477; Revision: 7; Updated: Dec-21; Applicability: All

When using RSA for digital signatures, and for passing encryption session keys or similar keys, a key pair for passing encrypted session keys that is different from the key pair used for digital signatures is used.

Approved symmetric encryption algorithms

The use of Electronic Codebook Mode with block ciphers allows repeated patterns in plaintext to appear as repeated patterns in ciphertext. Most plaintext, including written language and formatted files, contains significant repeated patterns. As such, an adversary can use this to deduce possible meanings of ciphertext. The use of other modes such as Galois/Counter Mode, Cipher Block Chaining, Cipher Feedback or Output Feedback can prevent such attacks, although each has different properties which can make them inappropriate for certain use cases.

Security Control: 0479; Revision: 5; Updated: Dec-21; Applicability: All

Symmetric cryptographic algorithms are not used in Electronic Codebook Mode.

Cryptographic algorithms for use with High Assurance Cryptographic Equipment

ASD has approved the following cryptographic algorithms for the protection of SECRET and TOP SECRET data when implemented by HACE in an ASD approved configuration.

Recommended algorithms and key sizes should be given preference in order to ensure interoperability with the [Commercial National Security Algorithm \(CNSA\) Suite](#).

Purpose	Algorithm	Approved for SECRET	Approved for TOP SECRET	Recommended
Encryption	AES	AES-128 AES-192 AES-256	AES-256	AES-256
Hashing	SHA-2	SHA-256 SHA-384 SHA-512	SHA-384 SHA-512	SHA-384
Digital signatures	ECDSA	NIST P-256 NIST P-384 NIST P-521	NIST P-384 NIST P-521	NIST P-384
	RSA	3072 bit key or larger	3072 bit key or larger	3072 bit key
Key exchange	DH	3072 bit key or larger	3072 bit key or larger	3072 bit key
	ECDH	NIST P-256 NIST P-384 NIST P-521	NIST P-384 NIST P-521	NIST P-384
	RSA	3072 bit key or larger	3072 bit key or larger	3072 bit key

Security Control: 1232; Revision: 6; Updated: Dec-21; Applicability: S, TS

AACAs used by HACE are implemented in an ASD approved configuration, with preference given to CNSA Suite algorithms and key sizes.

Further information

Further information on selecting evaluated products can be found in the evaluated product acquisition section of the [Guidelines for Evaluated Products](#).

Further information on [CNSA Suite algorithms and key sizes](#) is available from the United States' National Security Agency.

ASD Approved Cryptographic Protocols

High assurance cryptographic protocols

High assurance cryptographic protocols, which are not covered in this section, can be used for the protection of SECRET and TOP SECRET data if they are suitably implemented in HACE. Further information on high assurance cryptographic protocols can be obtained from the ACSC.

ASD Approved Cryptographic Protocols

In general, ASD only approves the use of cryptographic equipment and software that has passed a formal evaluation. However, ASD approves the use of some cryptographic protocols even though their implementations in specific cryptographic equipment or software has not been formally evaluated. This approval is limited to cases where they are used in accordance with these guidelines.

The AACPs are:

- Transport Layer Security (TLS)
- Secure Shell (SSH)
- Secure/Multipurpose Internet Mail Extension (S/MIME)
- OpenPGP Message Format
- Internet Protocol Security (IPsec)
- Wi-Fi Protected Access 2
- Wi-Fi Protected Access 3.

Using ASD Approved Cryptographic Protocols

If cryptographic equipment or software implements unapproved protocols, it is possible that these protocols could be used without a user's knowledge. In combination with an assumed level of security confidence, this can represent a security risk. As such, organisations can ensure that only AACPs or high assurance cryptographic protocols can be used by disabling unapproved protocols (which is preferred) or advising users not to use unapproved protocols via usage policies.

Security Control: 0481; Revision: 6; Updated: Dec-21; Applicability: All

Only AACPs or high assurance cryptographic protocols are used by cryptographic equipment and software.

Further information

Further information on AACPs can be found in the found in the following sections of these guidelines.

Further information on the use of Wi-Fi Protected Access 2 and Wi-Fi Protected Access 3 in wireless networks can be found in the wireless networks section of the [Guidelines for Networking](#).

Transport Layer Security

Definitions

The terms Secure Sockets Layer (SSL) and TLS have traditionally been used interchangeably. However, as SSL 3.0 is no longer an AACP, instances of 'SSL' refer to SSL version 3.0 and below while 'TLS' refers to TLS 1.0 and beyond.

Using Transport Layer Security

The latest version of TLS is version 1.3, which was released in August 2018.

When using ICT equipment or software that implements TLS, security controls for using AACPs also need to be consulted in the ASD Approved Cryptographic Protocols section of these guidelines.

Security Control: 1139; Revision: 5; Updated: Oct-19; Applicability: All
Only the latest version of TLS is used.

Security Control: 1369; Revision: 2; Updated: Oct-19; Applicability: All
AES in Galois Counter Mode is used for symmetric encryption.

Security Control: 1370; Revision: 2; Updated: Oct-19; Applicability: All
Only server-initiated secure renegotiation is used.

Security Control: 1372; Revision: 2; Updated: Sep-18; Applicability: All
DH or ECDH is used for key establishment.

Security Control: 1448; Revision: 1; Updated: Sep-18; Applicability: All
When using DH or ECDH for key establishment, the ephemeral variant is used.

Security Control: 1373; Revision: 1; Updated: Sep-18; Applicability: All
Anonymous DH is not used.

Security Control: 1374; Revision: 2; Updated: Oct-19; Applicability: All
SHA-2-based certificates are used.

Security Control: 1375; Revision: 3; Updated: Oct-19; Applicability: All
Cipher suites are configured to use SHA-2 as part of the Message Authentication Code and Pseudo-Random Function.

Security Control: 1553; Revision: 0; Updated: Oct-19; Applicability: All
TLS compression is disabled.

Perfect Forward Secrecy

Using Perfect Forward Secrecy (PFS) reduces the impact of the compromise of a TLS session.

Security Control: 1453; Revision: 1; Updated: Sep-18; Applicability: All
PFS is used for TLS connections.

Further information

Further information on handling TLS traffic through gateways can be found in the web content filters section of the [Guidelines for Gateways](#).

Further information on the implementation of TLS for websites can be found in the ACSC's [Implementing Certificates, TLS, HTTPS and Opportunistic TLS](#) publication.

Secure Shell

Using Secure Shell

When using ICT equipment or software that implements SSH, security controls for using AACPs also need to be consulted in the ASD Approved Cryptographic Protocols section of these guidelines.

Configuring Secure Shell

SSH version 1 was found to have a number of security vulnerabilities. As such, it was replaced by SSH version 2. A number of security risks also exist when SSH is configured in an insecure manner. For example, forwarding connections and access privileges, using host-based authentication, and permitting system administrator logins. The configuration settings below are based on OpenSSH. Organisations using other implementations of SSH should adapt these settings to suit their SSH implementation.

Security Control: 1506; Revision: 0; Updated: Sep-18; Applicability: All

The use of SSH version 1 is disabled.

Security Control: 0484; Revision: 6; Updated: Dec-21; Applicability: All

The SSH daemon is configured to:

- *only listen on the required interfaces (ListenAddress xxx.xxx.xxx.xxx)*
- *have a suitable login banner (Banner x)*
- *have a login authentication timeout of no more than 60 seconds (LoginGraceTime 60)*
- *disable host-based authentication (HostbasedAuthentication no)*
- *disable rhosts-based authentication (IgnoreRhosts yes)*
- *disable the ability to login directly as root (PermitRootLogin no)*
- *disable empty passwords (PermitEmptyPasswords no)*
- *disable connection forwarding (AllowTCPForwarding no)*
- *disable gateway ports (GatewayPorts no)*
- *disable X11 forwarding (X11Forwarding no).*

Authentication mechanisms

Public key-based authentication schemes offer stronger authentication than passphrase-based authentication schemes due to passphrases being more susceptible to guessing attacks. Therefore, if passphrases are used, counter-measures should be put in place to reduce the chance of a successful brute force attack.

Security Control: 0485; Revision: 3; Updated: Sep-18; Applicability: All

Public key-based authentication is used for SSH connections.

Security Control: 1449; Revision: 1; Updated: Sep-18; Applicability: All

SSH private keys are protected with a passphrase or a key encryption key.

Automated remote access

If using logins without a passphrase for automated purposes, a number of security risks may arise, specifically:

- if access from unknown Internet Protocol (IP) addresses is not restricted, an adversary could automatically authenticate to systems without needing to know any passphrases

- if port forwarding is not disabled, or it is not configured securely, access may be gained to forwarded ports thereby creating a communication channel between an adversary and a host
- if agent credential forwarding is enabled, an adversary could connect to the stored authentication credentials and use them to connect to other trusted hosts, or even intranet hosts if port forwarding has been allowed as well
- if X11 display remoting is not disabled, an adversary could gain control of displays as well as keyboard and mouse control functions
- if console access is allowed, every user who logs into the console could run programs that are normally restricted to authenticated users.

To assist in mitigating these security risks, it is essential that the ‘forced command’ option is used to specify what command is executed and parameter checked is enabled.

Security Control: 0487; Revision: 3; Updated: Sep-18; Applicability: All

When using logins without a passphrase for automated purposes, the following are disabled:

- *access from IP addresses that do not require access*
- *port forwarding*
- *agent credential forwarding*
- *X11 display remoting*
- *console access.*

Security Control: 0488; Revision: 3; Updated: Sep-18; Applicability: All

If using remote access without the use of a passphrase, the ‘forced command’ option is used to specify what command is executed and parameter checked is enabled.

SSH-agent

SSH-agent or other similar key caching programs hold and manage private keys stored on workstations and respond to requests from remote systems to verify these keys. When an SSH-agent launches, it requests the user’s passphrase to unlock the user’s private key. Subsequent access to remote systems is performed by the agent and does not require the user to re-enter their passphrase. Screen locks and expiring key caches ensure that the user’s private key is not left unlocked for a long period of time. Furthermore, to limit the exposure of credentials, agent credential forwarding should only be enabled when SSH traversal is required.

Security Control: 0489; Revision: 4; Updated: Sep-18; Applicability: All

When SSH-agent or other similar key caching programs are used, it is only on workstations and servers with screen locks, key caches are set to expire within four hours of inactivity, and agent credential forwarding is enabled only when SSH traversal is required.

Further information

Further information on [configuring OpenSSH](#) is available from the OpenSSH project.

Secure/Multipurpose Internet Mail Extension

Using Secure/Multipurpose Internet Mail Extension

S/MIME 2.0 required the use of weaker cryptography (40-bit keys) than is approved for use in these guidelines. Version 3.0 was the first version to become a suitable standard.

Organisations choosing to implement S/MIME should be aware of the inability of many content filters to inspect encrypted messages and attachments for inappropriate content, and for server-based antivirus software to scan for viruses and other malicious code.

When using ICT equipment or software that implements S/MIME, security controls for using AACPs also need to be consulted in the ASD Approved Cryptographic Protocols section of these guidelines.

Security Control: 0490; Revision: 3; Updated: Sep-18; Applicability: All
Versions of S/MIME earlier than 3.0 are not used.

Internet Protocol Security

Using Internet Protocol Security

When using ICT equipment or software that implements IPsec, security controls for using AACPs also need to be consulted in the ASD Approved Cryptographic Protocols section of these guidelines.

Internet Security Association Key Management Protocol authentication

Most IPsec implementations handle a number of methods for authentication as part of Internet Security Association Key Management Protocol (ISAKMP). These can include digital certificates, encrypted nonces or pre-shared keys. These methods are all considered suitable for use.

Mode of operation

IPsec can be operated in transport mode or tunnel mode. The tunnel mode of operation provides full encapsulation of IP packets while the transport mode of operation only encapsulates the payload of the IP packet.

Security Control: 0494; Revision: 3; Updated: Sep-18; Applicability: All
Tunnel mode is used for IPsec connections; however, if using transport mode, an IP tunnel is used.

Protocol selection

IPsec contains two major protocols, Authentication Header (AH) and Encapsulating Security Payload (ESP). In order to provide a secure Virtual Private Network style connection, both authentication and encryption are needed. AH and ESP can provide authentication for the entire IP packet and the payload respectively. However, ESP is generally preferred for authentication since AH by its nature has network address translation limitations. However, if maximum security is desired at the expense of network address translation functionality, then ESP can be wrapped inside of AH, which will then authenticate the entire IP packet and not just the encrypted payload.

Security Control: 0496; Revision: 4; Updated: Sep-18; Applicability: All
The ESP protocol is used for IPsec connections.

Key exchange

There are several methods for establishing shared keying material for an IPsec connection, including manual keying and Internet Key Exchange (IKE) version 1 and 2. IKE addresses a number of security risks associated with manual keying, and for this reason is the preferred method for key establishment.

Security Control: 1233; Revision: 1; Updated: Sep-18; Applicability: All
IKE is used for key exchange when establishing an IPsec connection.

Internet Security Association Key Management Protocol modes

ISAKMP main mode provides greater security than aggressive mode since all exchanges are protected.

Security Control: 0497; Revision: 5; Updated: Sep-18; Applicability: All

If using ISAKMP in IKE version 1, aggressive mode is disabled.

Security association lifetimes

Using a secure association lifetime of four hours, or 14400 seconds, provides a balance between security and usability.

Security Control: 0498; Revision: 3; Updated: Sep-18; Applicability: All

A security association lifetime of less than four hours, or 14400 seconds, is used.

Hashed Message Authentication Code algorithms

The approved Hashed Message Authentication Code (HMAC) algorithms are HMAC-SHA256, HMAC-SHA384 or HMAC-SHA512.

Security Control: 0998; Revision: 4; Updated: Sep-18; Applicability: All

HMAC-SHA256, HMAC-SHA384 or HMAC-SHA512 is used as a HMAC algorithm.

Diffie-Hellman groups

Using a larger DH group provides more security for the key exchange. The minimum modulus size needed is specified in the ASD Approved Cryptographic Algorithms section of these guidelines.

Security Control: 0999; Revision: 5; Updated: Sep-18; Applicability: All

The largest modulus size possible for all relevant components in the network is used when conducting a key exchange.

Perfect Forward Secrecy

Using PFS reduces the impact of the compromise of a security association.

Security Control: 1000; Revision: 4; Updated: Sep-18; Applicability: All

PFS is used for IPsec connections.

Internet Key Exchange Extended Authentication

XAuth using IKE version 1 has documented security vulnerabilities associated with its use.

Security Control: 1001; Revision: 4; Updated: Sep-18; Applicability: All

The use of XAuth is disabled for IPsec connections using IKE version 1.

Cryptographic system management

Cryptographic systems

Cryptographic systems are comprised of cryptographic equipment and keying material. Where security controls for cryptographic systems are different to other systems, the variations are contained in this section.

Cryptographic equipment

Transporting cryptographic equipment in a keyed state may expose the keying material in it to potential compromise. Therefore, if cryptographic equipment is transported in a keyed state it should be done based on the sensitivity or classification of the keying material in it.

If cryptographic equipment or associated keying material is compromised or suspected of being compromised (e.g. stolen, lost, copied or communicated over the internet) then the confidentiality and integrity of previous and future communications may also be compromised.

Security Control: 0501; Revision: 5; Updated: Dec-21; Applicability: All

Keyed cryptographic equipment is transported based on the sensitivity or classification of the keying material in it.

Security Control: 0142; Revision: 4; Updated: Dec-21; Applicability: All

The compromise or suspected compromise of cryptographic equipment or associated keying material is reported to an organisation's Chief Information Security Officer, or one of their delegates, as soon as possible after it occurs.

Security Control: 1091; Revision: 6; Updated: Dec-21; Applicability: All

Keying material is changed when compromised or suspected of being compromised.

High Assurance Cryptographic Equipment

HACE can be used by organisations to protect SECRET and TOP SECRET data. Organisations using HACE must comply with all communications security and equipment-specific doctrine produced by the ACSC for the management and use of HACE.

Security Control: 0499; Revision: 9; Updated: Jun-21; Applicability: S, TS

All communications security and equipment-specific doctrine produced by the ACSC for the management and use of HACE is complied with.

Security Control: 0506; Revision: 3; Updated: Sep-18; Applicability: S, TS

Areas in which HACE is used are separated from other areas and designated as a cryptographic controlled area.

Guidelines for Gateways

Gateways

Purpose of gateways

Gateways act as data flow control mechanisms at the network layer and may also control data at the higher layers of the Open System Interconnect (OSI) model.

Deploying gateways

This section describes the security controls applicable to all gateways. Additional areas of these guidelines should also be consulted depending on the type of gateway deployed:

- For connections between different security domains, where at least one system is SECRET or higher, see the Cross Domain Solutions section of these guidelines.
- For devices used to control data flow in bi-directional gateways, see the firewalls section of these guidelines.

Applying the security controls

In all cases, gateways assumes the highest sensitivity or classification of the connected security domains.

Gateway architecture and configuration

Gateways are necessary to control data flows between security domains and prevent unauthorised access from external networks. Given the criticality of gateways in controlling the flow of data between security domains, any failure, particularly at higher classifications, may have serious consequences. As such, robust mechanisms for alerting personnel to situations that may cause cyber security incidents are especially important for gateways.

Security Control: 0628; Revision: 5; Updated: Mar-19; Applicability: All

All systems are protected from systems in other security domains by one or more gateways.

Security Control: 1192; Revision: 2; Updated: Sep-18; Applicability: All

All connections between security domains implement mechanisms to inspect and filter data flows for the transport and higher layers as defined in the OSI model.

Security Control: 0631; Revision: 6; Updated: Jun-20; Applicability: All

Gateways:

- *are the only communications paths into and out of internal networks*
- *allow only explicitly authorised connections*
- *are managed via a secure path isolated from all connected networks (physically at the gateway or on a dedicated administration network)*
- *log all physical and logical access to their components*
- *are configured to save logs to a secure logging facility*
- *have all security controls tested to verify their effectiveness after any changes to their configuration.*

Security Control: 1427; Revision: 2; Updated: Jun-19; Applicability: All

Gateways implement ingress traffic filtering to detect and prevent Internet Protocol (IP) source address spoofing.

Gateway operation

Implementing logging and alerting capabilities for gateways can assist in detecting cyber security incidents, attempted intrusions and unusual usage patterns. In addition, storing event logs on a secure logging facility increases the difficulty for an adversary to delete logging data in order to destroy evidence of a targeted cyber intrusion.

Security Control: 0634; Revision: 7; Updated: Jun-19; Applicability: All

All gateways connecting networks in different security domains are operated such that they:

- *log network traffic permitted through the gateway*
- *log network traffic attempting to leave the gateway*
- *are configured to save event logs to a secure logging facility*
- *provide real-time alerts for any cyber security incidents, attempted intrusions and unusual usage patterns.*

Demilitarised zones

Demilitarised zones are used to prevent direct access to data and services on internal networks. Organisations that require certain data and services to be accessed from the internet can place them in the less trusted demilitarised zone instead of on internal networks.

Security Control: 0637; Revision: 5; Updated: Sep-18; Applicability: All

Demilitarised zones are used to broker access to services accessed by external entities, and mechanisms are applied to mediate internal and external access to less-trusted services hosted in these demilitarised zones.

Gateway testing

Testing security controls on gateways assists with understanding its security posture by determining the effectiveness of security controls. An adversary may be aware of regular testing activities. Therefore, performing testing at irregular intervals will reduce the likelihood that an adversary could exploit regular testing activities.

Security Control: 1037; Revision: 4; Updated: Sep-18; Applicability: All

Gateways are subject to rigorous testing, performed at irregular intervals no more than six months apart, to determine the strength of security controls.

Gateway administration

System administrator privileges should be minimised and roles should be separated (e.g. separate network administration and security policy configuration roles) to minimise security risks posed by a malicious user with privileged access to a gateway.

Providing system administrators with formal training will ensure they are fully aware of, and accept, their roles and responsibilities regarding the management of gateways. Formal training could be through commercial providers, or simply through Standard Operating Procedures or reference documents bound by a formal agreement.

The system owner of the highest security domain of connected security domains is responsible for protecting the most sensitive data, and as such is best placed to manage any shared components of gateways. However, in cases where multiple security domains from different organisations are connected to a gateway, it may be more appropriate to have a qualified third party manage the gateway on behalf of all connected organisations.

Security Control: 0611; Revision: 4; Updated: Mar-19; Applicability: All

Access to gateway administration functions is limited to the minimum roles and privileges to support the gateway securely.

Security Control: 0612; Revision: 4; Updated: Sep-18; Applicability: All

System administrators are formally trained to manage gateways.

Security Control: 1520; Revision: 1; Updated: Jun-21; Applicability: All

All system administrators of gateways are cleared to access the highest level of data communicated or processed by the gateway.

Security Control: 0613; Revision: 5; Updated: Jun-21; Applicability: S, TS

All system administrators of gateways that process Australian Eyes Only or Australian Government Access Only data are Australian nationals.

Security Control: 0616; Revision: 4; Updated: Oct-19; Applicability: All

Roles for the administration of gateways are separated.

Security Control: 0629; Revision: 3; Updated: Sep-18; Applicability: All

For gateways between networks in different security domains, a formal arrangement exists whereby any shared components are managed by the system managers of the highest security domain or by a mutually agreed third party.

Shared ownership of gateways

As changes to a security domain connected to a gateway potentially affects the security posture of other connected security domains, system owners should formally agree to be active stakeholders in other security domains to which they are connected via a gateway.

Security Control: 0607; Revision: 4; Updated: Jun-21; Applicability: All

Once connectivity is established, system owners become stakeholders for all connected security domains.

Gateway authentication

Ensuring users and services are authenticated by gateways can reduce the likelihood of unauthorised access and provides an auditing capability to support the investigation of cyber security incidents.

Security Control: 0619; Revision: 5; Updated: Sep-18; Applicability: All

Users and services accessing networks through gateways are authenticated.

Security Control: 0620; Revision: 4; Updated: Sep-18; Applicability: All

Only users and services authenticated and authorised to a gateway can use the gateway.

Security Control: 1039; Revision: 4; Updated: Sep-18; Applicability: All

Multi-factor authentication is used for access to gateways.

ICT equipment authentication

Authenticating ICT equipment to networks accessed through gateways assists in preventing unauthorised ICT equipment connecting to a network. For example, by using 802.1X.

Security Control: 0622; Revision: 5; Updated: Sep-18; Applicability: All

ICT equipment accessing networks through gateways is authenticated.

Further information

Further information on topics covered in this section can be found in the following cyber security guidelines:

- [Guidelines for Cyber Security Incidents](#)
- [Guidelines for Physical Security](#)
- [Guidelines for Evaluated Products](#)
- [Guidelines for ICT Equipment](#)
- [Guidelines for System Hardening](#)

- [Guidelines for System Management](#)
- [Guidelines for System Monitoring](#)
- [Guidelines for Networking](#)
- [Guidelines for Data Transfers](#).

Further information on preventing IP source address spoofing can be found in [Network Ingress Filtering: Defeating Denial of Service Attacks which employ IP Source Address Spoofing](#).

Cross Domain Solutions

Introduction to cross domain security

A Cross Domain Solution (CDS) is a system comprising security-enforcing functions tailored to mitigate the specific security risks of accessing or transferring data between security domains. A CDS may be an integrated appliance or, more commonly, be composed of discrete technologies or sub-systems, with each sub-system consisting of hardware and/or software components.

This section describes the security controls applicable to a CDS and extends upon the security controls within the prior gateways section which are also applicable. Furthermore, the [Guidelines for Data Transfers](#) is also applicable to a CDS. Finally, additional sections of these guidelines should be consulted depending on the specific type of CDS deployed.

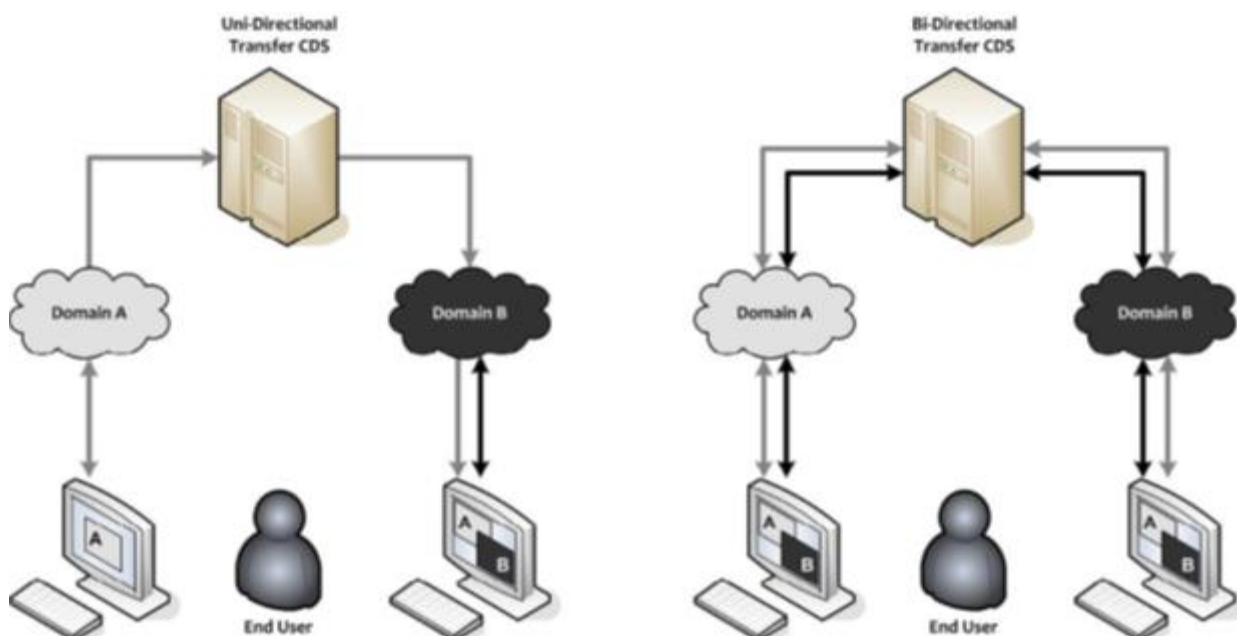
Personnel involved in the planning, analysis, design, implementation or assessment of a CDS should refer to the Australian Cyber Security Centre (ACSC)'s [Introduction to Cross Domain Solutions](#) and [Fundamentals of Cross Domain Solutions](#) publications.

Types of Cross Domain Solution

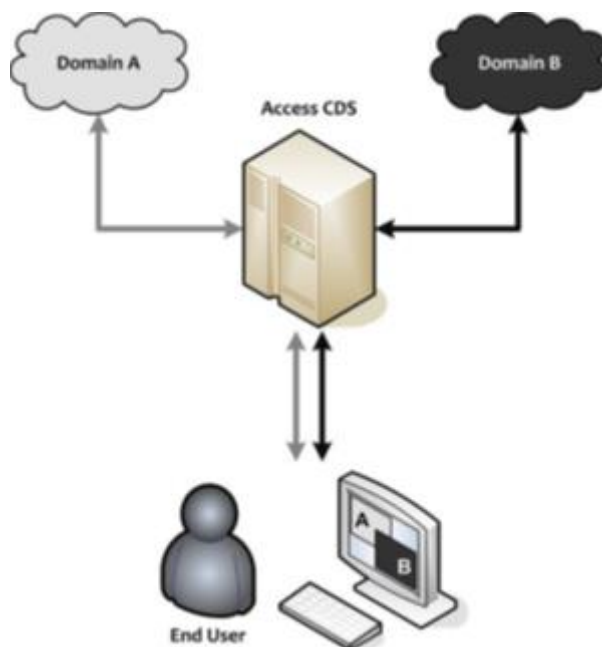
These guidelines define two logical types of CDS: a Transfer CDS and an Access CDS. These logical definitions are more closely aligned with how a CDS is described and sold by vendors and system integrators. Vendors may also offer a combined Access and Transfer solution.

Regardless of logical configuration, the underlying mechanisms in each CDS will consist of a low to high data transfer path, a high to low data transfer path, or both. Data filtering and other security controls are then applied to mitigate threats applicable to the system's operating context, including specific data paths and business cases.

A Transfer CDS facilitates the transfer of data, in one (unidirectional) or multiple (bi-directional) directions between different security domains.



An Access CDS provides the user with access to multiple security domains from a single device. Conceptually, an Access CDS allows remote interaction with one or multiple systems in a different security domain, such as a 'virtual desktop', and does not allow users to move data between security domains.



Applying the security controls

In all cases the gateway or CDS assumes the highest sensitivity or classification of the connected security domains.

When to implement a Cross Domain Solution

There are significant security risks associated with connecting SECRET and TOP SECRET networks to any other network in a different security domain via a simple gateway.

Security Control: 0626; Revision: 5; Updated: Dec-21; Applicability: S, TS

When connecting a SECRET or TOP SECRET network to any other network from a different security domain, a CDS is implemented.

Consultation when implementing or modifying a Cross Domain Solution

A CDS can be complex to deploy and manage securely, as such, the likelihood of a network compromise is increased. A secure CDS implementation ensures that the security policy of each security domain involved is upheld in a robust manner across all physical and logical layers of the connection between domains.

Security Control: 0597; Revision: 6; Updated: Sep-18; Applicability: S, TS

When designing and deploying a CDS, the ACSC is notified and consulted; and directions provided by the ACSC are complied with.

Security Control: 0627; Revision: 5; Updated: Sep-18; Applicability: S, TS

When introducing additional connectivity to a CDS, such as adding a new gateway to a common network, the ACSC is consulted on the impact to the security of the CDS; and directions provided by the ACSC are complied with.

Separation of data flows

A CDS should implement robust security enforcing functions, including content filtering and isolated paths, to ensure data flows are appropriately controlled.

Security Control: 0635; Revision: 6; Updated: Dec-21; Applicability: S, TS

A CDS implements isolated upward and downward network paths.

Security Control: 1521; Revision: 2; Updated: Dec-21; Applicability: S, TS

A CDS implements protocol breaks at each layer of the OSI model.

Security Control: 1522; Revision: 2; Updated: Dec-21; Applicability: S, TS

A CDS implements content filtering and separate independent security-enforcing components for upward and downward data flows.

Event logging

In addition to the security controls listed in the event logging and auditing section of the [Guidelines for System Monitoring](#), a CDS should have comprehensive logging capabilities to establish accountability for all actions performed by users. Effective logging practices can increase the likelihood that unauthorised behaviour will be detected.

Due to the criticality of data import and export functions provided by a CDS, organisations should regularly assess the performance of a CDS's data transfer policies against the security policies the CDS has been deployed to enforce.

Security Control: 0670; Revision: 4; Updated: Sep-18; Applicability: S, TS

All security-relevant events generated by a CDS are logged and regularly analysed.

Security Control: 1523; Revision: 0; Updated: Sep-18; Applicability: S, TS

A representative sample of security events generated by a CDS, relating to the enforcement of data transfer policies, is taken at least every 3 months and assessed against the security policies that the CDS is responsible for enforcing between security domains.

User training

It is important that users know how to use a CDS securely. This can be achieved via training before access is granted, and reinforced by logon banners and awareness messages.

Security Control: 0610; Revision: 7; Updated: Dec-21; Applicability: S, TS

Users are trained on the secure use of a CDS before access to the CDS is granted.

Further information

Further information on topics covered in this section can be found in the following cyber security guidelines:

- [Guidelines for Cyber Security Incidents](#)
- [Guidelines for Physical Security](#)
- [Guidelines for Evaluated Products](#)
- [Guidelines for ICT Equipment](#)
- [Guidelines for System Hardening](#)
- [Guidelines for System Management](#)
- [Guidelines for System Monitoring](#)
- [Guidelines for Networking](#)
- [Guidelines for Data Transfers](#).

Further information on the basics of a CDS can be found in the ACSC's [Introduction to Cross Domain Solutions](#) publication.

Further information on the fundamentals of a CDS can be found in the ACSC's [Fundamentals of Cross Domain Solutions](#) publication.

Firewalls

Using firewalls

Where an organisation connects to another organisation, both organisations should implement a firewall in their gateway environment to protect themselves from intrusions that originate outside of their environment. This requirement may not be necessary in the specific cases where shared network infrastructure is used only as a transport medium and link encryption is used.

Security Control: 1528; Revision: 2; Updated: Dec-21; Applicability: All

An evaluated firewall is used between organisations' networks and public network infrastructure.

Security Control: 0639; Revision: 8; Updated: Apr-19; Applicability: All

An evaluated firewall is used between networks belonging to different security domains.

Security Control: 1194; Revision: 2; Updated: Sep-18; Applicability: All

The requirement to use a firewall as part of gateway infrastructure is met by both parties independently; shared ICT equipment does not satisfy the requirements of both parties.

Further information

Further information on selecting evaluated products can be found in the evaluated product acquisition section of the [Guidelines for Evaluated Products](#).

Diodes

Using diodes

A diode enforces one-way flow of network traffic thus requiring separate paths for incoming and outgoing data. This makes it much more difficult for an adversary to use the same path to both launch a targeted cyber intrusion and exfiltrate data afterwards.

Security Control: 0643; Revision: 6; Updated: Dec-21; Applicability: All

An evaluated diode is used for controlling the data flow of a unidirectional gateway between an organisation's network and public network infrastructure.

Security Control: 0645; Revision: 6; Updated: Dec-21; Applicability: S, TS

An evaluated diode used for controlling the data flow of a unidirectional gateway between a SECRET or TOP SECRET network and public network infrastructure completes a high assurance evaluation.

Security Control: 1157; Revision: 4; Updated: Dec-21; Applicability: All

An evaluated diode is used for controlling the data flow of a unidirectional gateway between networks.

Security Control: 1158; Revision: 5; Updated: Dec-21; Applicability: S, TS

An evaluated diode used for controlling the data flow of a unidirectional gateway between a SECRET or TOP SECRET network and any other network completes a high assurance evaluation.

Volume checking

Monitoring the volume of data being transferred across a diode ensures that it conforms to expectations. It can also alert an organisation to potential malicious activity if the volume of data suddenly changes from the norm.

Security Control: 0648; Revision: 3; Updated: Sep-18; Applicability: All

A diode (or server connected to the diode) deployed to control data flow in unidirectional gateways monitors the volume of the data being transferred.

Further information

Further information on selecting evaluated products can be found in the evaluated product acquisition section of the [Guidelines for Evaluated Products](#).

Web proxies

Web usage policy

If organisations allow users to access the web they should define the extent of access that is granted. This can be achieved through a web usage policy and education of users.

Security Control: 0258; Revision: 3; Updated: Aug-19; Applicability: All

A web usage policy is developed and implemented.

Using web proxies

Web proxies are a key component in enforcing web usage policies and preventing cyber security incidents.

Security Control: 0260; Revision: 2; Updated: Sep-18; Applicability: All

All web access, including that by internal servers, is conducted through a web proxy.

Web proxy authentication and logging

Thorough web proxy logs are a valuable asset when responding to cyber security incidents and user violation of web usage policies.

Security Control: 0261; Revision: 4; Updated: Sep-18; Applicability: All

A web proxy authenticates users and provides logging that includes the following details about websites accessed:

- *address (uniform resource locator)*
- *time/date*
- *user*
- *amount of data uploaded and downloaded*
- *internal and external IP addresses.*

Web content filters

Using web content filters

An effective web content filter greatly reduces the likelihood of malicious code infection or other inappropriate content from being accessed by users. Web content filters can also disrupt or prevent an adversary from communicating with their malicious code if deployed on an organisation's network.

Some forms of content filtering performed by web content filters are the same as those performed by other types of content filters, while other forms of content filtering are specific to web content filters.

Security Control: 0963; Revision: 5; Updated: Sep-18; Applicability: All

A web content filter is used to filter potentially harmful web-based content.

Security Control: 0961; Revision: 7; Updated: Apr-20; Applicability: All

Client-side active content, such as Java, is restricted to a list of allowed websites.

Security Control: 1237; Revision: 1; Updated: Sep-18; Applicability: All

Web content filtering controls are applied to outbound web traffic where appropriate.

Transport Layer Security filtering

Since Transport Layer Security (TLS) web traffic travelling over Hypertext Transfer Protocol Secure connections can deliver content without any filtering, organisations can reduce this security risk by using TLS inspection.

Security Control: 0263; Revision: 7; Updated: Apr-20; Applicability: All

For TLS traffic communicated through internet gateways, either of the following approaches are implemented:

- *a solution that decrypts and inspects all TLS traffic as per content filtering security controls*
- *a list of websites to which encrypted connections are allowed, with all other TLS traffic decrypted and inspected as per content filtering security controls.*

Inspection of Transport Layer Security traffic

As encrypted TLS traffic may contain personal information, organisations are recommended to seek legal advice on whether inspecting such traffic could be in breach of the [Privacy Act 1988](#).

Security Control: 0996; Revision: 5; Updated: Sep-18; Applicability: All

Legal advice is sought regarding the inspection of TLS traffic by internet gateways.

Allowing access to specific websites

Defining a list of allowed websites and blocking all other websites effectively removes one of the most common data delivery and exfiltration techniques used by an adversary. However, if users have a legitimate requirement to access numerous websites, or a rapidly changing list of websites, organisations should consider the costs of such an implementation.

Even a relatively permissive list of allowed websites offers better security than relying on a list of known malicious websites, or no restrictions at all, while still reducing implementation costs. An example of a permissive list could be the entire Australian subdomain, that is '*.au', or the top 1,000 websites from the Alexa website ranking (after filtering Dynamic Domain Name System domains and other inappropriate domains).

Security Control: 0958; Revision: 7; Updated: Apr-20; Applicability: All

A list of allowed websites, using either domain name or IP address, is implemented for all Hypertext Transfer Protocol and Hypertext Transfer Protocol Secure traffic communicated through internet gateways.

Security Control: 1170; Revision: 3; Updated: Apr-20; Applicability: All

If a list of allowed websites is not implemented, a list of allowed website categories is implemented instead.

Blocking access to specific websites

Collections of websites that have been deemed to be inappropriate due to their content or hosting of malicious content can be blocked to prevent them from being accessed.

Targeted cyber intrusions commonly use dynamic or other domains where domain names can be registered anonymously for free due to their lack of attribution.

Security Control: 0959; Revision: 6; Updated: Apr-20; Applicability: All

If a list of allowed websites is not implemented, a list of blocked websites is implemented instead.

Security Control: 0960; Revision: 6; Updated: Apr-20; Applicability: All

If a list of blocked websites is implemented, the list is updated on a daily basis to ensure that it remains effective.

Security Control: 1171; Revision: 1; Updated: Sep-18; Applicability: All

Attempts to access a website through its IP address instead of through its domain name are blocked.

Security Control: 1236; Revision: 1; Updated: Sep-18; Applicability: All

Dynamic domains and other domains where domain names can be registered anonymously for free are blocked.

Further information

Further information on content filtering techniques can be found in the content filtering section of these guidelines.

Further information and [examples of client-side JavaScript controls](#) are available from the NoScript project.

Content filtering

Content filtering techniques

Content filters reduce the likelihood of unauthorised or malicious content transiting a security domain boundary by assessing data based on defined security policies. The following techniques can assist with assessing the suitability of data to transit a security domain boundary.

Technique	Purpose
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Antivirus scan	Scans the data for viruses and other malicious code.
Automated dynamic analysis	Analyses email and web content in a sandbox before delivering it to users.
Data format check	Inspects data to ensure that it conforms to expected and permitted formats.
Data range check	Checks the data in each field to ensure that it falls within the expected and permitted ranges.
Data type check	Inspects each file header to determine the actual file type.
File extension check	Inspects the file name extension to determine the purported file type.
Keyword search	Searches data for keywords or ‘dirty words’ that could indicate the presence of inappropriate or undesirable material.
Metadata check	Inspects files for metadata that should be removed prior to release.
Protective marking check	Validates the protective marking of the data to ensure that it is correct.
Manual inspection	The manual inspection of data for suspicious content that an automated system could miss, which is particularly important for the transfer of multimedia or content rich files.
Verification against file specification	Verifies that the file conforms to the defined file specification and can be effectively processed by subsequent content filters.

Content filtering

Implementing an effective content filter which cannot be bypassed reduces the likelihood of malicious content successfully passing into a security domain. Content filtering is only effective when suitable components are selected and appropriately configured with consideration of an organisation’s business processes and threat environment. Furthermore, when content filters are implemented as a component of a CDS, their assurance requirements necessitate rigorous security testing.

Security Control: 0659; Revision: 5; Updated: Dec-21; Applicability: All

When importing data into a security domain, the data is filtered by a content filter designed for that purpose.

Security Control: 1524; Revision: 1; Updated: Dec-19; Applicability: S, TS

Content filters deployed in a CDS are subject to rigorous security assessment to ensure they mitigate content-based threats and cannot be bypassed.

Active, malicious and suspicious content

Many files are executable and are potentially harmful if executed by a user. Many file type specifications allow active content to be embedded in the file, which increases the attack surface. The definition of suspicious content will depend on the system's security risk profile and what is considered to be normal system behaviour.

Security Control: 0651; Revision: 4; Updated: Sep-18; Applicability: All

All suspicious, malicious and active content is blocked from entering a security domain.

Security Control: 0652; Revision: 2; Updated: Sep-18; Applicability: All

Any data identified by a content filtering process as suspicious is blocked until reviewed and approved for transfer by a trusted source other than the originator.

Automated dynamic analysis

Analysing email and web content in a sandbox is a highly effective strategy to detect suspicious behaviour including network traffic, new or modified files, or other configuration changes.

Security Control: 1389; Revision: 1; Updated: Sep-18; Applicability: All

Email and web content entering a security domain is automatically run in a dynamic malware analysis sandbox to detect suspicious behaviour.

Content validation

Content validation aims to ensure that the content received conforms to an approved standard. For example, content validation can be used to identify malformed content thereby allowing potentially malicious content to be blocked.

Examples of content validation include:

- ensuring numeric fields only contain numeric numbers
- ensuring content falls within acceptable length boundaries
- ensuring Extensible Markup Language (XML) documents are compared to a strictly defined XML schema.

Security Control: 1284; Revision: 2; Updated: Oct-19; Applicability: All

Content validation is performed on all data passing through a content filter with content which fails content validation blocked.

Content conversion and transformation

Content conversion or transformation can be an effective method to render potentially malicious content harmless by separating the presentation format from the data. By converting a file to another format, the exploit, active content and/or payload can be removed or disrupted.

Examples of content conversion and transformation to mitigate the threat of content exploitation include:

- converting a Microsoft Word document to a Portable Document Format (PDF) file
- converting a Microsoft PowerPoint presentation to a series of image files
- converting a Microsoft Excel spreadsheet to a comma-separated values file
- converting a PDF document to a plain text file.

Some file types, such as XML, will not benefit from conversion. Applying the conversion process to any attachments or files contained within other files (e.g. archive files or encoded files embedded in XML) can increase the effectiveness of a content filter.

Security Control: 1286; Revision: 1; Updated: Sep-18; Applicability: All

Content conversion is performed for all ingress or egress data transiting a security domain boundary.

Content sanitisation

Sanitisation is the process of attempting to make potentially malicious content safe to use by removing or altering active content while leaving the original content as intact as possible. Sanitisation is not as secure a method of content filtering as conversion, though many techniques may be combined. Inspecting and filtering extraneous application and protocol data, including metadata, will assist in mitigating the threat of content exploitation. Examples include:

- removal of document properties in Microsoft Office documents
- removal or renaming of JavaScript sections from PDF files
- removal of metadata from within image files.

Security Control: 1287; Revision: 1; Updated: Sep-18; Applicability: All

Content sanitisation is performed on suitable file types if content conversion is not appropriate for data transiting a security domain boundary.

Antivirus scanning

Antivirus scanning is used to prevent, detect and remove malicious code that includes computer viruses, worms, Trojans, spyware and adware.

Security Control: 1288; Revision: 1; Updated: Sep-18; Applicability: All

Antivirus scanning, using multiple different scanning engines, is performed on all content.

Archive and container files

Archive and container files can be used to bypass content filtering processes if the content filter does not handle the file type and embedded content correctly. Ensuring content filtering processes recognise archived and container files will ensure the embedded files they contain are subject to the same content filtering measures as un-archived files.

Archive files can be constructed in a manner which can pose a denial of service security risk due to processor, memory or disk space exhaustion. To limit the likelihood of such an attack, content filters can specify resource constraints/quotas while extracting these files. If these constraints are exceeded the inspection is terminated, the content blocked and appropriate personnel are alerted.

Security Control: 1289; Revision: 1; Updated: Sep-18; Applicability: All

The contents from archive/container files are extracted and subjected to content filter checks.

Security Control: 1290; Revision: 1; Updated: Sep-18; Applicability: All

Controlled inspection of archive/container files is performed to ensure that content filter performance or availability is not adversely affected.

Security Control: 1291; Revision: 1; Updated: Sep-18; Applicability: All

Files that cannot be inspected are blocked and generate an alert or notification.

Allowing access to specific content types

Creating and enforcing a list of allowed content types, based on business requirements and the results of a risk assessment, is a strong content filtering method that can reduce the attack surface of a system. As a simple example, an email content filter might only allow Microsoft Office documents and PDF files.

Security Control: 0649; Revision: 7; Updated: Apr-20; Applicability: All

A list of allowed content types is implemented.

Data integrity

Ensuring the authenticity and integrity of content reaching a security domain is a key component in ensuring its trustworthiness. It is also essential that content that has been authorised for release from a security domain is not modified (e.g. by the addition or substitution of data). If content passing through a filter contains a form of integrity protection, such as a digital signature, the content filter needs to verify the content's integrity before allowing it through. If the content fails these integrity checks it may have been spoofed or tampered with and should be dropped.

Examples of data integrity checks include:

- an email server or content filter verifying an email protected by DomainKeys Identified Mail
- a web service verifying the XML digital signature contained within a Simple Object Access Protocol request
- validating a file against a separately supplied hash
- checking that data to be exported from a security domain has been digitally signed by a release authority.

Security Control: 1292; Revision: 1; Updated: Sep-18; Applicability: All

The integrity of content is verified where applicable and blocked if verification fails.

Security Control: 0677; Revision: 5; Updated: Dec-21; Applicability: All

If data is signed, the signature is validated before the data is exported.

Encrypted data

Encryption can be used to bypass content filtering if encrypted content cannot be subject to the same checks performed on unencrypted content. Organisations should consider the need to decrypt content, depending on the security domain they are communicating with and depending on whether the need-to-know principle needs to be enforced.

Choosing not to decrypt content poses a security risk that malicious code's encrypted communications and data could move between security domains. In addition, encryption could mask data at a higher classification being allowed to pass to a security domain of lower classification, which could result in a data spill.

Where a business need to preserve the confidentiality of encrypted data exists, an organisation may consider a dedicated system to allow encrypted content through external, boundary or perimeter controls to be decrypted in an appropriately secure environment, in which case the content should be subject to all applicable content filtering controls after it has been decrypted.

Security Control: 1293; Revision: 1; Updated: Sep-18; Applicability: All

All encrypted content, traffic and data is decrypted and inspected to allow content filtering.

Peripheral switches

Using peripheral switches

When accessing different systems through a peripheral switch, it is important that sufficient assurance is held in the operation of the switch to ensure that data does not pass between different security domains. As such, the level of assurance needed in a peripheral switch is determined by the difference in sensitivity or classification of systems connected to the switch.

There is no requirement for an evaluated peripheral switch when all connected systems belong to the same security domain.

Security Control: 0591; Revision: 7; Updated: Dec-21; Applicability: All

An evaluated peripheral switch is used when sharing peripherals between systems.

Security Control: 1457; Revision: 3; Updated: Dec-21; Applicability: S, TS

An evaluated peripheral switch used for sharing peripherals between SECRET and TOP SECRET systems, or between SECRET or TOP SECRET systems belonging to different security domains, preferably completes a high assurance evaluation.

Security Control: 1480; Revision: 1; Updated: Dec-21; Applicability: S, TS

An evaluated peripheral switch used for sharing peripherals between SECRET or TOP SECRET systems and any non-SECRET or TOP SECRET systems completes a high assurance evaluation.

Further information

Further information on selecting evaluated products can be found in the evaluated product acquisition section of the [Guidelines for Evaluated Products](#).

Guidelines for Data Transfers

Data transfers

Data transfer processes and procedures

Ensuring that data transfer processes, and supporting data transfer procedures, are adhered to will facilitate the consistent application of data transfer-related security controls and the generation of necessary audit records.

Security Control: 0663; Revision: 6; Updated: Dec-21; Applicability: All

Data transfer processes, and supporting data transfer procedures, are developed and implemented.

User responsibilities

When users transfer data to or from a system, they should understand the potential consequences of their actions. This could include spills of data onto a system not authorised to handle the data, or the unintended introduction of malicious code to a system. Accordingly, users should be held accountable for all data transfers that they make.

Security Control: 0661; Revision: 7; Updated: Apr-19; Applicability: All

Users transferring data to and from a system are held accountable for the data they transfer.

Data transfer approval

Users can prevent cyber security incidents by checking protective markings to ensure that the destination system is appropriate for the data being transferred, performing antivirus scanning on data to be transferred, and following all other procedures as part of data transfer processes. In doing so, trusted sources are people or systems responsible for authorising data exports based on a formal assessment. Trusted sources may include an organisation's Chief Information Security Officer and their delegates.

Security Control: 0664; Revision: 6; Updated: Dec-21; Applicability: S, TS

All data transferred from a SECRET or TOP SECRET system to any other system is reviewed and approved by a trusted source.

Security Control: 0675; Revision: 5; Updated: Dec-21; Applicability: S, TS

A trusted source signs all data authorised for export from a SECRET or TOP SECRET system.

Security Control: 0665; Revision: 6; Updated: Dec-21; Applicability: S, TS

Trusted sources for SECRET and TOP SECRET systems are limited to people and services that have been authorised as such by an organisation's Chief Information Security Officer.

Import of data

Scanning data being imported to a system for malicious and active content reduces the likelihood of the system being infected with malicious code.

Security Control: 0657; Revision: 5; Updated: Dec-21; Applicability: All

Data imported to a system is scanned for malicious and active content.

Security Control: 0658; Revision: 5; Updated: Dec-21; Applicability: S, TS

Data imported to a SECRET or TOP SECRET system undergoes data format checks and logging, and is monitored to detect overuse/unusual usage patterns.

Export of data

When data is exported from a system, protective markings should be assessed to determine if the export is permitted. Thorough inspection, the likelihood of data being transferred to a system that is not authorised to handle it, or into the public domain, can be reduced.

Security Control: 1187; Revision: 2; Updated: Dec-21; Applicability: All

When exporting data from a system, protective marking checks are undertaken.

Security Control: 0669; Revision: 4; Updated: Dec-21; Applicability: S, TS

When exporting data from a SECRET or TOP SECRET system, the following activities are undertaken:

- *data format checks and logging*
- *monitoring to detect overuse/unusual usage patterns*
- *limitations on data types and sizes*
- *keyword searches on all textual data.*

Preventing export of highly sensitive data to foreign systems

In order to reduce the likelihood of spilling Australian Eyes Only (AUSTEO) and Australian Government Access Only (AGAO) data onto foreign systems, it is important that processes, and supporting procedures, are developed to detect AUSTEO and AGAO data and to prevent it from crossing into foreign systems.

Security Control: 1535; Revision: 2; Updated: Dec-21; Applicability: S, TS

Processes, and supporting procedures, are developed and implemented to prevent AUSTEO and AGAO data in both textual and non-textual formats from being exported to foreign systems.

Security Control: 0678; Revision: 3; Updated: Dec-21; Applicability: S, TS

When exporting AUSTEO or AGAO data from a system, keyword searches are undertaken on all textual data and any identified data is quarantined until reviewed and approved for release by a trusted source other than the originator.

Monitoring data import and export

It is important to monitor data import and export processes to ensure the confidentiality and integrity of systems and data. This applies to all import and export mechanisms including those which are performed using a gateway, Cross Domain Solution or removable media. Data transfer logs can assist with such activities and may contain information such as who authorised the data transfer, the type of data transferred, where the data was transferred from/to, when the data was transferred, why the data was transferred and how the data was transferred.

Security Control: 1586; Revision: 0; Updated: Aug-20; Applicability: All

Data transfer logs are used to record all data imports and exports from systems.

Security Control: 1294; Revision: 4; Updated: Dec-21; Applicability: All

Data transfer logs for systems are partially audited at least monthly.

Security Control: 0660; Revision: 8; Updated: Dec-21; Applicability: S, TS

Data transfer logs for SECRET and TOP SECRET systems are fully audited at least monthly.

Further information

Further information on using removable media for data transfers can be found in the media usage section of the [Guidelines for Media](#).

Further information on data transfers involving a gateway or Cross Domain Solution can be found in the content filtering section of the [Guidelines for Gateways](#).

Cyber Security Terminology

Glossary of abbreviations

Abbreviation	Meaning
AACA	ASD Approved Cryptographic Algorithm
AACP	ASD Approved Cryptographic Protocol
ACSC	Australian Cyber Security Centre
AES	Advanced Encryption Standard
AGAO	Australian Government Access Only
AGD	Attorney-General's Department
AH	Authentication Header
AISEP	Australian Information Security Evaluation Program
ASD	Australian Signals Directorate
ASIO	Australian Security Intelligence Organisation
ATA	Advanced Technology Attachment
AUSTEO	Australian Eyes Only
CCRA	Common Criteria Recognition Arrangement
CDN	content delivery network
CDS	Cross Domain Solution
CISO	Chief Information Security Officer
CNSA	Commercial National Security Algorithm
DBMS	database management system
DH	Diffie-Hellman

DKIM	DomainKeys Identified Mail
DMA	Direct Memory Access
DMARC	Domain-based Message Authentication, Reporting and Conformance
DSA	Digital Signature Algorithm
EAL	Evaluation Assurance Level
EAP	Extensible Authentication Protocol
EAP-TLS	Extensible Authentication Protocol-Transport Layer Security
ECDSA	Elliptic Curve Digital Signature Algorithm
ECDH	Elliptic Curve Diffie-Hellman
EEPROM	electrically erasable programmable read-only memory
EPROM	erasable programmable read-only memory
ESP	Encapsulating Security Payload
FIPS	Federal Information Processing Standard
FT	Fast Basic Service Set Transition
HACE	High Assurance Cryptographic Equipment
HIPS	Host-based Intrusion Prevention System
HMAC	Hashed Message Authentication Code
HSTS	Hypertext Transfer Protocol Strict Transport Security
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
ICT	Information and Communications Technology

IEC	International Electrotechnical Commission
IKE	Internet Key Exchange
IP	Internet Protocol
IPsec	Internet Protocol Security
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
IR	infrared
IRAP	Infosec Registered Assessors Program
ISAKMP	Internet Security Association Key Management Protocol
ISM	Information Security Manual
ISO	International Organization for Standardization
LAN	Local Area Network
MAC	Media Access Control
MFD	multifunction device
MTA-STS	Mail Transfer Agent Strict Transport Security
NAA	National Archives of Australia
NIDS	Network-based Intrusion Detection System
NIPS	Network-based Intrusion Prevention System
NIST	National Institute of Standards and Technology
OSI	Open System Interconnect
OWASP	Open Web Application Security Project
PDF	Portable Document Format
PFS	Perfect Forward Secrecy

PMK	Pairwise Master Key
PP	Protection Profile
PSC	Protective Security Circular
PSPF	Protective Security Policy Framework
PSTN	Public Switched Telephone Network
RADIUS	Remote Access Dial-In User Service
REL	Releasable To
RF	Radio Frequency
RSA	Rivest-Sharmir-Adleman
SCEC	Security Construction and Equipment Committee
SEG	Security Equipment Guide
SHA-2	Secure Hashing Algorithm 2
S/MIME	Secure/Multipurpose Internet Mail Extension
SNMP	Simple Network Management Protocol
SOE	Standard Operating Environment
SQL	Structured Query Language
SP	Special Publication
SPF	Sender Policy Framework
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Sockets Layer
TLS	Transport Layer Security
USB	Universal Serial Bus

VLAN	Virtual Local Area Network
VPN	Virtual Private Network
WPA2	Wi-Fi Protected Access 2
WPA3	Wi-Fi Protected Access 3
XML	Extensible Markup Language

Glossary of cyber security terms

Term	Meaning
access control	The process of granting or denying requests for access to systems, applications and data. Can also refer to the process of granting or denying requests for access to facilities.
Access Cross Domain Solution	A system permitting access to multiple security domains from a single client device.
aggregation (of data)	A term used to describe compilations of data that may require a higher level of protection than their component parts.
application control	An approach in which only an explicitly defined set of trusted applications are allowed to execute on systems.
asset	Anything of value, such as ICT equipment, software or data.
attack surface	The amount of ICT equipment and software used in a system. The greater the attack surface the greater the chances of an adversary finding an exploitable security vulnerability.
audit log	A chronological record of system activities including records of system access and operations performed.
audit trail	A chronological record that reconstructs the sequence of activities surrounding, or leading to, a specific operation, procedure or event.
Australian Information Security Evaluation Program	A program under which evaluations are performed by impartial bodies against the Common Criteria. The results of these evaluations are then certified by the

	Australian Certification Authority within the Australian Cyber Security Centre.
Australian Eyes Only data	Data not to be passed to, or accessed by, foreign nationals.
Australian Government Access Only data	Data not to be passed to, or accessed by, foreign nationals, with the exception of seconded foreign nationals.
authentication	Verifying the identity of a user, process or device as a prerequisite to allowing access to resources in a system.
Authentication Header	A protocol used in Internet Protocol Security (IPsec) that provides data integrity and data origin authenticity but not confidentiality.
authorising officer	An executive with the authority to formally accept the security risks associated with the operation of a system and to authorise it to operate.
availability	The assurance that systems and data are accessible and useable by authorised entities when required.
biometrics	Measurable physical characteristics used to identify or verify an individual.
cascaded connections	Cascaded connections occur when one network is connected to another, which is then connected to another, and so on.
caveat	A marking that indicates that the data has special requirements in addition to those indicated by its classification. This term covers codewords, source codewords, releasability indicators and special-handling caveats.
certification report	An artefact of Common Criteria evaluations that outlines the outcomes of a product's evaluation.
Chief Information Security Officer	A senior executive who is responsible for coordinating communication between security and business functions as well as overseeing the application of security controls and associated security risk management processes.
classification	The categorisation of systems and data according to the expected impact if it was to be compromised.

classified data	Data that would cause damage, serious damage or exceptionally grave damage to the national interest, organisations or individuals if compromised (i.e. data assessed as PROTECTED, SECRET or TOP SECRET).
coercivity	A property of magnetic material, used as a measure of the amount of coercive force required to reduce the magnetic induction to zero from its remnant state.
Commercial Grade Cryptographic Equipment	A subset of ICT equipment which contains cryptographic components.
Common Criteria	An international standard for product evaluations.
Common Criteria Recognition Arrangement	An international agreement which facilitates the mutual recognition of Common Criteria evaluations by certificate producing schemes.
communications security	The security controls applied to protect telecommunications from unauthorised interception and exploitation, as well as ensure the authenticity of such telecommunications.
conduit	A tube, duct or pipe used to protect cables.
confidentiality	The assurance that data is disclosed only to authorised entities.
connection forwarding	The use of network address translation to allow a port on a node inside a network to be accessed from outside the network. Alternatively, using a Secure Shell server to forward a Transmission Control Protocol connection to an arbitrary port on the local host.
content filter	A filter that examines content to assess conformance against a security policy.
continuous monitoring plan	A document that describes the plan for the continuous monitoring and assurance in the effectiveness of security controls for a system.
control plane	The administrative interface that allows for the management and orchestration of a system's infrastructure and applications.

Cross Domain Solution	A system capable of implementing comprehensive data flow security policies with a high level of trust between two or more differing security domains.
cryptographic algorithm	An algorithm used to perform cryptographic functions such as encryption, integrity, authentication, digital signatures or key establishment.
cryptographic equipment	A generic term for commercial cryptographic equipment and High Assurance Cryptographic Equipment.
cryptographic hash	An algorithm (the hash function) which takes as input a string of any length (the message) and generates a fixed length string (the message digest or fingerprint) as output. The algorithm is designed to make it computationally infeasible to find any input which maps to a given digest, or to find two different messages that map to the same digest.
cryptographic protocol	An agreed standard for secure communication between two or more entities to provide confidentiality, integrity, authentication and non-repudiation of data.
cryptographic software	Software designed to perform cryptographic functions.
cryptographic system	A related set of hardware or software used for cryptographic communication, processing or storage, and the administrative framework in which it operates.
cyber resilience	The ability to adapt to disruptions caused by cyber security incidents while maintaining continuous business operations. This includes the ability to detect, manage and recover from cyber security incidents.
cyber security	Measures used to protect the confidentiality, integrity and availability of systems and data.
cyber security event	An occurrence of a system, service or network state indicating a possible breach of security policy, failure of safeguards or a previously unknown situation that may be relevant to security.
cyber security incident	An unwanted or unexpected cyber security event, or a series of such events, that have a significant probability of compromising business operations.
cyber threat	Any circumstance or event with the potential to harm systems or data.

data at rest	Data that resides on media or a system.
data in transit	Data that is being communicated across a communication medium.
data security	Measures used to protect the confidentiality, integrity and availability of data.
data spill	The accidental or deliberate exposure of data into an uncontrolled or unauthorised environment, or to people without a need-to-know.
declassification	A process whereby requirements for the protection of data are removed and an administrative decision is made to formally authorise its release into the public domain.
degausser	An electrical device or permanent magnet assembly which generates a coercive magnetic force for the purpose of degaussing magnetic storage devices.
degaussing	A process for reducing the magnetisation of a magnetic storage device to zero by applying a reverse (coercive) magnetic force, rendering any previously stored data unreadable.
demilitarised zone	A small network with one or more servers that is kept separate from the core network, typically on the outside of the firewall or as a separate network protected by the firewall. Demilitarised zones usually provide data to less trusted networks, such as the internet.
denial-of-service attack	An attempt by an adversary to prevent legitimate access to online services (typically a website), for example, by consuming the amount of available bandwidth or the processing capacity of the server hosting the online service.
device access control software	Software that can be used on a system to restrict access to communications ports. Device access control software can block all access to a communications port or allow access based on device types, manufacturer's identification or even unique device identifiers.
digital preservation	The coordinated and ongoing set of processes and activities that ensure long-term, error-free storage of digital information, with means for retrieval and

	interpretation, for the entire time span the information is required.
digital signature	A cryptographic process that allows the proof of the source (with non-repudiation) and the verification of the integrity of that data.
diode	A device that allows data to flow in only one direction.
distributed-denial-of-service attack	A distributed form of denial-of-service attack.
dual-stack network device	ICT equipment that implements both Internet Protocol version 4 and Internet Protocol version 6 protocol stacks.
emanation security	The counter-measures employed to reduce sensitive or classified emanations from a facility and its systems to an acceptable level. Emanations can be in the form of Radio Frequency energy, sound waves or optical signals.
Encapsulating Security Payload	A protocol used for encryption and authentication in IPsec.
encryption software	Software designed to ensure the confidentiality of data by encrypting it when at rest.
Enterprise Mobility Evaluation Program	The investigation, analysis, verification and validation of enterprise mobility solutions used to protect up to PROTECTED data.
escort	A person who ensures that when maintenance or repairs are undertaken to ICT equipment that uncleared personnel are not exposed to data they are not authorised to access.
event	In the context of system logs, an event constitutes an evident change to the normal behaviour of a network, system or user.
facility	A physical space where business is performed. For example, a facility can be a building, a floor of a building or a designated space on the floor of a building.
fax machine	A device that allows copies of documents to be sent over a telephone network.
firewall	A network device that filters incoming and outgoing network data based on a series of rules.

firmware	Software embedded in ICT equipment.
fly lead	A lead that connects ICT equipment to the fixed infrastructure of a facility. For example, the lead that connects a workstation to a network wall socket.
foreign national	A person who is not an Australian citizen.
foreign system	A system that is not managed by, or on behalf of, the Australian Government.
fuzzing	Fuzzing (or fuzz testing) is a method used to discover errors or potential security vulnerabilities in software.
gateway	Gateways securely manage data flows between connected networks from different security domains.
handling requirements	An agreed standard for the storage and dissemination of data to ensure its protection.
hardware	A generic term for ICT equipment.
Hash-based Message Authentication Code Algorithms	A cryptographic construction that can be used to compute Message Authentication Codes using a hash function and a secret key.
High Assurance Cryptographic Equipment	Cryptographic equipment that has been designed and authorised for the protection of SECRET and TOP SECRET data.
High Assurance Evaluation Program	The rigorous investigation, analysis, verification and validation of products used to protect SECRET and TOP SECRET data.
high assurance ICT equipment	ICT equipment that has been designed and authorised for the protection of SECRET and TOP SECRET data.
Host-based Intrusion Detection System	Software, resident on a system, which monitors system activities for malicious or unwanted behaviour.
Host-based Intrusion Prevention System	Software, resident on a system, which monitors system activities for malicious or unwanted behaviour and can react in real-time to block or prevent those activities.
hybrid hard drive	Non-volatile magnetic media that uses a cache to increase read/write speeds and reduce boot times. The cache is normally non-volatile flash memory media.

ICT equipment	Any device that can process, store or communicate data (e.g. computers, multifunction devices, mobile phones, digital cameras, electronic storage media and other radio devices).
incident response plan	A document that describes the plan for responding to cyber security incidents.
Infosec Registered Assessors Program	An initiative of the Australian Cyber Security Centre designed to register suitably qualified individuals to carry out security assessments for systems.
infrared device	Devices such as mice, keyboards and pointing devices that have an infrared communications capability.
integrity	The assurance that data has been created, amended or deleted only by authorised individuals.
interactive authentication	Authentication that involves the interaction of a person with a system.
Internet Protocol Security	A suite of protocols for secure communications through authentication or encryption of Internet Protocol (IP) packets as well as including protocols for cryptographic key establishment.
Internet Protocol telephony	The transport of telephone calls over IP networks.
Internet Protocol version 6	A protocol used for communicating over packet switched networks. Version 6 is the successor to version 4 which is widely used on the internet.
Intrusion Detection System	An automated system used to identify an infringement of security policy. IDS can be host-based or network-based.
Internet Security Association Key Management Protocol aggressive mode	A protocol that uses half the exchanges of main mode to establish an IPsec connection.
Internet Security Association Key Management Protocol main mode	A protocol that offers optimal security using six packets to establish an IPsec connection.
jump server	A computer which is used to manage important or critical resources in a separate security domain. Also known as a jump host or jump box.

keying material	Cryptographic keys generated or used by cryptographic equipment or software.
key management	The use and management of cryptographic keys and associated hardware and software. It includes their generation, registration, distribution, installation, usage, protection, storage, access, recovery and destruction.
lockable commercial cabinet	A cabinet that is commercially available, of robust construction and is fitted with a commercial lock.
logging facility	A facility that includes software which generates events and their associated details, the transmission (if necessary) of event logs, and how they are stored.
malicious code	Any software that attempts to subvert the confidentiality, integrity or availability of a system.
malicious code infection	The occurrence of malicious code infecting a system.
management traffic	Traffic generated by system administrators over a network in order to control workstations and servers. This includes standard management protocols and traffic that contains data relating to the management of the network.
media	A generic term for hardware, often portable in nature, which is used to store data.
media destruction	The process of physically damaging media with the intent of making data stored on it inaccessible. To destroy media effectively, only the actual material in which data is stored needs to be destroyed.
media disposal	The process of relinquishing control of media when it is no longer required.
media sanitisation	The process of erasing or overwriting data stored on media so that it cannot be retrieved or reconstructed.
metadata	Descriptive data about the content and context used to identify data.
mobile device	A portable computing or communications device. For example, a laptop, mobile phone or tablet.
multifunction device	ICT equipment that combines printing, scanning, copying, faxing or voice messaging functionality in the

	one device. These devices are often designed to connect to computer and telephone networks simultaneously.
need-to-know	The principle of restricting an individual's access to only the data they require to fulfil the duties of their role.
network access control	Security policies used to control access to a network and actions on a network. This can include authentication checks and authorisation controls.
network device	ICT equipment designed to facilitate the communication of data.
network infrastructure	The infrastructure used to carry data between workstations and servers or other network devices.
non-interactive authentication	Authentication between systems or services that does not involve the interaction of a person.
non-repudiation	Providing proof that a user performed an action, and in doing so preventing a user from denying that they did so.
non-volatile flash memory media	A specific type of electrically erasable programmable read-only memory.
non-volatile media	A type of media which retains its data when power is removed.
off-hook audio protection	A method of mitigating the possibility of an active handset inadvertently allowing background discussions to be heard by a remote party. This can be achieved through the use of a hold feature, mute feature, push-to-talk handset or equivalent.
online services	Services using the internet such as social media, online collaboration tools, web browsing, instant messaging, IP telephony, video conferencing, file sharing websites and peer-to-peer applications.
OpenPGP Message Format	An open-source implementation of Pretty Good Privacy, a widely available cryptographic toolkit.
passphrase	A sequence of words used for authentication.
passphrase complexity	The use of at least three of the following character sets in passphrases: lower-case alphabetical characters (a-z),

	upper-case alphabetical characters (A-Z), numeric characters (0-9) or special characters.
password	A sequence of characters used for authentication.
patch	A piece of software designed to remedy security vulnerabilities, or improve the usability or performance of software and ICT equipment.
patch cable	A metallic (copper) or fibre-optic cable used for routing signals between two components in an enclosed container or rack.
patch panel	A group of sockets or connectors that allow manual configuration changes, generally by means of connecting patch cables.
penetration test	A penetration test is designed to exercise real-world scenarios in an attempt to achieve a specific goal, such as compromising critical systems or data.
Perfect Forward Secrecy	Additional security for security associations ensuring that if one security association is compromised subsequent security associations will not be compromised.
peripheral switch	A device used to share a set of peripherals between multiple computers. For example, a keyboard, video monitor and mouse.
plan of action and milestones	A document that describes security vulnerabilities in a system and the plans for their rectification.
position of trust	A position that involves duties that require a higher level of assurance than that provided by normal employment screening. In some organisations additional screening may be required. Positions of trust can include, but are not limited to, an organisation's Chief Information Security Officer and their delegates, system administrators or privileged users.
privileged accounts	Privileged accounts include privileged user accounts and privileged service accounts.
privileged operating environments	Privileged operating environments are those used exclusively for administrative activities.

privileged user	A user who can alter or circumvent a system's security controls. This can also apply to users who could have only limited privileges, such as software developers, who can still bypass security controls. A privileged user can have the capability to modify system configurations, account privileges, audit logs and security configurations for applications.
product	A generic term used to describe software or hardware.
PROTECTED area	An area that has been authorised to process, store or communicate PROTECTED data. Such areas are not necessarily tied to a specific level of security zone.
Protection Profile	A document that stipulates the security functionality that must be included in Common Criteria evaluation to meet a range of defined threats. Protection Profiles also define the activities to be taken to assess the security function of an evaluated product.
protective marking	An administrative label assigned to data that not only shows the value of the data but also defines the level of protection to be provided.
public data	Data that has been formally authorised for release into the public domain.
public network infrastructure	Network infrastructure that an organisation has no control over (e.g. the internet).
Public Switched Telephone Network	Public network infrastructure used for voice communications.
push-to-talk handsets	Handsets that have a button which is pressed by the user before audio can be communicated, thus providing off-hook audio protection.
quality of service	The ability to provide different priorities to different applications, users or data flows, or to guarantee a certain level of performance to a data flow.
Radio Frequency transmitter	A device designed to transmit electromagnetic radiation as part of a radio communication system.
reclassification	An administrative decision to change the security controls used to protect data based on a reassessment of the potential impact of its unauthorised disclosure. The lowering of the security controls for media

containing sensitive or classified data often requires sanitisation or destruction processes to be undertaken prior to a formal decision to lower the security controls protecting the data.

Releasable To data	Data not to be passed to, or accessed by, foreign nationals beyond those belonging to specific nations which the data has been authorised for release to.
remote access	Access to a system that originates from outside an organisation's network and enters the network through a gateway, including over the internet.
removable media	Storage media that can be easily removed from a system and is designed for removal (e.g. Universal Serial Bus flash drives or optical media).
seconded foreign national	A representative of a foreign government on exchange or long-term posting.
SECRET area	An area that has been authorised to process, store or communicate SECRET data. Such areas are not necessarily tied to a specific level of security zone.
secured space	An area certified to the physical security requirements for a Security Zone Two to Security Zone Five area, as defined in the Attorney-General's Department's Protective Security Policy Framework , Entity facilities policy, to allow for the processing or storage of sensitive or classified data.
Secure/Multipurpose Internet Mail Extension	A protocol which allows the encryption and signing of email messages.
Secure Shell	A network protocol that can be used to securely log into, execute commands on, and transfer files between remote workstations and servers.
security assessment	An activity undertaken to assess security controls for a system and its environment to determine if they have been implemented correctly and are operating as intended.
security assessment report	A document that describes that outcomes of a security assessment and contributes to the development of a plan of action and milestones.

security association	A collection of connection-specific parameters used for IPsec connections.
security association lifetime	The duration a security association is valid for.
Security Construction and Equipment Committee	An Australian Government interdepartmental committee responsible for the evaluation and endorsement of security equipment and services. The committee is chaired by the Australian Security Intelligence Organisation.
security documentation	An organisation's cyber security strategy; system-specific security documentation; and any supporting policies, processes, procedures and registers.
security domain	A system or collection of systems operating under a consistent security policy that defines the classification, releasability and special handling caveats for data processed within the domain.
security posture	The level of security risk to which a system is exposed. A system with a strong security posture is exposed to a low level of security risk while a system with a weak security posture is exposed to a high level of security risk.
security risk	Any event that could result in the compromise, loss of integrity or unavailability of data or resources, or deliberate harm to people measured in terms of its likelihood and consequences.
security risk appetite	Statements that communicate the expectations of an organisation's senior management about the organisation's security risk tolerance. These criteria help an organisation identify security risk and prepare appropriate treatments and provide a benchmark against which the success of mitigations can be measured.
security risk management	The process of identifying, assessing and taking steps to reduce security risks to an acceptable level.
security target	An artefact of Common Criteria evaluations that specifies conformance claims, threats and assumptions, security objectives, and security requirements for an evaluated product.
security vulnerability	A weakness in a system's security requirements, design, implementation or operation that could be accidentally

	triggered or intentionally exploited and result in a violation of the system's security policy.
sensitive data	Data that would cause limited damage to the national interest, organisations or individuals if compromised.
server	A computer that provides services to users or other systems. For example, a file server, email server or database server.
shared facility	Where an organisation's facility resides within a larger facility that is shared with one or more different organisations.
shared responsibility model	A framework that describes the management and operational responsibilities between different parties for a system. Where responsibilities relating to specific security controls are shared between multiple parties, enough detail is documented to provide clear demarcation between the parties.
softphone	An application that allows a workstation to act as a phone using a built-in or externally-connected microphone and speaker.
software	An element of a system including, but not limited to, an application or operating system.
solid state drive	Non-volatile media that uses non-volatile flash memory media to retain its data when power is removed and, unlike non-volatile magnetic media, contains no moving parts.
split tunnelling	Functionality that allows personnel to access both public network infrastructure and a Virtual Private Network connection at the same time, such as an organisation's system and the internet.
Standard Operating Environment	A standardised build of an operating system and associated software that can be used for servers, workstations, laptops and mobile devices.
Standard Operating Procedure	Instructions for following a defined set of activities in a specific manner. For example, an approved data transfer process.

standard user	A user who can, with their normal privileges, make only limited changes to a system and generally cannot bypass security controls.
system	A related set of hardware and software used for the processing, storage or communication of data and the governance framework in which it operates.
system owner	The executive responsible for a system.
system classification	The classification of a system is the highest classification of data which the system is authorised to store, process or communicate.
system security plan	A document that describes a system and its associated security controls.
system-specific security documentation	A system's system security plan, incident response plan, continuous monitoring plan, security assessment report, and plan of action and milestones.
telemetry	The automatic measurement and transmission of data collected from remote sources. Such data is often used within systems to measure the use, performance and health of one or more functions or devices that make up the system.
telephone	A device that is used for point-to-point communication over a distance. This includes digital and IP telephony.
telephone system	A system designed primarily for the transmission of voice communications.
TOP SECRET area	An area that has been authorised to process, store or communicate TOP SECRET data. Such areas are not necessarily tied to a specific level of security zone.
traffic flow filter	A device that has been configured to automatically filter and control the flow of data.
Transfer Cross Domain Solution	A system that facilitates the transfer of data, in one or multiple directions (low to high or high to low), between different security domains.
transport mode	An IPsec mode that provides a secure connection between two endpoints by encapsulating an IP payload.

trusted source	A person or system formally identified as being capable of reliably producing data meeting certain defined parameters, such as a maximum data classification and reliably reviewing data produced by others to confirm compliance with certain defined parameters.
tunnel mode	An IPsec mode that provides a secure connection between two endpoints by encapsulating an entire IP packet.
unprivileged accounts	Unprivileged accounts include unprivileged user accounts and unprivileged service accounts.
unprivileged operating environments	Unprivileged operating environments are those used for non-administrative activities, such as reading emails and browsing the web.
unsecured space	An area not been certified to the physical security requirements for a Security Zone Two to Security Zone Five area, as defined in the Attorney-General's Department's Protective Security Policy Framework , Entity facilities policy, to allow for the processing or storage of sensitive or classified data.
user	An individual that is authorised to access a system.
validation	Confirmation (through the provision of strong, sound, objective evidence) that requirements for a specific intended use or application have been fulfilled.
verification	Confirmation, through the provision of objective evidence, that specified requirements have been fulfilled.
Virtual Local Area Network	Network devices and ICT equipment grouped logically based on resources, security or business requirements instead of their physical location.
Virtual Private Network	A network that maintains privacy through a tunnelling protocol and security procedures. Virtual Private Networks may use encryption to protect traffic.
virtualisation	Simulation of a hardware platform, operating system, application, storage device or network resource.
volatile media	A type of media, such as random-access memory, which gradually loses its data when power is removed.

vulnerability assessment	A vulnerability assessment can consist of a documentation-based review of a system's design, an in-depth hands-on assessment or automated scanning with software tools. In each case, the goal is to identify as many security vulnerabilities as possible.
vulnerability management	Vulnerability management assists in identifying, prioritising and responding to security vulnerabilities.
wear levelling	A technique used in non-volatile flash memory media to prolong the life of the media. As data can be written to and erased from memory blocks a finite number of times, wear-levelling helps to distribute writes evenly across each memory block, thereby decreasing wear and increasing its lifetime.
Wi-Fi Protected Access	A protocol designed for communicating data over wireless networks.
Wi-Fi Protected Access 2	A protocol designed to replace the Wi-Fi Protected Access protocol for communicating data over wireless networks.
Wi-Fi Protected Access 3	A protocol designed to replace the WPA2 protocol for communicating data over wireless networks.
wireless access point	A device which enables communications between wireless clients. It is typically also the device which connects wired and wireless networks.
wireless communications	The transmission of data over a communications path using electromagnetic waves rather than a wired medium.
wireless network	A network based on the 802.11 standards.
workstation	A stand-alone or networked single-user computer.
X11 Forwarding	X11, also known as the X Window System, is a basic method of video display used in a variety of operating systems. X11 Forwarding allows the video display from one device to be shown on another device.