Australian Government Information Security Manual

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Cyber security framework

Using the cyber security guidelines

Purpose

The purpose of this document is to assist organisations in using their risk management framework to protect their information and systems from cyber threats. While there are other standards and guidelines designed to protect information and systems, the advice in this document is based on the experience of the Australian Cyber Security Centre (ACSC) within the Australian Signals Directorate (ASD).

Authority

Paragraph (1)(ca) of section 7 of the **Intelligence Services Act 2001** states that one of ASD's designated functions is:

to provide material, advice and other assistance to any person or body mentioned in subsection (2) on matters relating to the security and integrity of information that is processed, stored or communicated by electronic or similar means

Furthermore, subsection (2) of section 7 of the **Intelligence Services Act 2001** states:

For the purposes of paragraph (1)(ca), material, advice and other assistance may be provided to the following:

(a) a Commonwealth authority;

(b) a State authority;

(c) a foreign person or entity;

(d) any other person or body if:

> *(i) the material, advice and other assistance are provided for the purpose of protecting or facilitating trade and commerce with other countries, among the States, between Territories or between a Territory and a State, or outside Australia; or*

> *(ii) the material, advice and other assistance are provided by way of a postal, telegraphic, telephonic or other like service (within the meaning of paragraph 51(v) of the Constitution); or*

> *(iii) the information was obtained or generated in the operation of a postal, telegraphic, telephone or other like service (within the meaning of paragraph 51(v) of the Constitution).*

This document represents the considered advice of the ACSC provided in accordance with ASD's designated functions.

Intended audience

This document is intended for Chief Information Security Officers, Chief Information Officers, cyber security professionals and information technology managers. As such, this document discusses both governance and technical concepts in order to support the protection of organisations' information and systems.

The ACSC provides further cyber security advice in the form of hardening guides, consumer guides, Australian Communications Security Instructions, and other PROTECT and ALERT publications. In these cases, device and application-specific advice may take precedence over the security controls in this document.

Risk management considerations

This document is not a compliance-based standard. Rather, organisations are encouraged to consider security risks discussed in this document and apply security controls where appropriate within a risk management framework in accordance with their business requirements and threat environment.

Legislation and legal considerations

Organisations are not required as a matter of law to comply with this document, unless legislation, or a direction given under legislation or by some other lawful authority, compels them to comply.

This document does not override any obligations imposed by legislation or law. Furthermore, if this document conflicts with legislation or law, the latter takes precedence.

While this document contains examples of when legislation or laws may be relevant for organisations, there is no comprehensive consideration of such issues.

Applicability of security controls

Each security control in this document has an applicability marking that indicates the information, systems and/or areas that it is applicable to. These applicability markings are based on protective markings from the Attorney-General's Department (AGD)'s *Protective Security Policy Framework* (PSPF):

- O: OFFICIAL (including OFFICIAL: Sensitive)
- P: PROTECTED
- S: SECRET
- TS: TOP SECRET.

Organisations that do not handle government information can implement security controls marked as OFFICIAL for a baseline level of protection, or those marked as PROTECTED for an increased level of protection.

Further information

Further information on the use of protective markings can be found in AGD's PSPF, *Sensitive and classified information* policy, at https://www.protectivesecurity.gov.au/information/sensitive-classified-information/.

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

- Department of Finance, *Commonwealth Risk Management Policy*, at https://www.finance.gov.au/comcover/risk-management/the-commonwealth-risk-management-policy/
- AGD's PSPF, *Security planning and risk management* policy, at https://www.protectivesecurity.gov.au/governance/security-planning-risk-management/
- International Organization for Standardization (ISO) 31000:2018, *Risk management – Guidelines*, at https://www.iso.org/standard/65694.html
- ISO Guide 73:2009, *Risk management – Vocabulary*, at https://www.iso.org/standard/44651.html
- International Electrotechnical Commission 31010:2009, *Risk management – Risk assessment techniques*, at https://www.iso.org/standard/51073.html
- ISO 27005:2018, *Information technology – Security techniques – Information security risk management*, at https://www.iso.org/standard/75281.html
- National Institute of Standards and Technology (NIST) Special Publication (SP) 800-30 Rev. 1, *Guide for Conducting Risk Assessments*, at https://csrc.nist.gov/publications/detail/sp/800-30/rev-1/final

- NIST SP 800-37 Rev. 2, *Risk Management Framework for Information Systems and Organizations: A System Life Cycle Approach for Security and Privacy*, at https://csrc.nist.gov/publications/detail/sp/800-37/rev-2/final.

Guidelines for cyber security roles

Chief Information Security Officer

Cyber security leadership

To provide cyber security leadership within organisations, it is important that each organisation appoints a Chief Information Security Officer (CISO).

Security Control: 0714; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A CISO is appointed to provide cyber security leadership for their organisation.

Responsibilities

The CISO within an organisation is typically responsible for providing strategic-level guidance for their organisation's cyber security program and ensuring compliance with cyber security policy, standards, regulations and legislation. They are likely to work with, or report to, a Chief Security Officer who is responsible for the full breadth of security within their organisation.

Security Control: 1478; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The CISO provides strategic-level guidance for their organisation's cyber security program and ensures their organisation's compliance with cyber security policy, standards, regulations and legislation.

Further information

Further information on the duties of the CISO can be found in the *Guidelines for authorising systems*.

System owners

System ownership

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: O, P, S, TS; Priority: Must
Each system has a designated system owner.

Responsibilities

System owners are responsible for obtaining authorisation to operate each of their systems.

Security Control: 1525; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
System owners register each system with the system's authorising officer.

Security Control: 0027; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
System owners obtain authorisation to operate each system from the system's authorising officer.

Security Control: 1526; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
System owners monitor security risks and the effectiveness of security controls for each system.

Further information

Further information on authorising officers and obtaining authorisation to operate systems can be found in the *Guidelines for authorising systems*.

Further information on change management processes can be found in the *Change management* section of the *Guidelines for system management*.

Further information on monitoring systems and their operating environments can be found in the *Guidelines for system monitoring*.

Guidelines for authorising systems

Authorising systems

Authorising officers

For TOP SECRET systems the authorising officer is Director-General Australian Signals Directorate (ASD), or their delegate.

For SECRET and below systems the authorising officer should be an organisation's Chief Information Security Officer (CISO), or their delegate. Alternatively, an organisation's Chief Security Officer (CSO), or their delegate, may be used.

For systems that process, store or communicate sensitive compartmented information the authorising officer is Director-General ASD, 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. Alternatively, an organisation's CSO, or their delegate, may be used.

In all cases, the authorising officer should have an appropriate level of seniority and understanding of security risks they are accepting on behalf of the organisation.

Authorising systems to operate

Before a system is authorised to operate, an authorising officer formally accepts the security risks associated with its operation. In some cases however, security risks may be inadequately identified and/or security controls may be inadequately implemented. In such cases, the authorising officer may request further work be undertaken by the system owner. In the intervening time, the authorising officer may choose to authorise a system to operate for an interim period with caveats placed on its use.

Security Control: 0064; Revision: 7; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Security risks associated with the operation of a system are determined by a security assessment, and formally accepted by an authorising officer, before the system is authorised to operate.

Ongoing security risk management and monitoring

Regular monitoring of cyber threats, security risks and security controls associated with a system is beneficial in maintaining the security posture of the system; however, specific events may necessitate the system undergoing another security assessment before being authorised to continue operating. These may include:

- changes in security policies relating to the system
- detection of new or emerging cyber threats to the system
- 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.

Security Control: 0809; Revision: 3; Updated: Jan-19; Applicability: O, P, S, TS; Priority: Must
When a change to a system or its environment impacts the security posture of the system, security risks associated with the operation of the system are determined by a security assessment, and formally accepted by an authorising officer, before the system is authorised to continue operating.

Conducting security assessments

Assessors

Security assessments for TOP SECRET systems can be undertaken by Australian Cyber Security Centre (ACSC) assessors or Information Security Registered Assessors Program (IRAP) assessors.

Security assessments for SECRET and below systems can be undertaken by an organisation's own assessors or IRAP assessors.

In all cases, assessors should hold an appropriate security clearance and have an appropriate level of experience and understanding of the security controls and security risks they are assessing.

Security assessments

The purpose of a security assessment is to determine whether security controls for a system have been appropriately identified, implemented and are operating effectively. In conducting a security assessment, it is important that the system owner is aware of the extent of any testing that assessors may undertake in order to manage any risks associated with such activities.

When an assessor is engaged early in a system's development lifecycle, it may be beneficial to perform the security assessment in two phases. Initially to assess the selection and documentation of security controls for the system, and subsequently to assess their implementation. This allows for the identification of security risks earlier in the system's development lifecycle, thereby assisting to reduce the costs associated with any remediation activities.

Security Control: 0904; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Prior to the beginning of a security assessment, the system owner develops a Statement of Applicability (SoA) for their system which identifies the security controls that they have chosen to implement.

Security Control: 1531; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Prior to the beginning of a security assessment, a test plan is developed by assessors in consultation with the system owner.

Security Control: 0805; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
During a security assessment, the system is reviewed by assessors to determine whether security controls in the SoA are appropriate and have been implemented and are operating effectively.

Security Control: 1140; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
At the conclusion of a security assessment, a security assessment report is produced outlining the effectiveness of the implementation of security controls, the system's strengths and weaknesses, any recommended remediation activities, and an assessment of security risks associated with the operation of the system.

Gateway and cloud services

Commercial and government gateway and cloud services selected by the ACSC will need to undergo regular security assessments to determine their security posture and security risks associated with their use.

Security Control: 0100; Revision: 8; Updated: Sep-18; Applicability: O, P; Priority: Must
Commercial and government gateway and cloud services selected by the ACSC undergo a joint security assessment by ACSC and IRAP assessors at least every two years.

Further information

The IRAP website lists the range of activities IRAP assessors are authorised to perform. This information is available at https://www.cyber.gov.au/programs/information-security-registered-assessors-program-irap.

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.

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 (IP) 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.
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.

In addition, logs created by various security tools and appliances such as antivirus software, content filters and host-based or network-based intrusion detection or intrusion prevention systems can be captured and correlated alongside other data sources.

Finally, many potential cyber security incidents are noticed by personnel rather than software tools. As such, successful detection of cyber security incidents is often based around trained cyber security personnel with access to sufficient data sources complemented by tools supporting both manual and automated analysis.

Security Control: 0576; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
An intrusion detection and prevention strategy is developed and implemented that includes:

- *network-based intrusion detection and prevention*
- *procedures and resources for maintaining detection signatures*
- *procedures and resources for the analysis of event logs and real-time alerts*
- *procedures and resources for responding to detected cyber security incidents*
- *the frequency for review of intrusion detection and prevention procedures and resourcing.*

Security Control: 0120; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Cyber security personnel have access to sufficient data sources and tools to ensure that any security alerts generated by systems are investigated and that systems and data sources are able to be searched for key indicators of compromise including but not limited to IP addresses, domains and file hashes.

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***.

Managing cyber security incidents

Recording cyber security incidents

The purpose of recording cyber security incidents in a register is to highlight their type and frequency so that corrective action can be taken. This information, along with information on the costs of any remediation activities, can also be used as an input to future security risk assessments.

Security Control: 0125; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Cyber security incidents are recorded in a register with the following information:

- *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 information owners and restrict access to the information. In doing so, affected systems can be powered off, have their network connectivity removed or have additional access controls applied to the information. It should be noted though that powering off systems could destroy information 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 information.

Security Control: 0133; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When a data spill occurs, information owners are advised and access to the information 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 further. Once isolated, infected systems and media can be scanned by antivirus software to potentially remove the infection. It is important to note though, a complete operating system restoration from a known good backup or reinstallation is the only reliable way to ensure that malicious code can be truly eradicated.

Security Control: 0917; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
When malicious code is detected, the following steps are taken to handle the infection:

- *the infected system is isolated*
- *all previously connected systems, including any 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 possible, any previously infected system is restored from a known good backup or rebuilt.*

Allowing targeted cyber intrusions to continue

When a targeted cyber intrusion is detected, organisations may wish to allow the intrusion to continue for a short period of time in order to understand its extent. Organisations allowing a targeted cyber intrusion to continue on a system should establish with their legal advisors whether the actions are breaching the ***Telecommunications (Interception and Access) Act 1979***.

Security Control: 0137; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Legal advice is sought before allowing targeted cyber intrusion activity to continue on a system for the purpose of collecting further information or evidence.

Post-incident analysis

Post-incident analysis after a targeted cyber intrusion can assist in determining whether an adversary has been removed from a system. This can be achieved, in part, by conducting a full network traffic capture for at least seven days. Organisations should then be able to identify anomalous behaviour that may indicate whether the adversary has persisted on the system or not.

Security Control: 1213; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Post-incident analysis is performed for successful targeted cyber intrusions; this includes storing full network traffic for at least seven days after a targeted cyber intrusion.

Integrity of evidence

When gathering evidence following any form of cyber security incident, it is important that its integrity is maintained. Even though an investigation may not directly lead to a law enforcement agency 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 in investigations, the ACSC requests that no actions which could affect the integrity of evidence be carried out before the ACSC becomes involved.

Security Control: 0138; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The integrity of evidence gathered during an investigation is maintained by investigators recording all of their actions and ensuring raw audit trails are copied onto media for archiving.

Further information

Further information on documenting cyber security incident responsibilities and procedures 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*.

Reporting cyber security incidents

Reporting cyber security incidents

Reporting cyber security incidents 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 damage to systems and their organisation, and to take remedial action if necessary, including seeking advice from the ACSC.

Security Control: 0123; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When organisations use outsourced information technology or cloud services, their service providers report all cyber security incidents to the organisation's CISO, or one of their delegates, as soon as possible after they occur or are discovered.

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 or 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.

Security Control: 0140; Revision: 6; Updated: May-19; Applicability: O, P, S, TS; Priority: Must
Cyber security incidents are reported to the ACSC.

Further information

Further information on reporting cyber security incidents to the ACSC is available at https://www.cyber.gov.au/report.

Guidelines for outsourcing

Information technology and cloud services

Information technology services

Information technology services encompass business process services, application processes and infrastructure services. The range of information technology services that can be outsourced is extensive.

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.

Authorising the use of outsourced information technology and cloud services

Outsourced information technology and cloud services can be used as long as an authorising officer formally accepts security risks associated with the operation of the outsourced service and authorises its use.

Using outsourced information technology and cloud services

Outsourcing can be a cost-effective option for providing information technology and cloud services, as well as potentially delivering a superior service; however, it can also affect an organisation's security risk profile. A risk assessment can assist in identifying and managing jurisdictional, governance, privacy and security risks associated with the use of such services. The use of gateways or cloud services listed on the Australian Cyber Security Centre (ACSC)'s list of certified gateways or the ACSC's *Certified Cloud Services List* can also assist in managing such risks. However, organisations will still need to decide whether a particular outsourced information technology or cloud service represents an acceptable risk and, if appropriate to do so, authorise it for their own use.

Security Control: 1395; Revision: 2; Updated: Sep-18; Applicability: O, P; Priority: Must
*If using outsourced cloud services, only those listed on the ACSC's **Certified Cloud Services List** are used.*

Security Control: 1529; Revision: 0; Updated: Sep-18; Applicability: S, TS; Priority: Must
If using outsourced cloud services for highly classified information, public clouds are not used.

Security Control: 1396; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
*If using an outsourced cloud service not listed on the ACSC's **Certified Cloud Services List**, or for highly classified information, the ACSC is notified in writing at the earliest opportunity, and certainly before entering into or renewing a contract.*

Foreign owned service providers and offshore services

Outsourced information technology or cloud services located offshore may be subject to lawful and covert collection, without an organisation's 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.

Security Control: 0873; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
*If using an outsourced information technology service, or cloud service not listed on the ACSC's **Certified Cloud Services List**, a service provider whose systems are located in Australia is used.*

Contractual arrangements

Obligations for protecting information are no different when using an outsourced information technology or cloud service than using an in-house service. As such, the contract or service agreement between an organisation and a service provider should address mitigations to security risks. Otherwise, an organisation only has service provider promises that can be hard to verify and may be unenforceable.

Security Control: 0072; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Any security controls associated with the protection of information entrusted to a service provider are documented in contract provisions, a memorandum of understanding or an equivalent formal agreement between parties.

Security Control: 1073; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
An organisation's systems and information are not accessed or administered by a service provider from outside Australian borders unless a contractual arrangement exists between the organisation and the service provider to do so.

Data ownership

Although data ownership resides with an organisation, 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 explicitly retain ownership of their data through contract provisions.

Security Control: 1451; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
When entering into a contractual arrangement for outsourced information technology or cloud services, contractual ownership over an organisation's data is explicitly retained.

Supply chain integrity

Organisations should determine whether measures need to be taken to mitigate the cyber threats arising from potential supply chain exploitation. In doing so, they should consider security risks that arise as systems and software are being built and delivered, as well as the degree of security risk that a particular supplier may introduce into the delivery of a contracted service. The globalised nature of information technology increases the difficulty in evaluating supply chain integrity. Adopting a risk-based approach will assist in circumstances where organisations are not able to acquire all the information necessary to do a complete security risk assessment.

Security Control: 1452; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
A review of suppliers, including their country of origin, is performed before obtaining software, hardware or services to assess the potential increase to an organisation's security risk profile.

Further information

Further information on authorising the use of outsourced information technology and cloud services can be found in the *Guidelines for authorising systems*.

Further information on the definition of cloud computing can be found in NIST SP 800-145, *The NIST Definition of Cloud Computing*, at https://csrc.nist.gov/publications/detail/sp/800-145/final.

The ACSC's list of certified gateways is available at https://www.acsc.gov.au/infosec/irap/asd_certified_gateways.htm.

The ACSC's *Certified Cloud Services List* is available at https://www.acsc.gov.au/infosec/irap/certified_clouds.htm.

The whole-of-government policy on secure cloud computing can be found in the Digital Transformation Agency's *Secure Cloud Strategy* publication at https://www.dta.gov.au/our-projects/secure-cloud-strategy.

Further information on outsourced information technology and cloud services can be found in the Attorney-General's Department's *Protective Security Policy Framework*, *Security governance for contracted goods and service*

providers policy, at https://www.protectivesecurity.gov.au/governance/security-governance-for-contracted-service-providers/.

Further information on the ACSC's Managed Service Provider Partner Program can be found at https://www.cyber.gov.au/programs/msp-partner-program.

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*, at https://csrc.nist.gov/publications/detail/sp/800-161/final.

Guidelines for security documentation

Development and maintenance of security documentation

Security documentation

Security documentation supports the accurate and consistent application of security policies and procedures. It is important that security documentation is developed by personnel with a good understanding of security matters, the technologies being used and the business requirements of the organisation and system owners.

The System Security Plan (SSP), Standard Operating Procedures (SOPs) and Incident Response Plan (IRP) form a documentation suite for a system, it is essential that they are logically connected and consistent. Furthermore, it is important that security documentation for systems are logically connected to organisational-level security documentation such as a cyber security strategy.

Security documentation may be presented in a number of formats including dynamic content such as wikis, intranets or other forms of document repositories.

Security Control: 0039; Revision: 4; Updated: May-19; Applicability: O, P, S, TS; Priority: Must
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 security policies and procedures are in place. Having approval not only assists in the implementation of security policies and procedures, it also ensures personnel are aware of cyber security issues and security risks. As such, it is important that once security documentation has been approved it is published and communicated to all personnel.

Security Control: 0047; Revision: 4; Updated: May-19; Applicability: O, P, S, TS; Priority: Should
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, security controls and processes may cease to be effective. In such a situation, resources could be devoted to areas that have reduced effectiveness or are no longer relevant.

Security Control: 0888; Revision: 5; Updated: May-19; Applicability: O, P, S, TS; Priority: Should
Security documentation is reviewed at least annually and includes a 'current as at [date]' or equivalent statement.

System-specific security documentation

System Security Plan

An SSP describes the system, its system boundary and the security controls that have been implemented. It is developed by selecting relevant security controls from this document based on its classification, functionality and the technologies it is implementing with additional security controls included based on security risks identified during a security risk assessment.

There can be many stakeholders involved in defining a system's SSP. 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

- owners of information to be processed, stored or communicated by the system

- users for whom the capability is being developed.

Depending on the documentation framework used, some details common to multiple systems could be consolidated in a higher-level SSP.

Security Control: 0041; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Systems have a SSP that includes security controls from this document based on its classification, functionality and the technologies it is implementing with additional security controls included based on security risks identified during a security risk assessment.

Standard Operating Procedures

SOPs provide a step-by-step guide to undertaking security related tasks. They provide assurance that tasks can be undertaken in a repeatable manner, even by users without detailed knowledge of a system.

Depending on the documentation framework used, some details common to multiple systems could be consolidated into a higher-level SOP.

Security Control: 0042; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Systems have SOPs that cover the following:

- *system administration and maintenance activities, such as managing backups and user accounts*

- *software and hardware configuration changes, such as patches, updates and upgrades*

- *the acquisition, support and disposal of assets*

- *the labelling, registering and mustering of assets.*

Incident Response Plan

Having an IRP 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 information or services, and preserve any evidence.

Depending on the documentation framework used, some details common to multiple systems could be consolidated into a higher-level IRP.

Security Control: 0043; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Systems have an IRP that covers the following:

- *guidelines on what constitutes a cyber security incident*

- *the types of incidents likely to be encountered and the expected response to each type*

- *how to report cyber security incidents, internally to the organisation and externally to the Australian Cyber Security Centre (ACSC)*

- *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 ACSC 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.*

Further information

Further information on detecting, managing and reporting cyber security incidents can be found in the *Guidelines for cyber security incidents*.

Guidelines for physical security

Facilities and systems

Certification and accreditation authorities

Information on the certification and accreditation authorities for physical security are outlined in the Attorney-General's Department (AGD)'s **Protective Security Policy Framework** (PSPF), **Entity facilities** policy.

Facilities containing systems

The application of defence-in-depth to the protection of systems is enhanced through the use of successive layers of physical security. The first layer of security is the use of Security Zones for a facility.

Deployable platforms should meet physical security certification and accreditation requirements as per any other system. Physical security certification authorities dealing with deployable platforms can have specific requirements that supersede the security controls in this document and, as such, personnel should contact their appropriate physical security certification authority to seek guidance.

In the case of deployable platforms, physical security requirements may also include perimeter controls, building standards and manning levels.

Security Control: 0810; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Any facility containing a system, including a deployable system, is certified and accredited to at least the sensitivity or classification of the system.

Server rooms, communications rooms and security containers

The second layer in the protection of systems is the use of a higher Security Zone or secure room for a server room or communications room while the final layer is the use of lockable commercial cabinets or security containers. All layers are designed to limit access to people without the appropriate authorisation to access systems at a facility.

Security Control: 1053; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Servers and network devices are secured in server rooms or communications rooms that meet the requirements for a Security Zone or secure room suitable for their sensitivity or classification.

Security Control: 1530; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Servers and network devices are secured in lockable commercial cabinets or security containers suitable for their sensitivity or classification taking into account protection afforded by the Security Zone or secure room they reside in.

Security Control: 0813; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Server rooms, communications rooms and security containers are not left in unsecured states.

Security Control: 1074; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Keys or equivalent access mechanisms to server rooms, communications rooms and security containers are appropriately controlled.

Network infrastructure

While physical security can provide a degree of protection to information communicated over network infrastructure, organisations can have reduced control over information when it is communicated over network infrastructure in areas not authorised for the processing of such information. For this reason, it is important that information communicated over network infrastructure outside of areas in which it is authorised to be processed is appropriately encrypted.

Security Control: 0157; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Information communicated over network infrastructure in areas not authorised for the processing of such information is encrypted as if it was communicated through unsecured spaces.

Controlling physical access to network devices

Adequate physical protection should be provided to network devices, especially those in public areas, to prevent an adversary physically damaging a network device with the intention of interrupting services.

Physical access to network devices can also allow an adversary to reset devices to factory default settings by pressing a physical reset button, connecting a serial interface to a device or connecting directly to a device to bypass any access controls. Resetting a network device to factory default settings may disable security settings on the device including authentication and encryption functions as well as resetting administrator accounts and passwords to known defaults. Even if access to a network device is not gained by resetting it, it is highly likely a denial of service will occur.

Physical access to network devices can be restricted through methods such as physical enclosures that prevent access to console ports and factory reset buttons, mounting devices on ceilings or behind walls, or placing devices in locked rooms or cabinets.

Security Control: 1296; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Physical security controls are implemented to protect network devices, especially those in public areas, from physical damage or unauthorised access.

Preventing observation by unauthorised people

The inside of facilities without sufficient perimeter security are often exposed to observation through windows. Ensuring systems and information are not visible through windows will assist in reducing this security risk. This can be achieved by using blinds or curtains on windows.

Security Control: 0164; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Unauthorised people are prevented from observing systems, in particular, workstation displays and keyboards.

Further information

Further information on encryption can be found in the ***Guidelines for using cryptography***.

Further information on physical security for Security Zones, secure rooms and security containers can be found in AGD's PSPF, ***Entity facilities*** policy, at https://www.protectivesecurity.gov.au/physical/entity-facilities/.

ICT equipment and media

Accounting for ICT equipment and media

Maintaining and regularly auditing an inventory of authorised ICT equipment and media can assist organisations in both tracking legitimate assets and determining whether unauthorised assets have been introduced into a system or its operating environment.

Security Control: 0336; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
All ICT equipment and media are registered with a unique identifier in an appropriate register.

Security Control: 0159; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
All ICT equipment and media are accounted for on a regular basis.

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 information 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: O, P, S, TS; Priority: Must
ICT equipment and media are secured when not in use.

Further information

Further information on ICT equipment and media can be found in the *Fax machines and multifunction devices* section of the *Guidelines for communications systems* as well as in the *Guidelines for ICT equipment management* and *Guidelines for media management*.

Further information on the encryption of media can be found in the *Guidelines for using cryptography*.

Further information on the storage of ICT equipment can be found in AGD's PSPF, *Physical security for entity resources* policy, at https://www.protectivesecurity.gov.au/physical/physical-security-entity-resources/.

Wireless devices and Radio Frequency transmitters

Radio Frequency devices

Many RF devices, such as mobile devices, can pose a security risk to organisations when they are capable of picking up and recording or transmitting background conversations. In highly classified environments, it is important that organisations understand the security risks associated with the introduction of RF devices and should maintain a register of those that have been authorised for use in such environments.

Security Control: 1543; Revision: 0; Updated: Apr-19; Applicability: S, TS; Priority: Should
A register is maintained of authorised RF devices that can be used in SECRET and TOP SECRET areas.

Security Control: 0225; Revision: 2; Updated: Sep-18; Applicability: S, TS; Priority: Must
Unauthorised RF devices are not brought into SECRET and TOP SECRET areas.

Security Control: 0829; Revision: 4; Updated: Mar-19; Applicability: S, TS; Priority: Should
Security measures are used to detect and respond to unauthorised RF devices in SECRET and TOP SECRET areas.

Bluetooth and wireless keyboards

While there have been a number of revisions to the Bluetooth protocol that have made incremental improvements to its security over time, there have also been trade-offs that have limited these improvements, such as maintaining

backward compatibility with earlier versions of the protocol. While newer versions of the Bluetooth protocol have addressed many of its historical weaknesses, it still provides inadequate security for the communication of sensitive or classified information. As such, sensitive or classification information communicated using Bluetooth will need to be limited to within RF screened buildings.

Security Control: 1058; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
Bluetooth and wireless keyboards are not used unless in an RF screened building.

Security Control: 1155; Revision: 1; Updated: Sep-18; Applicability: S, TS; Priority: Must
Bluetooth and wireless keyboards are not used unless in an RF screened building.

Infrared keyboards

When using infrared keyboards with SECRET systems, drawn curtains that block infrared transmissions are an acceptable method of protection.

When using infrared keyboards with a TOP SECRET system, windows with curtains that can be opened are not acceptable as a method of permanently blocking infrared transmissions.

Security Control: 0222; Revision: 2; Updated: Sep-18; Applicability: O, P; Priority: Should
When using infrared keyboards, infrared ports are positioned to prevent line of sight and reflected communications travelling into an unsecured space.

Security Control: 0223; Revision: 4; Updated: Sep-18; Applicability: S; Priority: Must
When using infrared keyboards, the following activities are prevented:

- *line of sight and reflected communications travelling into unsecured spaces*
- *multiple infrared keyboards for different systems being used in the same area*
- *other infrared devices being used in the same area*
- *infrared keyboards operating in areas with unprotected windows.*

Security Control: 0224; Revision: 4; Updated: Sep-18; Applicability: TS; Priority: Must
When using infrared keyboards, the following activities are prevented:

- *line of sight and reflected communications travelling into unsecured spaces*
- *multiple infrared keyboards for different systems being used in the same area*
- *other infrared devices being used in the same area*
- *infrared keyboards operating in areas with windows that have not had a permanent method of blocking infrared transmissions applied to them.*

Wireless RF pointing devices

As many wireless RF pointing devices used Bluetooth, they along with other wireless RF pointing devices can pose an unacceptable emanation security risk, unless used in an RF screened building.

Security Control: 0221; Revision: 2; Updated: Sep-18; Applicability: TS; Priority: Must
Wireless RF pointing devices are not used in TOP SECRET areas unless used in an RF screened building.

Further information

Further information on the use of mobile devices can be found in the ***Guidelines for enterprise mobility***.

Further information on the use of Bluetooth devices with mobile devices can be found in the ***Mobile device management*** section of the ***Guidelines for enterprise mobility***.

Further information on wireless networks can be found in the *Wireless networks* section of the *Guidelines for network management*.

Guidelines for personnel security

Cyber security awareness raising and training

Providing cyber security awareness raising and training

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

Security Control: 0252; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Ongoing cyber security awareness raising and training is provided to personnel and includes:

- *the purpose of the awareness raising and training program*

- *security appointments and contacts within the organisation*

- *the use and protection of systems, applications, media and information*

- *reporting of cyber security incidents and suspected compromises*

- *not to introduce or use unauthorised ICT equipment, media or applications with systems*

- *not to attempt to bypass, strain or test security controls on systems*

- *not to attempt to gain unauthorised access to systems, applications or information.*

Using online services

Organisations should ensure personnel know what constitutes suspicious contact and how to report such events. For example, questions regarding work duties or projects being undertaken by their organisation. In addition, socially engineered messages, such as those sent via email, instant messages and direct messaging on social media, are one of the most common techniques used to spread malicious code.

Security Control: 0817; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Personnel are advised what suspicious contact is and how to report it, especially when using online services.

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 collaboration tools or forums and on social media. Even information that appears to be benign in isolation, such as the Global Positioning System information in a picture, could, along with other information, have a considerable security impact. In addition, to ensure that personal opinions of individuals are not interpreted as official policy, personnel should maintain separate work and personal accounts for online services, especially when using social media.

Security Control: 0820; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Personnel are advised to not post work information to non-approved online services and to report cases where such information is posted.

Security Control: 1146; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Personnel are advised to maintain separate work and personal accounts for online services.

Posting personal information to online services

Personnel should be aware that any personal information they post to online services such as social media could be used to develop a detailed profile of their lifestyle and hobbies in order to attempt to build a trust relationship with them or others. This relationship could then be used to attempt to elicit information from them or to implant malicious code on systems (e.g. by having them open emails or visit websites with malicious content). Furthermore, encouraging personnel to use the privacy settings of online services can minimise who can view their interactions on such services.

Security Control: 0821; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Personnel are advised of security risks associated with posting personal information to online services and, where possible, to restrict access to only those they have authorised to view it.

Sending and receiving files via online services

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

Security Control: 0824; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Personnel are advised not to send or receive files via unauthorised online services.

Further information

Further information on email usage policies can be found in the *Email usage* section of the *Guidelines for email management*.

Further information on web usage policies can be found in the *Web content and connections* section of the *Guidelines for gateway management*.

Further information on detecting socially engineered messages be found in the Australian Cyber Security Centre's *Detecting Socially Engineered Messages* publication at https://www.cyber.gov.au/publications/detecting-socially-engineered-messages.

Access to systems and their resources

Security clearances

Where this document refers 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

Ensuring that the requirements for access to a system are documented and agreed upon helps determine if personnel have the appropriate authorisations, security clearances and need-to-know to access the system. Types of system accounts for which access requirements should be documented include standard users, privileged users, contractors and visitors.

Security Control: 0432; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Each system's System Security Plan specifies any authorisations, security clearances and briefings necessary for system access.

Security clearances and briefings

Security clearances and briefings provide assurance that personnel can be trusted with access to information that is processed, stored or communicated by a system.

Security Control: 0434; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Personnel undergo appropriate employment screening, and where necessary hold an appropriate security clearance, before being granted access to systems.

Security Control: 0435; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
All personnel receive any necessary briefings before being granted access to systems.

Standard access to systems

Personnel seeking access to systems should have a genuine business requirement verified by their manager. Once a requirement to access a system is established, personnel should be given only the privileges that they need to undertake their duties.

Security Control: 0405; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Standard access to systems, applications and information is validated when first requested and revalidated on an annual or more frequent basis.

Security Control: 1503; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Standard access to systems, applications and information is limited to that required for personnel to undertake their duties.

Standard access to systems by foreign nationals

Due to the extra sensitivities associated with Australian Eyes Only (AUSTEO), Australian Government Access Only (AGAO) and other information with nationality releasability markings, foreign access to such information is strictly controlled.

Security Control: 0409; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
Foreign nationals, including seconded foreign nationals, do not have access to systems that process, store or communicate AUSTEO information unless effective controls and procedures are in place to ensure such information is not accessible to them.

Security Control: 0411; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
Foreign nationals, excluding seconded foreign nationals, do not have access to systems that process, store or communicate AGAO information unless effective controls and procedures are in place to ensure such information is not accessible to them.

Security Control: 0816; Revision: 4; Updated: Apr-19; Applicability: P, S, TS; Priority: Must
Foreign nationals, including seconded foreign nationals, do not have access to systems that process, store or communicate information with nationality releasability markings unless effective controls and procedures are put in place to ensure information that is not marked as releasable to their nation is not accessible to them.

Privileged access to systems

Privileged access is considered to be access which can give a user one or more of:

- the ability to change key system configurations
- the ability to change control parameters
- access to audit and security monitoring information
- the ability to circumvent security controls
- access to data, files and accounts used by other users, including backups and media
- special access for troubleshooting a system.

Users of privileged accounts are often targeted as their accounts can potentially give full access to a system. Ensuring that users of privileged accounts do not have access to read emails, open attachments, browse the Web or obtain files via online services such as instant messaging or social media, minimises opportunities for these accounts to be compromised. To further assist in minimising security risks associated with privileged accounts, their use should be restricted.

Security Control: 1507; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Privileged access to systems, applications and information is validated when first requested and revalidated on an annual or more frequent basis.

Security Control: 1508; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Privileged access to systems, applications and information is limited to that required for personnel to undertake their duties.

Security Control: 0445; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Privileged users are assigned a dedicated privileged account to be used solely for tasks requiring privileged access.

Security Control: 1509; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
The use of privileged accounts, and any activities undertaken with them, are monitored and audited.

Security Control: 1175; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Technical security controls are used to prevent privileged users from reading emails, browsing the Web and obtaining files via online services.

Privileged access to systems by foreign nationals

As privileged users often have the ability to bypass security controls on a system, it is strongly encouraged that foreign nationals are not given privileged access to systems, particularly those processing AUSTEO or AGAO information.

Security Control: 0446; Revision: 2; Updated: Sep-18; Applicability: S, TS; Priority: Must
Foreign nationals, including seconded foreign nationals, do not have privileged access to AUSTEO systems.

Security Control: 0447; Revision: 2; Updated: Sep-18; Applicability: S, TS; Priority: Must
Foreign nationals, excluding seconded foreign nationals, do not have privileged access to AGAO systems.

Security Control: 0448; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Foreign nationals, excluding seconded foreign nationals, do not have privileged access to systems.

Suspension of access to systems

Removing or suspending an account can prevent it from being accessed when there is no longer a legitimate business requirement for its use, such as when a user changes duty or leaves an organisation.

Security Control: 0430; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Access to systems, applications and information is removed or suspended on the same day a user no longer has a legitimate business requirement for access.

Security Control: 1404; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Access to systems, applications and information is removed or suspended after one month of inactivity.

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: O, P, S, TS; Priority: Should
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

Under strict circumstances, temporary access to systems may be granted on a case-by-case basis to personnel who lack an appropriate security clearance or briefings. In such circumstances, a security risk assessment should be undertaken and personnel should be closely supervised or have their access controlled in such a way that they only have access to information they require to undertake their duties.

Security Control: 0441; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When personnel are granted temporary access to a system, effective security controls are in place to restrict their access to only information that is necessary to undertake their duties, or they are continually supervised by another user who has the appropriate security clearance to access the system.

Security Control: 0443; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Must
Temporary access is not granted to systems that process, store or communicate caveated or sensitive compartmented information.

Control of Australian systems

Due to extra sensitivities associated with AUSTEO and AGAO systems, it is essential that control of such systems is maintained by Australian citizens working for the Australian Government and that such systems can only be accessed from facilities under the sole control of the Australian Government.

Security Control: 0078; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
Systems processing, storing or communicating AUSTEO or AGAO information remain at all times under the control of an Australian national working for or on behalf of the Australian Government.

Security Control: 0854; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
Access to AUSTEO or AGAO information from systems not under the sole control of the Australian Government is prevented.

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, at https://www.protectivesecurity.gov.au/information/access-to-information/.

Guidelines for communications infrastructure

Cable management

Applicability

The security controls in this section apply to new cable installations or upgrades. Organisations do not need to retrofit existing cable infrastructure to align with these security controls.

When designing cable management systems, the *Cable labelling and registration* and *Cable patching* sections of these guidelines also apply.

This section is applicable to all domestic facilities. For deployable platforms or facilities outside of Australia, consult the *Emanation security* section of these guidelines.

Implementation scenarios

This section provides common security controls for non-shared government facilities, shared government facilities and shared non-government facilities. Specific requirements for any of these scenarios will be identified as such.

A non-shared government facility is where the entire facility and personnel are cleared to the highest level of information processed in the facility.

A shared government facility is where the facility and personnel are cleared at different levels.

A shared non-government facility is where the facility is shared by government organisations and non-government organisations.

Cable sheaths and conduits

The cable's protective sheath is not considered to be a conduit. However, for fibre-optic cables with subunits, the cable's outer protective sheath is considered to be a conduit.

Cable standards

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

Security Control: 0181; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Cables are installed in accordance with the relevant Australian Standards, as directed by the Australian Communications and Media Authority (ACMA).

Cable colours

The use of defined cable colours provides an easily recognisable cable management system.

Security Control: 0926; Revision: 5; Updated: Sep-18; Applicability: O, P, S; Priority: Should
The cable colours in the following table are used in non-TOP SECRET areas.

System	Cable Colour
SECRET	Pink

PROTECTED	*Blue*
OFFICIAL	*Black or grey*

Security Control: 0186; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
The cable colours in the following table are used in TOP SECRET areas.

System	*Cable Colour*
TOP SECRET	*Red*
SECRET	*Pink*
PROTECTED	*Blue*
OFFICIAL	*Black or grey*

Cable colours for foreign systems in Australian facilities

Different cable colours for foreign systems in Australian facilities helps prevent unintended cross-patching of Australian and foreign systems.

Security Control: 0825; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
Cable colours for foreign systems installed in Australian facilities are not the same colour as those used for Australian systems.

Security Control: 0827; Revision: 1; Updated: Sep-18; Applicability: TS; Priority: Must
Cable colours for foreign systems installed in Australian facilities are not the same colour as those used for Australian systems.

Security Control: 0826; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
Cable colours used for foreign systems are agreed between the host organisation and the foreign system's owner.

Security Control: 0828; Revision: 1; Updated: Sep-18; Applicability: TS; Priority: Must
Cable colours used for foreign systems are agreed between the host organisation and the foreign system's owner.

Cable colour non-conformance

In certain circumstances it may not be possible to use the correct cable colours. Under these circumstances organisations are to band cables with the appropriate colour. The banding of cables is to comply with the inspection points for the cables. The size of the cable bands should be easily visible from the inspection point. For large bundles on cable reticulation systems, band and label the entire bundle. It is important bands are robust and 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: 1215; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Must
In non-TOP SECRET areas, cables with non-conformant cable colouring are banded with the appropriate colour at inspection points.

Security Control: 1216; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In TOP SECRET areas, cables with non-conformant cable colouring are both banded with the appropriate colour and labelled at inspection points.

Inspecting cables

Regular inspection of cable installations is necessary to detect illicit tampering or degradation.

Security Control: 1112; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
In non-shared government facilities, cables are inspectable at a minimum of five-metre intervals.

Security Control: 1118; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In non-TOP SECRET areas of shared government facilities, cables are inspectable at a minimum of five-metre intervals.

Security Control: 1119; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
In TOP SECRET areas of shared government facilities, cables are fully inspectable for their entire length.

Security Control: 1126; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In non-TOP SECRET areas of shared non-government facilities, cables are inspectable at a minimum of five-metre intervals.

Security Control: 0184; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In TOP SECRET areas of shared non-government facilities, cables are fully inspectable for their entire length.

Cable groupings

Grouping cables provides a method of sharing conduits and cable reticulation systems.

Security Control: 0187; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
The approved group combinations for cables in the following table are used.

Group	Approved Combination
1	OFFICIAL
	PROTECTED
2	SECRET
3	TOP SECRET

Use of fibre-optic cables

Fibre-optic cables do not produce, and are not influenced by, electromagnetic emanations. Therefore, they offer the highest degree of protection from electromagnetic emanation effects. Fibre-optic cables are also more difficult to tap than copper cables and many more fibres can be run per cable diameter than wired cables reducing cable infrastructure costs.

Security Control: 1111; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
In non-shared government facilities, fibre-optic cables are used for network infrastructure instead of copper cables.

Security Control: 1117; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
In shared government facilities, fibre-optic cables are used for network infrastructure instead of copper cables.

Security Control: 1125; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In non-TOP SECRET areas of shared non-government facilities, fibre-optic cables are used for network infrastructure instead of copper cables.

Security Control: 0182; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
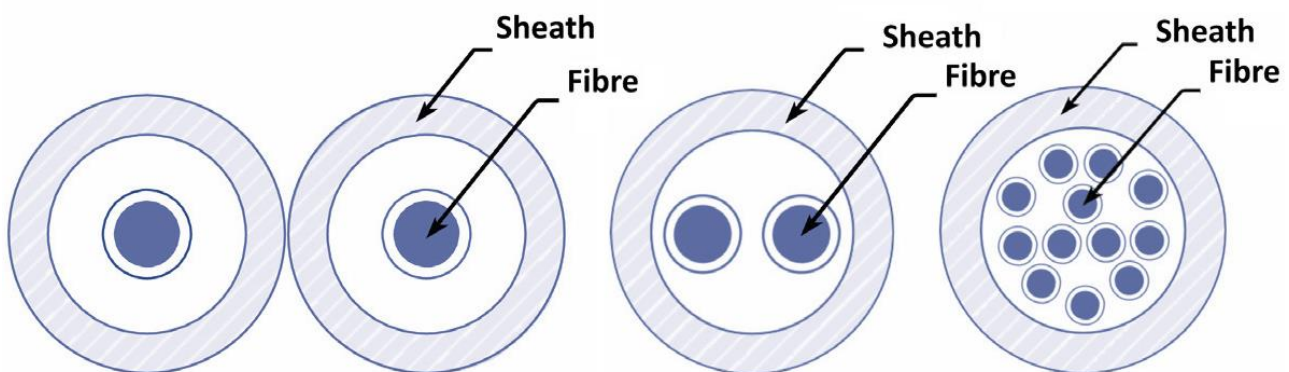*In TOP SECRET areas of shared non-government facilities, fibre-optic cables are used for network infrastructure instead of copper cables.*

Fibre-optic cables sharing a common conduit

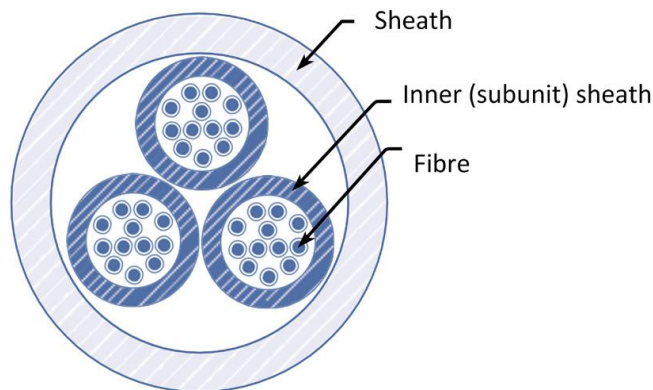Fibre-optic cables of various cable groups can share a common conduit to reduce costs.

Security Control: 0189; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
With fibre-optic cables, the fibres in the sheath only carry a single group.

Security Control: 0190; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
If a fibre-optic cable contains subunits, each subunit only carries a single group; however, each subunit in the cable can carry a different group.

Cables sharing a common reticulation system

Laying cables in a neat and controlled manner that allows for inspection reduces the need for individual cable trays.

Security Control: 1114; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
In non-shared government facilities, approved cable groups sharing a common reticulation system have a dividing partition or a visible gap between the differing cable groups.

Security Control: 1120; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
In shared government facilities, approved cable groups sharing a common reticulation system have a dividing partition or a visible gap between the individual cable groups.

Security Control: 1127; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In non-TOP SECRET areas of shared non-government facilities, approved cable groups sharing a common reticulation system have a dividing partition or a visible gap between the differing cable groups.

Security Control: 1128; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In TOP SECRET areas of shared non-government facilities, approved cable groups sharing a common reticulation system have a dividing partition or a visible gap between the differing cable groups.

Enclosed cable reticulation systems

In shared non-government facilities, cables are enclosed in a sealed reticulation system to prevent access and enhance cable management.

Security Control: 1130; Revision: 2; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In non-TOP SECRET areas of shared non-government facilities, cables are run in an enclosed cable reticulation system.

Security Control: 1131; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In TOP SECRET areas of shared non-government facilities, cables are run in an enclosed cable reticulation system.

Covers for enclosed cable reticulation systems

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

Security Control: 1164; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In non-TOP SECRET areas of shared non-government facilities, conduits or the front covers of ducts, cable trays in floors and ceilings, and associated fittings are clear plastic.

Security Control: 1165; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In TOP SECRET areas of shared non-government 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 non-government facilities, Security Construction and Equipment Committee (SCEC) endorsed seals are used to provide evidence of any tampering or illicit access to cable reticulation systems while conduits are sealed with a visible smear of conduit glue to prevent access.

Security Control: 0195; Revision: 3; Updated: Sep-18; Applicability: TS; Priority: Must
In shared non-government facilities, uniquely identifiable SCEC endorsed tamper-evident seals are used to seal all removable covers on reticulation systems, including box section front covers, conduit inspection boxes, outlet and junction boxes, and T-pieces.

Security Control: 0194; Revision: 2; Updated: Sep-18; Applicability: TS; Priority: Must
In shared non-government facilities, a visible smear of conduit glue is used to seal all plastic conduit joints and conduit runs connected by threaded lock nuts.

Connecting cable reticulation systems to cabinets

Strictly controlling the routing from cable management systems to cabinets prevents unauthorised modifications and tampering and provides easy inspection of cables.

Security Control: 1102; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In non-TOP SECRET areas, reticulation systems leading into cabinets are terminated as close as possible to the cabinet.

Security Control: 1101; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
In TOP SECRET areas, reticulation systems leading into cabinets in a secure communications or server room are terminated as close as possible to the cabinet.

Security Control: 1103; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In TOP SECRET areas, reticulation systems leading into cabinets not in a secure communications or server room are terminated at the boundary of the cabinet.

Terminating cables in cabinets

Having individual or divided cabinets prevents accidental or deliberate cross-patching and makes visual inspection of cables and patching easier.

Security Control: 1098; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In non-TOP SECRET areas, cables are terminated in individual cabinets, or for small systems, one cabinet with a division plate to delineate classifications.

Security Control: 1099; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Must
In TOP SECRET areas, cables are terminated in individual cabinets, or for small systems, one cabinet with a division plate to delineate classifications.

Security Control: 1100; Revision: 1; Updated: Sep-18; Applicability: TS; Priority: Must
TOP SECRET cables are terminated in an individual TOP SECRET cabinet.

Cabinet separation

Having a definite gap between cabinets allows for ease of inspection for any illicit cables or cross-patching.

Security Control: 1116; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
In non-shared government facilities, there is a visible gap between TOP SECRET cabinets and cabinets of lower classifications.

Security Control: 1124; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
In shared government facilities, there is a visible gap between TOP SECRET cabinets and cabinets of lower classifications.

Security Control: 1136; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In shared non-government facilities, there is a visible gap between TOP SECRET cabinets and cabinets of lower classifications.

Cables in walls

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

Security Control: 1115; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
In non-shared government facilities, cables from cable trays to wall outlets are run in flexible or plastic conduit.

Security Control: 1121; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
In shared government facilities, cables from cable trays to wall outlets are run in flexible or plastic conduit.

Security Control: 1132; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In shared non-government facilities, cables from cable trays to wall outlets are run in flexible or plastic conduit.

Cables in party walls

In shared non-government facilities, cables are not allowed in a party wall. A party wall is a wall shared with an unsecured space where there is no control over access. An inner wall can be used to run cables where the space is sufficient for inspection of the cables.

Wall penetrations

In shared government facilities and shared non-government facilities, penetrating a wall into a lower classified space requires the integrity of the classified spaces to be maintained. As such, all cables are encased in conduit with no gaps in the wall around the conduit.

Security Control: 1122; Revision: 1; Updated: Sep-18; Applicability: TS; Priority: Should
In shared government facilities, where wall penetrations exit into a lower classified space, cables are encased in conduit with all gaps between the conduit and the wall filled with an appropriate sealing compound.

Security Control: 1134; Revision: 1; Updated: Sep-18; Applicability: TS; Priority: Must
In shared non-government facilities, where wall penetrations exit into a lower classified space, cables are encased in conduit with all gaps between the conduit and the wall filled with an appropriate sealing compound.

Wall outlet terminations

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

Security Control: 1104; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Must
Cable groups sharing a wall outlet use fibre-optic cables and different connectors on opposite sides of the wall outlet for each group.

Security Control: 1105; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
TOP SECRET cables do not share a wall outlet with cables of a lower classification.

Security Control: 1106; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
The connectors for TOP SECRET systems are different from those of systems of lower classifications.

Wall outlet colours

The colouring of wall outlets makes it easy to identify TOP SECRET infrastructure.

Security Control: 1107; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Must
Wall outlets are not coloured red.

Security Control: 1108; Revision: 1; Updated: Sep-18; Applicability: TS; Priority: Must
Wall outlets are coloured red.

Wall outlet covers

Transparent covers on wall outlets allow for inspection of cable cross-patching and tampering.

Security Control: 1109; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In non-TOP SECRET areas, faceplates on wall outlets are clear plastic.

Security Control: 1110; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In TOP SECRET areas, faceplates on wall outlets are clear plastic.

Audio secure spaces

Audio secure spaces are designed to prevent audio conversations from being overheard. The Australian Security Intelligence Organisation (ASIO) should be consulted before any modifications are made to audio secure spaces.

Security Control: 0198; Revision: 2; Updated: Sep-18; Applicability: TS; Priority: Must
When penetrating an audio secured space, ASIO is consulted and all directions provided are complied with.

Power reticulation

In both shared government facilities and shared non-government facilities with TOP SECRET systems, 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: 2; Updated: Sep-18; Applicability: TS; Priority: Should
In TOP SECRET areas of shared government facilities, a power distribution board with a feed from an Uninterruptible Power Supply is used to power all TOP SECRET ICT equipment.

Security Control: 1135; Revision: 1; Updated: Sep-18; Applicability: TS; Priority: Must
In TOP SECRET areas of shared non-government facilities, a power distribution board with a feed from an Uninterruptible Power Supply is used to power all TOP SECRET ICT equipment.

Further information

Australian Standards for cables can be obtained from ACMA at
https://www.acma.gov.au/industry/telco/infrastructure/Cabling-rules.

Further information on physical security for Security Zones and secure rooms can be found in the Attorney-General's Department's *Protective Security Policy Framework*, *Entity facilities* policy, at
https://www.protectivesecurity.gov.au/physical/entity-facilities/.

Further information on endorsed seals for various sealing requirements is available in the SCEC's *Security Equipment Evaluated Products List* at https://www.scec.gov.au/catalogue.

Cable labelling and registration

Applicability

This section is applicable to all domestic facilities. For deployable platforms or facilities outside of Australia, consult the *Emanation security* section of these guidelines.

Conduit label specifications

Conduit labels should be a specific size and colour to allow for easy identification of secure conduits carrying cables.

Security Control: 0201; Revision: 2; Updated: Sep-18; Applicability: TS; Priority: Must
Labels for TOP SECRET conduits are a minimum size of 2.5 cm x 1 cm, attached at 5 m intervals and marked as 'TS RUN'.

Security Control: 0202; Revision: 2; Updated: Sep-18; Applicability: TS; Priority: Must
Conduit labels in areas where uncleared personnel could frequently visit have red text on a clear background.

Security Control: 0203; Revision: 2; Updated: Sep-18; Applicability: TS; Priority: Must
Conduit labels in areas that are not clearly observable have red text on a white background.

Installing conduit labelling

Conduit labelling in public or visitor areas could draw undue attention and disclose capabilities.

Security Control: 0204; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Conduit labels installed in public or visitor areas do not draw undue attention from people who do not have a need-to-know of the existence of such cables.

Labelling wall outlet boxes

Clear labelling of wall outlet boxes diminishes the possibility of incorrectly attaching ICT equipment of a lower classification to the wrong outlet.

Security Control: 1095; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
Wall outlet boxes denote the classification, cable number and outlet number.

Security Control: 0205; Revision: 2; Updated: Sep-18; Applicability: TS; Priority: Must
Wall outlet boxes denote the classification, cable number and outlet number.

Standard Operating Procedures

Documenting labelling conventions in Standard Operating Procedures (SOPs) makes cable and fault finding easier.

Security Control: 0206; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Site conventions for labelling and registration of cables are documented in SOPs.

Labelling cables

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

Security Control: 1096; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
Cables are labelled at each end with sufficient source and destination details to enable the physical identification and inspection of the cable.

Security Control: 0207; Revision: 2; Updated: Sep-18; Applicability: TS; Priority: Must
Cables are labelled at each end with sufficient source and destination details to enable the physical identification and inspection of the cable.

Cable register

Cable registers allow installers and inspectors to trace cables for cable inspections and malicious or accidental damage. Cable registers track all cable management changes throughout the life of the system.

Security Control: 0208; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
A cable register is maintained with the following information:

- *cable identification number*
- *classification*
- *source*
- *destination*
- *site/floor plan diagram*
- *seal numbers (if applicable).*

Security Control: 0210; Revision: 2; Updated: Sep-18; Applicability: TS; Priority: Must
A cable register is maintained with the following information:

- *cable identification number*
- *classification*
- *source*
- *destination*

- *site/floor plan diagram*
- *seal numbers (if applicable).*

Cable inspections

Cable inspections, at predefined periods, are a method of checking the cable management system with the cable register.

Security Control: 0211; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Cables are inspected for inconsistencies with the cable register in accordance with the frequency defined in a system's System Security Plan.

Cable patching

Applicability

The security controls in this section apply to new cable installations or upgrades. Organisations do not need to retrofit existing cable infrastructure to align with these security controls.

This section is applicable to all domestic facilities. For deployable platforms or facilities outside of Australia, consult the *Emanation security* section of these guidelines.

Terminations to patch panels

Connecting a system to another system of a lower classification will result in a data spill, possibly resulting in inadvertent or deliberate access by non-cleared personnel, or the lower system not meeting the appropriate requirements to secure the information from unauthorised access or tampering.

Security Control: 0213; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Only approved cable groups terminate on a patch panel.

Patch cable and fly lead connectors

Ensuring that cables are equipped with connectors of a different configuration to all other cables prevents inadvertent connection of different systems.

Security Control: 1093; Revision: 2; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In areas containing cables for systems of different classifications, connectors for each system are different from those of other systems; unless the higher classified patch cables cannot bridge the distance between the higher classified patch panel and any patch panel of a lower classification.

Security Control: 0214; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In areas containing cables for TOP SECRET systems and systems of lower classifications, the connectors for TOP SECRET systems are different from those of other systems.

Security Control: 1094; Revision: 1; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In areas containing cables for systems of different classifications, the selection of connector types is documented.

Security Control: 0215; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In areas containing cables for TOP SECRET systems and systems of lower classifications, the selection of connector types is documented.

Physical separation of patch panels

Appropriate physical separation between a TOP SECRET system and a system of a lower classification reduces or eliminates the chances of cross-patching between systems and reduces or eliminates the possibility of unauthorised personnel gaining access to TOP SECRET systems.

Security Control: 0216; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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; Priority: Must
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.*

Fly lead installation

Keeping the lengths of 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, fly leads should be treated as infrastructure and run in conduit or fixed infrastructure such as desk partitioning.

Security Control: 0218; Revision: 3; Updated: Sep-18; Applicability: TS; Priority: Should
If fibre-optic fly leads exceeding five meters in length are used to connect wall outlets to ICT equipment, they are run in a protective and easily inspected pathway and clearly labelled at the ICT equipment end with the wall outlet's designator.

Emanation security

Applicability

This section is only applicable to:

- organisations located outside of Australia

- facilities in Australia that have transmitters

- facilities that are shared with non-Australian government entities

- mobile platforms and deployable assets that process information.

Emanation security threat assessments in Australia

Obtaining current threat advice from the Australian Cyber Security Centre (ACSC) on potential adversaries, and applying the appropriate counter-measures, is vital to protecting systems from emanation security threats.

Security Control: 0247; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Must
System owners deploying systems with Radio Frequency (RF) 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 emanation security threat assessment.

Security Control: 0248; Revision: 5; Updated: Sep-18; Applicability: O, P, S; Priority: Must
System owners deploying systems with RF transmitters that will be co-located with systems of a higher classification contact the ACSC for an emanation security threat assessment and implement any additional installation criteria derived from the emanation security threat assessment.

Security Control: 1137; Revision: 2; Updated: Sep-18; Applicability: TS; Priority: Must
System owners deploying systems in shared facilities with non-Australian government entities contact the ACSC for an emanation security threat assessment and implement any additional installation criteria derived from the emanation security 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 recommended counter-measures and SOPs to reduce threats could result in the platform emanating compromising signals, which if intercepted and analysed, could lead to platform compromise with serious consequences.

Security Control: 0932; Revision: 5; Updated: Sep-18; Applicability: O, P; Priority: Should
System owners deploying systems overseas contact the ACSC for emanation security threat advice and implement any additional installation criteria derived from the emanation security threat advice.

Security Control: 0249; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Must
System owners deploying systems overseas contact the ACSC for an emanation security threat assessment and implement any additional installation criteria derived from the emanation security threat assessment.

Early identification of emanation security issues

It is important to identify the need for emanation security controls for a system early in the project life cycle as this can reduce costs for the project. Costs are much greater if changes have to be made once the system has been designed and deployed.

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

Industry and government standards

While ICT equipment in a TOP SECRET area in Australia may not need certification to TEMPEST standards, the ICT equipment still needs to meet applicable industry and government standards.

Security Control: 0250; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
ICT equipment in TOP SECRET areas meets industry and government standards relating to electromagnetic interference/electromagnetic compatibility.

Further information

Further information on cables and separation standards, as well as the potential dangers of operating RF transmitters near systems is documented in Australian Communications Security Instruction (ACSI) 61 D.

Further information on conducting an emanation security threat assessment is documented in ACSI 71 D.

Guidelines for communications systems

Telephone systems

Telephone systems usage policy

All non-secure telephone systems are subject to interception. Accidentally or maliciously revealing sensitive or classified information over a public telephone network can lead to the compromise of such information.

Security Control: 1078; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A policy governing the use of telephone systems 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 what they can discuss on particular telephone systems, as well as security risks associated with the use of non-secure telephone systems in sensitive or classified areas.

Security Control: 0229; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Should
Personnel are advised of security risks posed by non-secure telephone systems in areas where sensitive or classified conversations can occur.

Visual indication

When single telephone systems are approved to hold conversations at different levels, alerting the user to the sensitivity or classification of information that can be discussed will assist in reducing the likelihood of unintended disclosure of information.

Security Control: 0231; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
When permitting 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 to be 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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
Cordless telephone systems are not used for sensitive or classified conversations.

Security Control: 0234; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Cordless telephone systems are not used in conjunction with secure telephony devices.

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 an organisation is able to reduce security risks through the use of an audio secure room that is secured during conversations, then they may be used.

Security Control: 0235; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Speakerphones are not used on telephone systems in TOP SECRET areas unless the telephone system is located in a room rated as audio secure, the room is audio secure during conversations and only personnel involved in discussions are present in the room.

Off-hook audio protection

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

Security Control: 0236; Revision: 4; Updated: Sep-18; Applicability: O, P; Priority: Should
In PROTECTED areas, off-hook audio protection features are used on all telephones that are not authorised for the transmission of PROTECTED information.

Security Control: 0931; Revision: 4; Updated: Sep-18; Applicability: O, P, S; Priority: Should
In SECRET areas, push-to-talk handsets are used on all telephones that are not authorised for the transmission of SECRET information.

Security Control: 0237; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
In TOP SECRET areas, push-to-talk handsets are used on all telephones that are not authorised for the transmission of TOP SECRET information.

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 using cryptography*.

Video conferencing and Internet Protocol telephony

Video and voice-aware firewall requirement

Where a video conferencing or IP telephony network is connected to another video conferencing or IP telephony network belonging to a different security domain the *Gateways* section of the *Guidelines for gateway management* 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 gateway management* does not apply.

Hardening video conferencing and Internet Protocol telephony infrastructure

Video conferencing and IP telephony traffic in a data network consists of IP packets and should be treated the same as any other data. As such, hardening can be applied to video conferencing units, handsets, software, servers, firewalls and gateways. For example, additional security could be added by using a Session Initiation Protocol (SIP) server that:

- has a fully patched operating system

- has fully patched software

- runs only required services

- uses encrypted non-replayable authentication

- applies network restrictions that only allow secure SIP traffic and secure Real-time Transport Protocol (RTP) traffic from video conferencing units and IP phones on a Virtual Local Area Network (VLAN) to reach the server.

Video and voice-aware firewalls

The use of video and voice-aware firewalls ensures that only video and voice traffic (e.g. signalling and data traffic) is allowed for a given call and that the session state is maintained throughout the transaction.

The requirement to use a video or voice-aware firewall does not necessarily require separate firewalls to be deployed for video conferencing, IP telephony and data traffic. If possible, organisations are encouraged to implement one firewall that is video and data-aware; voice and data-aware; or video, voice and data-aware depending on their needs.

Security Control: 0546; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Where a requirement exists to implement a firewall in a gateway, and video conferencing or IP telephony traffic passes through the gateway, a video or voice-aware firewall is used.

Protecting video conferencing and Internet Protocol telephony traffic

Video conferencing and IP telephony traffic is vulnerable to eavesdropping but can be protected with encryption. When encrypting video conferencing and IP telephony traffic, voice control signalling can be protected using Transport Layer Security and the 'sips://' identifier to force the encryption of all legs of the connection. Similar protections are available for RTP and the Real-time Control Protocol.

Security Control: 0547; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Video conferencing and IP telephony signalling and data is encrypted.

Establishment of secure signalling and data protocols

Use of secure signalling and data protocols protect against eavesdropping, some types of denial of service, person-in-the-middle attacks and call spoofing attacks.

Security Control: 0548; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Video conferencing and IP telephony functions are established using secure signalling and data protocols.

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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
Authentication and authorisation is used for all actions on a video conferencing network, including call setup and changing settings.

Security Control: 0555; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Authentication and authorisation is used for all actions on a IP telephony network, including registering a new IP phone, changing phone users, changing settings and accessing voicemail.

Security Control: 0551; Revision: 5; Updated: Sep-18; Applicability: O, P; Priority: Should
IP telephony is configured such that:

- *IP phones authenticate themselves to the call controller upon registration*

- *auto-registration is disabled and only a whitelist of authorised devices is allowed to access the network*

- *unauthorised devices are blocked by default*

- *all unused and prohibited functionality is disabled.*

Security Control: 0552; Revision: 5; Updated: Sep-18; Applicability: S, TS; Priority: Must
IP telephony is configured such that:

- *IP phones authenticate themselves to the call controller upon registration*

- *auto-registration is disabled and only a whitelist of authorised devices is allowed to access the network*

- *unauthorised devices are blocked by default*

- *all unused and prohibited functionality is disabled.*

Security Control: 1014; Revision: 5; Updated: Sep-18; Applicability: S, TS; Priority: Should
Individual logins are used for IP phones.

Traffic separation

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

Security Control: 0549; Revision: 3; Updated: Sep-18; Applicability: O, P; Priority: Should
Video conferencing and IP telephony traffic is separated physically or logically from other data traffic.

Security Control: 0550; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Must
Video conferencing and IP telephony traffic is separated physically or logically from other data traffic.

Security Control: 0556; Revision: 4; Updated: Sep-18; Applicability: O, P; Priority: Should
Workstations are not connected to video conferencing units or IP phones unless the workstation or the device uses VLANs or similar mechanisms to maintain separation between video conferencing, IP telephony and other data traffic.

Security Control: 0557; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
Workstations are not connected to video conferencing units or IP phones unless the workstation or the device uses VLANs or similar mechanisms to maintain separation between video conferencing, IP telephony and other data traffic.

Lobby and shared area phones

Lobby IP phones in public areas may give an adversary the opportunity to access the internal data network) by replacing the IP phone with another device or installing a device in line. Alternatively, the IP phone could be used for social engineering purposes (since the call may appear to be internal) or to access poorly protected voicemail boxes.

Security Control: 1015; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Traditional analog phones are used in lobby and shared areas.

Security Control: 0558; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
If IP phones are used in lobby and shared areas, their ability to access data networks, voicemail and directory services are prevented.

Microphones and webcams

Microphones (including headsets and Universal Serial Bus [USB] handsets) and webcams can pose a security risk in classified areas. 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: 4; Updated: Sep-18; Applicability: O, P, S; Priority: Should
Microphones (including headsets and USB handsets) and webcams are not used with non-SECRET workstations in SECRET areas.

Security Control: 1450; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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

Telephony is considered a critical service for any organisation. A denial of service response plan will assist in responding to a video conferencing and IP telephony denial of service, signalling floods, and established call teardown and RTP data floods.

Resources and services that can be used to monitor for signs of a denial of service can include:

- router and switch logging and flow data
- packet captures
- proxy and call manager logs and access control lists
- video and voice-aware firewalls and gateways
- network redundancy
- load balancing
- PSTN failover.

Security Control: 1019; Revision: 7; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
A denial of service response plan is developed and implemented that includes:

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

Further information

Further information on the use of telephones and 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 using cryptography*.

Further information on firewalls and gateways can be found in the *Guidelines for gateway management*.

Fax machines and multifunction devices

Using cryptographic equipment with fax machines and multifunction devices

Specific information regarding the 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: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A policy governing the use of fax machines and MFDs is developed and implemented.

Sending fax messages

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

Security Control: 1092; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Separate fax machines or MFDs are used for sending sensitive or classified fax messages and all other fax messages.

Security Control: 0241; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When sending fax messages, the fax message is encrypted to an appropriate level to be communicated over unsecured telecommunications infrastructure or the PSTN.

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: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The sender of a fax message makes arrangements for the receiver to collect the fax message as soon as possible after it is received and notify the sender if the fax message does not arrive in an agreed amount of time.

Connecting multifunction devices to telephone systems

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

Security Control: 0245; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A direct connection from an MFD to a digital telephone system is not enabled unless the telephone system is authorised to operate at the same sensitivity or classification as the computer network to which the MFD is connected.

Connecting multifunction devices to computer networks

As networked MFDs are considered to be devices that reside on a computer network, they should have the same security controls as other devices on the computer network.

Security Control: 0590; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Where MFDs connected to computer networks have the ability to communicate via a gateway to another network:

- *each MFD applies user identification, authentication and audit functions for all information communicated by that device*

- *security controls are of similar strength to those specified for workstations on that network*
- *each gateway can identify and filter information in accordance with the security controls for the export of data via a gateway.*

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: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
MFDs connected to computer 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: O, P, S, TS; Priority: Should
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 using cryptography***.

Further information on MFDs communicating via network gateways can be found in the ***Guidelines for gateway management***.

Guidelines for enterprise mobility

Mobile device management

Types of mobile devices

These guidelines describe the use of mobile devices including mobile phones, smartphones, tablets, laptops, portable electronic devices and other portable internet-connected devices.

Device-specific guidance

To complement the security controls in this document, the Australian Cyber Security Centre (ACSC) publishes device-specific guidance. Where device-specific guidance exists, it should be consulted in conjunction with the security controls in this document.

Mobile device security policy

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

Security Control: 1533; Revision: 1; Updated: Apr-19; Applicability: O, P, S, TS; Priority: Must
A security policy governing the management of mobile devices is developed and implemented.

Security Control: 1195; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
A Mobile Device Management solution is used to ensure mobile device management policy is applied to all mobile devices.

Security Control: 0687; Revision: 5; Updated: Sep-18; Applicability: TS; Priority: Must
Mobile devices do not process, store or communicate TOP SECRET information unless explicitly approved by the ACSC to do so.

Privately-owned mobile devices

If organisations choose to allow personnel to use their personal mobile devices to access their organisation's information and systems, they should ensure that the devices do not present an unacceptable security risk. 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 and other hardening guidance available from the ACSC.

Security Control: 1399; Revision: 2; Updated: Mar-19; Applicability: O; Priority: Should
Personnel accessing official information using a privately-owned mobile device use an ACSC approved platform, a security configuration in accordance with ACSC hardening guidance, and have enforced separation of official and personal information.

Security Control: 1400; Revision: 1; Updated: Sep-18; Applicability: P; Priority: Must
Personnel accessing classified information using a privately-owned mobile device use an ACSC approved platform, a security configuration in accordance with ACSC hardening guidance, and have enforced separation of classified and personal information.

Security Control: 0694; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
Privately-owned mobile devices do not access highly classified systems.

Seeking legal advice for privately-owned mobile devices

Allowing privately-owned mobile devices to access an organisation's information and systems can increase liability risk. Organisations should seek legal advice to ascertain whether this scenario affects compliance with relevant legislation (e.g. compliance with government data retention laws in 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.

Security Control: 1297; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Prior to allowing privately-owned mobile devices to connect to an organisation's systems, legal advice is sought.

Organisation-owned mobile devices

If organisations choose to issue personnel with mobile devices to access their organisation's information and systems, they should ensure that the devices do not present an unacceptable security risk. 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 and other hardening guidance available from the ACSC.

Security Control: 1481; Revision: 1; Updated: Mar-19; Applicability: O; Priority: Should
Personnel accessing official information using an organisation-owned mobile device use an ACSC approved platform with a security configuration in accordance with ACSC hardening guidance.

Security Control: 1482; Revision: 0; Updated: Sep-18; Applicability: P, S, TS; Priority: Must
Personnel accessing classified information using an organisation-owned mobile device use an ACSC approved platform with a security configuration in accordance with ACSC hardening guidance.

Mobile device storage encryption

Encrypting the internal storage and removable media of mobile devices will lessen security risks associated with a lost or stolen device as it will present a significant challenge to an adversary looking to gain easy access to information stored on the device.

Security Control: 0869; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
All information on mobile devices is encrypted using at least an Australian Signals Directorate Approved Cryptographic Algorithm (AACA).

Mobile device communications encryption

If appropriate encryption is not available, mobile devices communicating sensitive or classified information present a security risk to such information. Encrypting communications, regardless of the protocol used (e.g. Bluetooth, infrared, Wi-Fi, 3G/4G/5G or other wireless protocols) is the only way to have any assurances that the information is protected.

Security Control: 1085; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Mobile devices used to communicate sensitive or classified information over public network infrastructure use encryption approved for communicating such information over public network infrastructure.

Mobile device Bluetooth functionality

Bluetooth provides inadequate security for information that is passed between mobile devices and other Bluetooth devices. As such, Bluetooth is not suitable for use with highly classified mobile devices. Furthermore, as Bluetooth has a number of known weaknesses which can potentially be exploited, the range of Bluetooth communications for all other mobile devices should be limited.

Security Control: 1202; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
The range of Bluetooth communications between mobile devices and other Bluetooth devices is restricted to less than 10 metres by using class 2 or class 3 Bluetooth devices.

Security Control: 0682; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
Bluetooth functionality is not enabled on highly classified mobile devices.

Mobile device Bluetooth pairing

To mitigate security risks associated with pairing mobile devices with other Bluetooth devices, Bluetooth version 2.1 introduced secure simple pairing and extended inquiry response. Secure simple pairing improved the pairing experience for Bluetooth devices and introduced a form of public key cryptography while extended inquiry response provided more information during the inquiry procedure to allow for better filtering of Bluetooth devices.

In addition to using Bluetooth devices that support at least Bluetooth version 2.1, personnel should consider the location and manner in which they pair Bluetooth devices. For example, by avoiding pairing devices in public locations.

Security Control: 1196; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Must
Mobile devices are configured to remain undiscoverable to other Bluetooth devices except during Bluetooth pairing.

Security Control: 1200; Revision: 3; Updated: Sep-18; Applicability: O, P; Priority: Must
Bluetooth pairing is performed using Bluetooth version 2.1 or later.

Security Control: 1198; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Must
Bluetooth pairing is performed in a manner such that connections are only made between intended Bluetooth devices.

Security Control: 1199; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
Bluetooth pairings are removed from mobile devices when there is no longer a requirement for their use.

Configuration control

Poorly controlled mobile devices are more vulnerable to compromise and provide an adversary with a potential access point into systems. Although organisations may initially provide secure mobile devices, the state of security may degrade over time. The security of mobile devices should be audited regularly to ensure their integrity.

Security Control: 0863; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Mobile devices prevent personnel from installing or uninstalling applications once provisioned.

Security Control: 0864; Revision: 3; Updated: Apr-19; Applicability: O, P, S, TS; Priority: Must
Mobile devices prevent personnel from disabling or modifying security functions once provisioned.

Maintaining mobile device security

It is important that mobile devices are regularly tested to ensure that they meet organisation-defined security configurations and that patches are being applied.

Security Control: 1365; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Mobile carriers that are able to provide timely security updates for mobile devices are used.

Security Control: 1366; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Mobile devices are able to accept security updates from mobile carriers as soon as they become available.

Connecting mobile devices to the Internet

During the time mobile devices are connected to the Internet for web browsing they are directly exposed to targeted cyber intrusions originating from the Internet. Should web browsing be required, best practice involves establishing a Virtual Private Network (VPN) connection and browsing the Web though an organisation's internet gateway.

A split tunnel VPN can allow access to systems from another network, including unsecured networks such as the Internet. If split tunnelling is not disabled there is an increased security risk that the VPN connection is susceptible to targeted cyber intrusions from such networks. Disabling split tunnelling may not be achievable on all mobile devices. Organisations can refer to the relevant ACSC hardening guidance for mobile devices on how to manage security risks associated with split tunnelling.

Security Control: 0874; Revision: 4; Updated: Sep-18; Applicability: O, P; Priority: Should
Web browsing from mobile devices is conducted through an organisation's internet gateway rather than via a direct connection to the Internet.

Security Control: 0705; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When accessing an organisation system via a VPN connection, split tunnelling is disabled.

Further information

Further information on the use of mobile devices can be found in the **Mobile device usage** section of these guidelines.

Further information on using Bluetooth to communicate sensitive or classified information can be found in the **Wireless devices and Radio Frequency transmitters** section of the **Guidelines for physical security**.

Further information on the use of encryption to reduce storage and physical transfer requirements is detailed in the **Cryptographic fundamentals** section of the **Guidelines for using cryptography**.

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 at https://www.cyber.gov.au/publications/risk-management-of-enterprise-mobility-including-bring-your-own-device.

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**, at https://csrc.nist.gov/publications/detail/sp/800-121/rev-2/final.

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 policy governing their use.

Security Control: 1082; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A policy governing the use of mobile devices is developed and implemented.

Personnel awareness

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

Security Control: 1083; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Personnel are advised of the sensitivity or classification permitted for voice and data communications when using mobile devices.

Paging and message services

As paging and message services do not appropriately encrypt information they cannot be relied upon for the communication of sensitive or classified information.

Security Control: 0240; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Paging, Multimedia Message Service, Short Message Service or instant messaging apps are not used to communicate sensitive or classified information.

Using mobile devices in public spaces

Personnel should be aware of the environment they use mobile devices in to view or communicate sensitive or classified information, especially in public areas such as public transport, transit lounges and coffee shops. In such locations personnel taking care to ensure information is not observed or conversations are overheard will assist in maintaining the confidentiality of their organisation's information. In some cases, privacy filters can be applied to the screen of a mobile device to prevent onlookers from reading content off its screen.

Security Control: 0866; Revision: 4; Updated: Apr-19; Applicability: O, P, S, TS; Priority: Must
Sensitive or classified information is not viewed or communicated in public locations unless care is taken to reduce the chance of conversations being overheard or the screen of a mobile device being observed.

Security Control: 1145; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Should
Privacy filters are applied to the screens of highly classified mobile devices.

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 do not leave mobile devices unattended when being actively used.

Security Control: 0871; Revision: 3; Updated: Apr-19; Applicability: O, P, S, TS; Priority: Must
Mobile devices are kept under continual direct supervision when being actively used.

Security Control: 0870; Revision: 3; Updated: Apr-19; Applicability: O, P, S, TS; Priority: Must
Mobile devices are carried or stored in a secured state when not being actively used.

Carrying mobile devices

As mobile devices used outside the office will be carried through areas not authorised to process the information stored on them, carrying them in a secured state (i.e. encryption is active when they are not in use) will decrease the likelihood of accidental or deliberate compromise of information. Depending on the type of mobile device, the effectiveness of encrypting its internal storage might be reduced if the device is lost or stolen while it is in sleep mode or powered on with a locked screen.

Security Control: 1084; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
If unable to apply encryption to mobile devices that is suitable for them to be carried through areas not authorised to process the information stored on them, they are physically transferred in a security briefcase or an approved multi-use satchel, pouch or transit bag.

Emergency sanitisation of mobile devices

The sanitisation of mobile devices in emergency situations can assist in reducing the potential for compromise of information 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: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Emergency sanitisation procedures are developed for mobile devices.

Security Control: 0702; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Must
If a cryptographic zeroise or sanitise function is provided for cryptographic keys on highly classified mobile devices, the function is used as part of emergency sanitisation procedures.

Before travelling overseas with mobile devices

Personnel travelling overseas with mobile devices face additional security risks. Taking steps to mitigate these security risks will assist in protecting their organisation's information. When personnel leave Australian borders they also leave behind any expectations of privacy.

Prior to the departure of personnel travelling overseas with mobile devices, organisations can:

- patch applications and operating systems

- implement multi-factor authentication

- backup all data

- remove all non-essential data

- disable applications that are not essential for the period of travel

- disable Bluetooth and wireless connectivity

- configure wireless to connect only to known secure networks.

Security Control: 1298; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
User education and the implementation of security controls are conducted prior to personnel travelling overseas with mobile devices.

While travelling overseas with mobile devices

Personnel lose control of information stored on mobile devices any time devices are not on their person. This includes storing mobile devices in checked-in luggage or in hotel rooms (including hotel room safes). Such situations provide an opportunity for mobile devices to be stolen or tampered with.

Security Control: 1087; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When travelling overseas with mobile devices and media, personnel retain control over them at all times, this includes by not placing them in checked-in luggage or leaving them unattended for any period of time.

Security Control: 1299; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Personnel take the following precautions when travelling overseas with mobile devices:

- *avoiding storing authentication details or tokens and passphrases with mobile devices*

- *avoiding connecting to open Wi-Fi networks*

- *clearing web browsers after each browsing session including history, cache, cookies and temporary files*

- *encrypting emails where possible*

- *ensuring login pages are encrypted before entering passphrases*

- *avoiding connecting to untrusted computers or inserting removable media.*

Security Control: 1088; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
If personnel are requested to decrypt mobile devices for inspection by customs personnel, or their devices leave their possession at any time, they report the potential compromise of information to their organisation as soon as possible.

After travelling overseas with mobile devices

Inspecting mobile devices after overseas travel allows organisations to check for evidence that devices may have been compromised, and if so, take appropriate actions such as resetting devices and all passphrases for accounts associated with the devices.

Security Control: 1300; Revision: 3; Updated: Apr-19; Applicability: O, P, S, TS; Priority: Should
If upon returning from overseas mobile devices are suspected of being compromised, the devices and all passphrases for accounts associated with the devices are reset.

Further information

Further information on the management of mobile devices can be found in the **Mobile device management** section of these guidelines.

Further information on using mobile devices in highly classified areas can be found in the **Wireless devices and Radio Frequency transmitters** 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 at https://www.cyber.gov.au/publications/travelling-overseas-with-electronic-devices.

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**, from the Protective Security Policy govdex community or ASIO by email.

Further information on approved multi-use satchels, pouches and transit bags can be found in the Security Construction and Equipment Committee's **Security Equipment Evaluated Products List** at https://www.scec.gov.au/catalogue.

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 Signals Directorate (ASD) performs product evaluations through the following programs:

- ASD Cryptographic Evaluation program, for software and ICT equipment that contains cryptographic functionality.

- High Assurance evaluation program, for ICT equipment protecting highly classified information.

The Australian Cyber Security Centre (ACSC) also certifies product evaluations conducted by licensed commercial facilities, in accordance with the Common Criteria, as part of the Australasian Information Security Evaluation Program (AISEP). All Common Criteria certified products are listed on the Common Criteria website.

Protection profiles

A protection profile is a technology-specific document that defines the security functions that must be included in a Common Criteria certified product to mitigate specific cyber threats. Protection profiles can be published by a recognised Common Criteria Recognition Arrangement (CCRA) scheme or by the CCRA body itself. Protection profiles published by the CCRA body are referred to as collaborative protection profiles.

The ACSC recognises Common Criteria evaluations against all protection profiles listed on the Common Criteria website. However, the AISEP only evaluates products against ACSC-endorsed protection profiles that are published on the ACSC's website. Where a protection profile 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 certified products can determine their suitability by reviewing their evaluation documentation. This includes the protection profile, security target, certification report and consumer guide.

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 protection profile exist outside of this scale. Notably, while products evaluated against a protection profile will fulfil the Common Criteria EAL requirements, the EAL number will not be published.

Security Control: 0280; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
If procuring an evaluated product, a product that has completed a protection profile 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: O, P, S, TS; Priority: Should
Evaluated products are delivered in a manner consistent with any delivery procedures defined in associated evaluation documentation.

Security Control: 0286; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When procuring high assurance ICT equipment, the ACSC is contacted for any equipment-specific delivery procedures.

Further information

Further information on the AISEP is available at https://www.cyber.gov.au/programs/australasian-information-security-evaluation-program-aisep.

The Common Criteria website is available at https://www.commoncriteriaportal.org/.

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 a formal assurance continuity process 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 vulnerabilities that were not considered as part of the product's evaluation.

For Common Criteria certified products, information is available from vendors regarding its installation, configuration, administration and operation. Additional information is also available in its evaluation documentation. For high assurance ICT equipment, installation and configuration guidance can be obtained from the ACSC.

Security Control: 0289; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Evaluated products are installed, configured, administered and operated in accordance with vendor guidance and evaluation documentation.

Security Control: 0290; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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 the information being protected by high assurance ICT equipment, it should always be operated in an evaluated configuration.

Security Control: 0292; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
High assurance ICT equipment is only operated in an evaluated configuration.

Further information

Further information on the use of ICT equipment can be found in the *Guidelines for ICT equipment management*.

Further information on patching can be found in the *System patching* section of the *Guidelines for system management*.

Guidelines for ICT equipment management

ICT equipment usage

Classifying ICT equipment

The purpose of classifying ICT equipment it to acknowledge the sensitivity or classification of information 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: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
ICT equipment is classified based on the highest sensitivity or classification of information that it is approved for processing, storing or communicating.

Labelling ICT equipment

Applying protective markings to ICT equipment assists to reduce the likelihood that a user will accidentally input information 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: O, P, S, TS; Priority: Must
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: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
The Australian Cyber Security Centre (ACSC)'s approval is sought before applying labels to external surfaces of high assurance ICT equipment.

Further information

Further information on classifying and labelling of media can be found in the *Media usage* section of the *Guidelines for media management*.

Further information on the use of protective markings can be found in the Attorney-General's Department (AGD)'s *Protective Security Policy Framework* (PSPF), *Sensitive and classified information* policy, at https://www.protectivesecurity.gov.au/information/sensitive-classified-information/.

ICT equipment maintenance and repairs

Maintenance and repairs by cleared technicians

Making unauthorised repairs to ICT equipment could impact its integrity. Using cleared technicians to maintain and repair ICT equipment on-site is considered the most secure approach. This ensures that if information is disclosed during the course of maintenance or repairs, the technicians are aware of the requirements to protect such information.

Security Control: 0305; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Where possible, maintenance and repairs of ICT equipment is carried out on-site by an appropriately cleared technician.

Security Control: 1079; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
The ACSC's approval is sought before undertaking any repairs to high assurance ICT equipment.

Maintenance and repairs by uncleared technicians

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: 0307; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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 information 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 physical transfer and storage requirements.

Security Control: 0310; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
ICT equipment maintained or repaired off-site is done so in accordance with the physical transfer and storage requirements for the sensitivity or classification of the ICT equipment.

Maintenance and repair of ICT equipment from secured spaces

When ICT equipment resides in an area that also contains ICT equipment of a higher classification, a technician could modify the lower classified ICT equipment in an attempt to compromise co-located ICT equipment of a higher classification.

Further information

Further information on the sanitisation of ICT equipment can be found in the **ICT equipment sanitisation and disposal** section of these guidelines.

Further information on the sanitisation of media can be found in the **Media sanitisation** section of the **Guidelines for media management**.

Further information on the storage and transfer of ICT equipment can be found in AGD's PSPF, **Physical security for entity resources** policy, at https://www.protectivesecurity.gov.au/physical/physical-security-entity-resources/.

ICT equipment sanitisation and disposal

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.

In addition, removing labels and markings indicating the classification, codewords, caveats, owner, system or network details as part of the disposal process will ensure ICT equipment does not display indications of its prior use and draw undue attention.

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 (SSDs)
- volatile memory, such as random-access memory sticks.

Security Control: 0313; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Procedures for the sanitisation and disposal of ICT equipment are developed and implemented.

Security Control: 0311; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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: 1217; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Labels and markings indicating the classification, codewords, caveats, owner, system, network, or any other marking that can associate the ICT equipment with its original use, are removed prior to disposal.

Security Control: 0316; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Following sanitisation, destruction or declassification, a formal administrative decision is made to handle ICT equipment, or its waste, as 'publicly releasable' before it is released into the public domain.

Sanitisation and disposal of highly sensitive ICT equipment

The ACSC provides specific advice on how to securely dispose of high assurance ICT equipment and TEMPEST-rated ICT equipment. In addition, ICT equipment located overseas that has processed or stored Australian Eyes Only (AUSTEO)

and Australian Government Access Only (AGAO) material can have more severe consequences for Australian interests if not sanitised and disposed of appropriately.

Security Control: 0315; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
If disposing of high assurance ICT equipment or TEMPEST-rated ICT equipment, the ACSC is contacted for requirements relating to its secure disposal.

Security Control: 1218; Revision: 1; Updated: Sep-18; Applicability: S, TS; Priority: Should
ICT equipment, including associated media, that is located overseas and has processed or stored AUSTEO or AGAO information is sanitised in situ where possible.

Security Control: 0312; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
ICT equipment, including associated media, that is located overseas and has processed or stored AUSTEO or AGAO information 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, transfer rollers and platens can become imprinted with text and images over time and should be destroyed if any 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: O, P, S, TS; Priority: Must
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: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
MFD print drums and image transfer rollers are inspected and destroyed if there is remnant toner which cannot be removed or if a print is visible on the image transfer roller.

Security Control: 1220; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Printer and MFD platens are inspected and destroyed if any images are retained on the platen.

Security Control: 1221; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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 information 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 information 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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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 information 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 by the ACSC, or vendor sanitisation guidance, should be consulted to determine the most appropriate method to remove information from a network device's memory.

Security Control: 1223; Revision: 3; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Must
Memory in network devices is sanitised using the following processes, in order of preference:

- *following device-specific guidance provided by the ACSC*

- *following vendor sanitisation guidance*

- *if guidance is unavailable, performing a full reset and loading of a dummy configuration file.*

Sanitising fax machines

Fax machines store information such as phone number directories and pages 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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Must
Fax machines are checked to ensure no pages are trapped in the paper path due to a paper jam.

Further information

Further information on the sanitisation, destruction and disposal of media can be found in the *Guidelines for media management*.

Guidelines for media management

Media usage

Removable media security policy

Establishing a removable media security policy will allow sound oversight and accountability of information transported or transferred between systems on removable media. In addition, a well-enforced removable media security policy can decrease the likelihood and consequence of accidental data spills and information theft or loss.

Security Control: 1359; Revision: 2; Updated: Apr-19; Applicability: O, P, S, TS; Priority: Should
A removable media security policy is developed and implemented that includes:

- *details of the removable media authority within the organisation*
- *types of media permitted within the organisation*
- *processes for media registration and auditing*
- *processes for media classification and labelling*
- *processes for the use of media for data transfers*
- *processes for the sanitisation/destruction and disposal of media.*

Classifying media storing information

Media that is not correctly classified could be handled and stored inappropriately or accessed by personnel who do not have appropriate security clearances.

Security Control: 0323; Revision: 5; Updated: Feb-19; Applicability: O, P, S, TS; Priority: Must
Media is classified to the highest sensitivity or classification of information stored on the media.

Classifying media connected to systems

There is no guarantee that information will not be copied to media while connected to a system unless read-only devices or read-only media are used.

Security Control: 0325; Revision: 5; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Must
Any media connected to a system is classified as the same sensitivity or classification as the system, unless the media is read-only, the media is inserted into a read-only device or the system has a mechanism through which read-only access can be ensured.

Reclassifying media

Media should always be protected according to the sensitivity or classification of the information it stores; however, if the sensitivity or classification of the information changes, so should the protection afforded to the media.

Security Control: 0331; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Media is reclassified if information copied onto the media is of a higher sensitivity or classification than the information already on the media, or information stored on the media is subject to a classification upgrade.

Security Control: 0330; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
If reclassifying media to a lower sensitivity or classification, the reclassification of all information on the media has been approved by the originator, or the media has been appropriately sanitised/destroyed and a formal administrative decision has been made to reclassify it.

Labelling media

Labelling media helps personnel to identify its sensitivity or classification and ensure that appropriate security controls are applied to its handling and usage.

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: O, P, S, TS; Priority: Must
Media, with the exception of internally mounted fixed media within ICT equipment, is labelled with protective markings reflecting its sensitivity or classification.

Connecting media to systems

Some operating systems provide functionality to automatically execute programs that reside on media. While this functionality was designed with a legitimate purpose in mind (e.g. such as automatically loading a graphical user interface for a user to browse the contents of media or to install software residing on the media) it can also be used for malicious purposes. For example, an adversary can create a file on media that the operating system believes it should automatically execute. When the operating system executes the file, it can have the same effect as when a user explicitly executes malicious code; however, in this case the user is taken out of the equation as the operating system executes the file without explicitly asking for permission.

Device access control software allows greater control over media that can be connected to systems and how it can be used. This assists in preventing unauthorised media being connected to systems and, if desired, preventing information from being written to it. Media can also be prevented from connecting to systems by disabling connection ports in software or by physical means such as using wafer seals or applying epoxy. If physical means are used to prevent media connecting to systems, procedures covering detection and reporting processes are needed in order to respond to attempts to bypass these security controls.

Security Control: 0337; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Media is not used with systems that are not authorised to process, store or communicate the sensitivity or classification of information on it.

Security Control: 0341; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Any automatic execution features for media are disabled in the operating system of systems.

Security Control: 0342; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Unauthorised media is prevented from connecting to systems via the use of device access control software, disabling connection ports, or by physical means.

Security Control: 0343; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Media is prevented from being written to via the use of device access control software if there is no business requirement for its use.

External interface connections that allow Direct Memory Access

It has been demonstrated that an adversary can connect media to a locked system via an external interface connection that allows Direct Memory Access (DMA) and subsequently gain access to encryption keys in memory. Furthermore, an adversary can read or write any content to memory that they desire. The best defence against this security vulnerability is to disable access to external interface connections that allow DMA using software controls or physical measures. External interface connections that allow DMA include FireWire, ExpressCard and Thunderbolt.

Security Control: 0345; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
External interface connections that allow DMA are disabled.

Handling media

As media can be easily misplaced or stolen, mechanisms should be put in place to protect information stored on it. Furthermore, applying encryption to media may reduce the requirements for storage and physical transfer. Any reduction in requirements needs to be based on the original sensitivity or classification of information residing on the media and the level of assurance in the encryption software being used to encrypt the media.

Security Control: 0831; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Media is handled in a manner suitable for its sensitivity or classification.

Security Control: 1059; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Media is encrypted with at least an Australian Signals Directorate Approved Cryptographic Algorithm.

Using media for data transfers

Organisations transferring data between systems belonging to different security domains are strongly encouraged to use write-once media. This will ensure that information from one of the systems cannot be accidently transferred onto the media then onto another system when the media is reused for the next transfer.

Security Control: 0347; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
When transferring data manually between two systems belonging to different security domains, write-once media is used.

Further information

Further information on accounting for and storing media can be found in the *ICT equipment and media* section of the *Guidelines for physical security*.

Further information on labelling ICT equipment can be found in the *ICT equipment usage* section of the *Guidelines for ICT equipment management*.

Further information on reducing storage and physical transfer requirements can be found in the *Cryptographic fundamentals* section of the *Guidelines for using cryptography*.

Further information on using media to transfer data between systems can be found in the *Guidelines for data transfers and content filtering*.

Further information on the use of protective markings can be found in the Attorney-General's Department (AGD)'s *Protective Security Policy Framework* (PSPF), *Sensitive and classified information* policy, at https://www.protectivesecurity.gov.au/information/sensitive-classified-information/.

Further information on the storage and transfer of media can be found in AGD's PSPF, *Physical security for entity resources* policy, at https://www.protectivesecurity.gov.au/physical/physical-security-entity-resources/.

Media sanitisation

Media in ICT equipment

ICT equipment will often contain devices that are quite small and may not be immediately recognisable as memory. Examples of these include M.2 or Mini-Serial Advanced Technology Attachment (mSATA) devices. When sanitising M.2 or mSATA devices, the sanitisation procedures for flash memory devices apply. Generally, if a device offers persistent storage of information, it is likely that the sanitisation procedures for flash memory will apply.

Hybrid hard drives

When sanitising hybrid hard drives, the sanitisation procedures for flash memory devices apply.

Solid state drives

When sanitising solid state drives (SSDs), the sanitisation procedures for flash memory devices apply.

Media that cannot be sanitised

When attempts to sanitise media are unsuccessful, the only way to provide assurance that all information has been erased is to destroy the media. Additionally, some types of media cannot be sanitised and therefore should be destroyed.

Sanitisation procedures

Sanitising media prior to reuse in a different environment ensures that information is not inadvertently accessed by unauthorised personnel or otherwise insufficiently protected.

Using approved sanitisation methods provides a level of assurance that no information will be left on media. The procedures described in this document are designed not only to prevent common information recovery practices but also to protect from those that could emerge in the future.

When sanitising media, it is necessary to read back the contents of the media to verify that the overwrite process was completed successfully.

Security Control: 0348; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Procedures for the sanitisation of media are developed and implemented.

Volatile media sanitisation

When sanitising volatile media, the specified time to wait following removal of power is based on applying a safety factor to the time recommended in research into preventing the recovery of the contents of volatile media.

If read back cannot be achieved following the overwriting of media contents, or information persists on the media, destroying the media is the only way to provide complete assurance information no longer persists.

Security Control: 0351; Revision: 5; Updated: Sep-18; Applicability: O, P; Priority: Must
Volatile media is sanitised by removing power from the media for at least 10 minutes or by overwriting all locations on the media with a random pattern followed by a read back for verification.

Security Control: 0352; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Must
Volatile media is sanitised by overwriting the media at least once in its entirety with a random pattern, followed by a read back for verification, and then followed by removing power from the media for at least 10 minutes.

Treatment of volatile media following sanitisation

Published literature suggests that short-term remanence effects are likely in volatile media. Data retention times have been reported to be measured in minutes at normal room temperatures and up to hours in extreme cold. Furthermore, some volatile media can suffer from long-term remanence effects resulting from physical changes to the media due to continuous storage of static data for an extended period 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 and a static image being displayed on a device and stored in volatile media for a period of months.

Security Control: 0835; Revision: 3; Updated: Sep-18; Applicability: TS; Priority: Must
Following sanitisation, highly classified 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

Both the host-protected area and device configuration overlay table of non-volatile magnetic media are normally not visible to an operating system or a computer's basic input/output system. Therefore, any sanitisation of the readable sectors of media will not overwrite these hidden sectors leaving any data contained in these locations untouched. Some sanitisation programs include the ability to reset media to their default state removing any host-protected areas or device configuration overlays. This allows the sanitisation program to see the entire contents of media during the subsequent sanitisation process.

Modern non-volatile magnetic media automatically reallocates 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 g-list, sanitising the media will not overwrite these non-addressable bad sectors. While these sectors may be considered bad by the media, quite often this is due to the sectors no longer meeting expected performance norms and not due to an inability to read/write to them. The Advanced Technology Attachment (ATA) secure erase command was built into the firmware of post-2001 media and is able to access sectors that have been added to the g-list.

Modern non-volatile magnetic media also contain a primary defects table or 'p-list'. The p-list contains a list of bad sectors found during post-production processes. No data is ever stored in sectors on the p-list as they are inaccessible before the media is used for the first time.

Security Control: 1065; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The host-protected area and device configuration overlay table of non-volatile magnetic media is reset prior to sanitisation.

Security Control: 0354; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Non-volatile magnetic media is sanitised by booting from separate media to the media being sanitised and then overwriting the media at least once (or three times if pre-2001 or under 15 Gigabytes) in its entirety with a random pattern followed by a read back for verification.

Security Control: 1067; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The ATA secure erase command is used where available, in addition to using block overwriting software, to ensure the growth defects table (g-list) is overwritten.

Treatment of non-volatile magnetic media following sanitisation

Due to concerns with the sanitisation of the host-protected area, device configuration overlay table and growth defects table, highly classified non-volatile magnetic media retains its classification following sanitisation.

Security Control: 0356; Revision: 5; Updated: Sep-18; Applicability: S, TS; Priority: Must
Following sanitisation, highly classified 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), the manufacturer's specification for ultraviolet erasure time should be multiplied by a factor of three to provide an additional level of certainty in the process.

Security Control: 0357; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Non-volatile EPROM media is sanitised by erasing the media in accordance with the manufacturer's specification, increasing the specified ultraviolet erasure time by a factor of three, then overwriting the media 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 best practice for sanitising non-volatile electrically erasable programmable read-only memory (EEPROM) media.

Security Control: 0836; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Non-volatile EEPROM media is sanitised by overwriting the media 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 ability to recover information from non-volatile EPROM and EEPROM media following sanitisation, highly classified EPROM and EEPROM media retains its classification following sanitisation.

Security Control: 0358; Revision: 5; Updated: Sep-18; Applicability: S, TS; Priority: Must
Following sanitisation, highly classified non-volatile EPROM and EEPROM media retains its classification.

Non-volatile flash memory media sanitisation

In flash memory media, a technique known as wear levelling ensures that writes are distributed evenly across each memory block. This feature necessitates flash memory being overwritten with a random pattern twice as this helps ensure that all memory blocks are overwritten.

Security Control: 0359; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Non-volatile flash memory media is sanitised by overwriting the media 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 flash memory, it is possible that not all memory locations were written to when attempting to overwrite the media. For this reason, highly classified flash memory media retains its classification following sanitisation.

Security Control: 0360; Revision: 5; Updated: Sep-18; Applicability: S, TS; Priority: Must
Following sanitisation, highly classified non-volatile flash memory media retains its classification.

Sanitising media prior to reuse

Sanitising media prior to reuse assists with enforcing the need-to-know principle.

Security Control: 0947; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
All media is sanitised prior to reuse.

Encrypted media

When applied appropriately, the use of encryption can provide additional assurance during media sanitisation, reuse and disposal. However, unless otherwise stated in consumer guides for evaluated encryption software, the use of encryption does not reduce the post-sanitisation classification of media.

Security Control: 1464; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Where a consumer guide for evaluated encryption software exists, the sanitisation and post-sanitisation requirements stated in the consumer guide are followed.

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 management*.

Further information on recoverability of information from volatile media can be found in the paper *Data Remanence in Semiconductor Devices* at https://www.usenix.org/legacy/events/sec01/full_papers/gutmann/gutmann.pdf.

The random-access memory (RAM) testing tool MemTest86 can be obtained from https://www.memtest86.com/.

The graphics card RAM testing tool MemtestG80 and MemtestCL can be obtained from https://www.simtk.org/home/memtest.

HDDerase is a freeware tool developed by the Center for Memory and Recording Research at the University of California San Diego. It is capable of calling the ATA secure erase command for non-volatile magnetic media. It is also capable of resetting the host-protected area and the device configuration overlay table information on the media. The tool is available for download from https://cmrr.ucsd.edu/resources/secure-erase.html.

Information on reliably erasing information from SSDs can be found in the paper *Reliably Erasing Data From Flash-Based Solid State Drives* at https://www.usenix.org/legacy/event/fast11/tech/full_papers/Wei.pdf.

Media destruction

Destruction procedures

Documenting procedures for media destruction will ensure that organisations carry out media destruction in an appropriate and consistent manner.

Security Control: 0363; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Procedures for the destruction of media are developed and implemented.

Media that cannot be sanitised

It is not possible to sanitise some types of media while maintaining a level of assurance that no information can be recovered.

Security Control: 0350; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
The following media types are destroyed prior to disposal as they cannot be sanitised:

- *microfiche and microfilm*
- *optical discs*
- *programmable read-only memory*
- *read-only memory*
- *other types of media that cannot be sanitised*
- *faulty media that cannot be successfully sanitised.*

Media destruction equipment

When physically destroying media, using approved equipment can provide a level of assurance that that information residing on the media is actually destroyed.

Approved equipment includes destruction equipment listed in the Security Construction and Equipment Committee (SCEC)'s *Security Equipment Evaluated Products List*, the Australian Security Intelligence Organisation (ASIO)'s

Security Equipment Guide (SEG)-009, *Optical Media Shredders*, and ASIO's SEG-018, *Destructors*. ASIO's SEG-009 and SEG-018 are available from the Protective Security Policy govdex community or ASIO by email.

If using degaussers to destroy media, the United States' National Security Agency maintains a list of evaluated degaussers while the United Kingdom's National Cyber Security Centre maintains a list of certified degaussers.

Security Control: 1361; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
SCEC or ASIO approved equipment is used when destroying media.

Security Control: 1160; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
If using degaussers to destroy media, degaussers evaluated by the United States' National Security Agency or certified by the United Kingdom's National Cyber Security Centre are used.

Media destruction methods

The destruction methods given below are designed to ensure that recovery of information is impossible or impractical.

Security Control: 1517; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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: 0366; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
One of the methods in the following table is used to destroy media.

Item	Destruction Methods					
	Furnace/ Incinerator	Hammer Mill	Disintegrator	Grinder/ Sander	Cutting	Degausser
Electrostatic memory devices	Yes	Yes	Yes	Yes	No	No
Magnetic floppy disks	Yes	Yes	Yes	No	Yes	Yes
Magnetic hard disks	Yes	Yes	Yes	Yes	No	Yes
Magnetic tapes	Yes	Yes	Yes	No	Yes	Yes
Optical disks	Yes	Yes	Yes	Yes	Yes	No
Semiconductor memory	Yes	Yes	Yes	No	No	No

Treatment of media waste particles

Following destruction, normal accounting and auditing procedures for media do not apply. However, depending on the destruction method used and the resulting particle size, it may still need to be stored and handled as classified waste.

The resulting waste for all destruction methods, except for furnace/incinerator and degausser, is stored and handled as per the following table.

Initial Media Handling	Screen Aperture Size Particles Can Pass Through		
	Less Than or Equal to 3 mm	Less Than or Equal to 6 mm	Less Than or Equal to 9 mm
TOP SECRET	OFFICIAL	SECRET	SECRET
SECRET	OFFICIAL	PROTECTED	SECRET
PROTECTED	OFFICIAL	OFFICIAL	OFFICIAL
OFFICIAL: Sensitive	OFFICIAL	OFFICIAL	OFFICIAL
OFFICIAL	OFFICIAL	OFFICIAL	OFFICIAL

Degaussing magnetic media

Degaussing magnetic media changes the alignment of magnetic domains resulting in information being permanently corrupted.

Coercivity (the resistance of magnetic material to change) varies between magnetic media types and between brands and models of the same type of media. Care is needed when degaussing magnetic media since a degausser of insufficient strength will not be effective. The United States' National Security Agency provides information on the common types of magnetic media and their associated coercivity ratings with their list of evaluated degaussers.

Since 2006, perpendicular magnetic media has been available. As some degaussers are only capable of sanitising longitudinal magnetic media, care needs to be taken to ensure that a suitable degausser is used.

Finally, to ensure that degaussers are being used in the correct manner to achieve an effective destruction outcome, product-specific directions provided by degausser manufacturers should be followed.

A degausser of sufficient field strength for the coercivity of the magnetic media is used, with the field strength being checked at regular intervals.

A degausser capable of the magnetic orientation (longitudinal or perpendicular) of the magnetic media is used.

Any product-specific directions provided by degausser manufacturers are followed.

Supervision of destruction

To verify that media is appropriately destroyed, the process needs to be supervised by at least one person cleared to the sensitivity or classification of the media being destroyed.

The destruction of media is performed under the supervision of at least one person cleared to the sensitivity or classification of the media being destroyed.

Security Control: 0371; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Personnel supervising the destruction of media supervise the handling of the media to the point of destruction and ensure that the destruction is completed successfully.

Supervision of accountable material destruction

Accountable material is more important than standard media. As such, its destruction should be supervised by at least two personnel who sign a destruction certificate afterwards.

Security Control: 0372; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
The destruction of accountable material is performed under the supervision of at least two personnel cleared to the sensitivity or classification of the media being destroyed.

Security Control: 0373; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Personnel supervising the destruction of accountable media supervise the handling of the material to the point of destruction, ensure that the destruction is completed successfully and sign a destruction certificate afterwards.

Outsourcing media destruction

ASIO has approved National Association for Information Destruction AAA certified destruction services with endorsements, as specified in ASIO's Protective Security Circular (PSC)-167, *External destruction of security classified information*, for the outsourced destruction of media. ASIO's PSC-167 is available from the Protective Security Policy govdex community or ASIO by email.

Security Control: 0840; Revision: 3; Updated: Sep-18; Applicability: O, P, S; Priority: Must
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: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The destruction of TOP SECRET media or accountable material is not outsourced.

Transporting media for external destruction

To prevent the unauthorised disclosure of official or classified information on media, it should be sanitised, if possible, before being transported to an off-site location for destruction.

Security Control: 1069; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
If possible, media is sanitised prior to transportation to an off-site location for destruction.

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 management*.

The United States' National Security Agency maintains a list of evaluated degaussers at https://www.nsa.gov/Portals/70/documents/resources/everyone/media-destruction/degausser-epl.pdf.

The United Kingdom's National Cyber Security Centre maintains a list of certified degaussers at https://www.ncsc.gov.uk/index/certified-product.

Further information on the SCEC's *Security Equipment Evaluated Products List* is available at https://www.scec.gov.au/catalogue.

Media disposal

Disposal of media

Before media, or its waste, can be released into the public domain it needs to be sanitised, destroyed or declassified. As the compromise of official information still presents a security risk, albeit minor, an appropriate authority needs to formally authorise its release into the public domain.

In addition, removing labels and markings indicating the classification, codewords, caveats, owner, system or network details as part of the disposal process will ensure media does not display indications of its prior use and draw undue attention.

Security Control: 0374; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Procedures for the disposal of media are developed and implemented.

Security Control: 0375; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Following sanitisation, destruction or declassification, a formal administrative decision is made to handle media, or its waste, as 'publicly releasable' before it is released into the public domain.

Security Control: 0378; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Labels and markings indicating the classification, codewords, caveats, owner, system, network, or any other marking that can associate media with its original use, are removed prior to disposal.

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 management*.

Guidelines for system hardening

Operating system hardening

Operating system versions

Newer versions of operating systems often introduce improvements in security functionality over older versions. This can make it more difficult for an adversary to craft reliable exploits for security vulnerabilities they discover. Using older versions of operating systems, especially those no longer supported by vendors, exposes organisations to exploitation techniques that have since been mitigated in newer versions of operating systems.

The x64 (64-bit) versions of Microsoft Windows include additional security functionality that the x86 (32-bit) versions lack. Using x86 (32-bit) versions of Microsoft Windows exposes organisations to exploitation techniques mitigated by x64 (64-bit) versions of Microsoft Windows.

Security Control: 1407; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The latest version (N), or N-1 version, of an operating system is used for Standard Operating Environments (SOEs).

Security Control: 1408; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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 easily lead to an unsafe operating environment allowing an adversary to gain an initial foothold on a network. Many options 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) produces hardening guidance to assist in securely configuring various operating systems.

Security Control: 1409; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
ACSC and vendor guidance is implemented to assist in hardening the configuration of operating systems.

Security Control: 0383; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Default operating system accounts are disabled, renamed or have their passphrase changed.

Security Control: 0380; Revision: 7; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Unneeded operating system accounts, software, components, services and functionality are removed or disabled.

Security Control: 1491; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Standard users are prevented from running all script execution engines shipped with Microsoft Windows including Windows Script Host (cscript.exe and wscript.exe), powershell.exe, powershell_ise.exe, cmd.exe, wmic.exe and Microsoft 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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
Unique domain accounts with local administrative privileges, but without domain administrative privileges, are used for workstation and server management.

Application management

While the ability to install applications may be a business requirement for users, this privilege can be exploited by an adversary who can email a malicious application, or host it on a compromised website, and use social engineering techniques to convince users into installing it. Even if privileged access is required to install applications, users will often use their privileged access if they believe, or can be convinced that, the requirement to install the application is legitimate. Additionally, if applications are configured to install using elevated privileges, an adversary can exploit this by creating a Windows Installer installation package to create a new account that belongs to the local administrators group.

Security Control: 0382; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Users do not have the ability to install, uninstall or disable software.

Application whitelisting

An adversary can email malicious code, or host malicious code on a compromised website, and use social engineering techniques to convince users into executing it. Such malicious code often aims to exploit security vulnerabilities in existing applications and does not need to be installed to be successful.

Application whitelisting, when implemented in its most effective form (i.e. using hashes for executables, software libraries, scripts and installers) can be an extremely effective mechanism in not only preventing malicious code from executing, but also ensuring only authorised applications can be installed. Other implementations of application whitelisting (e.g. using approved paths for installed applications, in combination with access controls requiring privileged access to write to those locations) can still be a very effective mitigation strategy.

When developing application whitelisting rule sets, defining a list of 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) and installers (e.g. .msi, .msp and .mst files) from scratch is a more secure method than relying on a list of those currently residing on a workstation or server. Furthermore, it is preferable that organisations define their own approved list of executables, software libraries, scripts and installers rather than relying on lists from application whitelisting vendors.

Security Control: 0843; Revision: 7; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
An application whitelisting solution is implemented on all workstations to restrict the execution of executables, software libraries, scripts and installers to an approved set.

Security Control: 1490; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
An application whitelisting solution is implemented on Active Directory servers, email servers and other servers handling user authentication to restrict the execution of executables, software libraries, scripts and installers to an approved set.

Security Control: 0846; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
All users (with the exception of privileged users when performing specific administrative activities) cannot disable, bypass or be exempted from application whitelisting mechanisms.

Security Control: 0955; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Application whitelisting is implemented using cryptographic hash rules, publisher certificate rules or path rules.

Security Control: 1471; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When implementing application whitelisting using publisher certificate rules, both publisher names and product names are used.

Security Control: 1392; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When implementing application whitelisting 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: 0957; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Application whitelisting solutions are configured to generate event logs for failed execution attempts, including information such as the name of the blocked file, the date/time stamp and the username of the user attempting to execute the file.

Enhanced Mitigation Experience Toolkit and Exploit protection

An adversary who develops exploits for Microsoft Windows will be more successful in exploiting security vulnerabilities when Microsoft's Enhanced Mitigation Experience Toolkit (EMET) has not been installed. EMET was designed to provide a number of system-wide mitigation measures while also providing application-specific mitigation measures. From Microsoft Windows 10 version 1709 and Microsoft Windows Server 2016 onwards, EMET functionality has been incorporated directly into the operating system as part of 'Exploit protection' functionality.

Security Control: 1414; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
If supported, the latest version of Microsoft's EMET is implemented on workstations and servers and configured with both operating system mitigation measures and application-specific mitigation measures.

Security Control: 1492; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
If supported, Microsoft's 'Exploit protection' functionality is implemented on workstations and servers.

Host-based Intrusion Prevention System

Many endpoint security solutions rely on signatures to detect malicious code. This approach is only effective when a particular piece of malicious code has already been profiled and signatures are current. Unfortunately, an adversary can create variants of known malicious code, or develop new unseen malicious code, to bypass traditional signature-based detection mechanisms. A Host-based Intrusion Prevention System (HIPS) can use behaviour-based detection schemes 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 antivirus vendors.

Security Control: 1341; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
A HIPS is implemented on workstations.

Security Control: 1034; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A HIPS is implemented on high value servers such as authentication servers, Domain Name System (DNS) servers, web servers, file servers and email servers.

Software firewall

Network firewalls often fail to prevent the propagation of malicious code on a network, or an adversary from extracting important information, as they generally 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 DNS. Software firewalls are more effective than network firewalls as they can control which applications and services can communicate to and from workstations and servers. The in-built Windows firewall should be used to control both inbound and outbound traffic for specific applications.

Security Control: 1416; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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 not use secure coding practices. An adversary can take advantage of this by developing malicious code to exploit security vulnerabilities that have not been detected and remedied. As significant time and effort is often involved in developing functioning and reliable exploits, an adversary will often reuse their exploits as much as possible. While exploits may be profiled by antivirus vendors, they often remain a variable intrusion method in organisations that do not have any measures in place to detect them.

Security Control: 1417; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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*

- *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: 2; Updated: Sep-18; Applicability: O, P; Priority: Should
Antivirus software has reputation rating functionality enabled.

Endpoint device control software

The use of endpoint device control software to control the use of unauthorised devices adds value as part of a defence-in-depth approach to the protection of workstations and servers.

Security Control: 1418; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Endpoint device control software is implemented on workstations and servers to prevent unauthorised devices from being used.

Further information

Further information on identifying, authenticating and authorising users (including privileged users) of systems can be found in the *System access* section of these guidelines.

Further information on the use of removable media with systems can be found in the *Media usage* section of the *Guidelines for media management*.

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 following ACSC publications:

- *Hardening Microsoft Windows 7 SP1 Workstations* at https://www.cyber.gov.au/publications/hardening-microsoft-windows-7-sp1-workstations

- *Hardening Microsoft Windows 8.1 Update Workstations* at https://www.cyber.gov.au/publications/hardening-microsoft-windows-8-1-update-workstations

- *Hardening Microsoft Windows 10 version 1709 Workstations* at https://www.cyber.gov.au/publications/hardening-microsoft-windows-10-build-1709.

Further information regarding application whitelisting can be found in the ACSC's *Implementing Application Whitelisting* publication at https://www.cyber.gov.au/publications/implementing-application-whitelisting.

Further information on Microsoft's EMET is available at https://support.microsoft.com/en-au/help/2458544/the-enhanced-mitigation-experience-toolkit.

Further information on Microsoft's Exploit protection functionality is available at https://docs.microsoft.com/en-au/windows/security/threat-protection/windows-defender-exploit-guard/exploit-protection-exploit-guard.

Independent testing of different antivirus software and their effectiveness is available at https://www.av-comparatives.org/ and https://av-test.org/en/.

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 in their applications.

Security Control: 0938; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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 over older versions. 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 (e.g. Microsoft Office), PDF viewers (e.g. Adobe Reader), web browsers (e.g. Microsoft Internet Explorer, Mozilla Firefox or Google Chrome), common web browser plugins (e.g. Adobe Flash), email clients (e.g. Microsoft Outlook) and software platforms (e.g. Oracle Java Platform and Microsoft .NET Framework), exposes organisations to exploitation techniques that have since been mitigated in newer versions of applications.

Security Control: 1467; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The latest releases of key business applications such as office productivity suites, PDF viewers, web browsers, common web browser plugins, email clients and software platforms are used when present within SOEs.

Security Control: 1483; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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 lower security level. This is especially risky for key business applications such as office productivity suites, Portable Document Format (PDF) viewers, web browsers, common web browser plugins, email clients and software platforms that are likely to be targeted by an adversary. To assist in minimising this security risk, the ACSC produces hardening guidance to assist in securely configuring key business applications. Further, to assist in securely configuring their applications, vendors may provide their own security guides.

Security Control: 1412; Revision: 2; Updated: Feb-19; Applicability: O, P, S, TS; Priority: Should
ACSC and vendor guidance is implemented to assist in hardening the configuration of Microsoft Office, web browsers and PDF viewers.

Security Control: 1484; Revision: 1; Updated: Jan-19; Applicability: O, P, S, TS; Priority: Must
Web browsers are configured to block or disable support for Flash content.

Security Control: 1485; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Web browsers are configured to block web advertisements.

Security Control: 1486; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Web browsers are configured to block Java from the Internet.

Security Control: 1541; Revision: 0; Updated: Jan-19; Applicability: O, P, S, TS; Priority: Must
Microsoft Office is configured to disable support for Flash content.

Security Control: 1542; Revision: 0; Updated: Jan-19; Applicability: O, P, S, TS; Priority: Must
Microsoft Office is configured to prevent activation of Object Linking and Embedding packages.

Security Control: 1470; Revision: 3; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Should
Any unrequired functionality in Microsoft Office, web browsers and PDF viewers is disabled.

Security Control: 1235; Revision: 2; Updated: Apr-19; Applicability: O, P, S, TS; Priority: Should
The use of Microsoft Office, web browser and PDF viewer add-ons is restricted to organisation approved add-ons.

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 sensitive or classified information. To reduce this security risk, organisations should disable or secure their use of Microsoft Office macros.

Security Control: 1487; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Microsoft Office macros are only allowed to execute in documents from Trusted Locations where write access is limited to personnel whose role is to vet and approve macros.

Security Control: 1488; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Microsoft Office macros in documents originating from the Internet are blocked.

Security Control: 1489; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Microsoft Office macro security settings cannot be changed by users.

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 Office 2013* publication at https://www.cyber.gov.au/publications/hardening-microsoft-office-2013 and the ACSC's *Hardening Microsoft Office 365 ProPlus, Office 2019 and Office 2016* publication at https://www.cyber.gov.au/publications/hardening-microsoft-office-2016.

Further information on configuring Microsoft Office macro settings can be found in the ACSC's *Microsoft Office Macro Security* publication at https://www.cyber.gov.au/publications/microsoft-office-macro-security.

Further information on configuring Microsoft Office to block macros in documents originating from the Internet can be found at https://cloudblogs.microsoft.com/microsoftsecure/2016/03/22/new-feature-in-office-2016-can-block-macros-and-help-prevent-infection/.

System access

Account types

When this document refers to passphrase policies, it is equally applicable to all account types. This includes user accounts, privileged accounts and service accounts.

User identification

Having uniquely identifiable users ensures accountability. In addition, where systems contain Australian Eyes Only (AUSTEO), Australian Government Access Only (AGAO) or nationality releasability information, and foreign nationals have access to the systems, it is important that security controls are implemented to ensure foreign nationals are identified as such.

Security Control: 0414; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
All users are uniquely identifiable and authenticated on each occasion that access is granted to a system.

Security Control: 1538; Revision: 0; Updated: Sep-18; Applicability: P, S, TS; Priority: Must
Where systems contain nationality releasability information, all users who are foreign nationals, including seconded foreign nationals, are uniquely identifiable.

Security Control: 0420; Revision: 7; Updated: Sep-18; Applicability: S, TS; Priority: Must
Where systems contain AUSTEO or AGAO information, all users who are foreign nationals, including seconded foreign nationals, are uniquely identifiable.

Security Control: 0975; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Security controls used to identify users who are foreign nationals, including seconded foreign nationals, include identification measures that specify their nationality.

Shared user accounts

Shared user accounts can hamper efforts to attribute actions on a system to specific personnel, and their use should be avoided. However, if there is a strong business justification for their use, a method of attributing actions undertaken by shared accounts to specific personnel should be implemented. For example, a logbook may be used to document the date and time that a person takes responsibility for using a shared user account.

Security Control: 0415; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
The use of shared user accounts is controlled and auditable.

Single-factor authentication

A significant threat to the compromise of user accounts is offline passphrase cracking tools. When an adversary gains access to a list of usernames and hashed passphrases from a system, they can attempt to recover passphrases by comparing the hash of a known passphrase with the hashes from the list of hashed passphrases that they obtained. By finding a match, an adversary will know the passphrase associated with a given username. Combined, this often forms a complete set of authentication information for an account. In order to reduce this security risk, organisations can implement multi-factor authentication. Alternatively, an organisation may attempt to increase the time on average it takes an adversary to compromise a passphrase by increasing both its complexity and length while decreasing the time it remains valid.

Security Control: 0417; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A numerical password is not used as the sole method of authenticating a user.

Security Control: 0421; Revision: 5; Updated: Sep-18; Applicability: O, P, S; Priority: Must
Passphrases used as the sole method of authentication enforce a minimum of 13 alphabetic characters; or a minimum of 10 characters consisting of at least three of the following character sets:

- *lowercase alphabetic characters (a-z)*
- *uppercase alphabetic characters (A-Z)*
- *numeric characters (0-9)*
- *special characters.*

Security Control: 0422; Revision: 5; Updated: Sep-18; Applicability: TS; Priority: Must
Passphrases used as the sole method of authentication enforce a minimum of 15 alphabetic characters; or a minimum of 11 characters consisting of at least three of the following character sets:

- *lowercase alphabetic characters (a-z)*
- *uppercase alphabetic characters (A-Z)*
- *numeric characters (0-9)*
- *special characters.*

Security Control: 0423; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Passphrase management practices:

- *ensure that passphrases are changed at least every 90 days*
- *prevent passphrases from being changed by a user more than once a day*
- *prevent passphrases from being reused within eight passphrase changes*
- *prevent the use of sequential passphrases where possible*
- *prevent passphrases being stored in cleartext.*

Security Control: 1426; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When systems cannot be configured to enforce passphrase complexity and management practices, passphrases are checked by alternative means for compliance with passphrase policies.

Multi-factor authentication

Multi-factor authentication uses independent methods to confirm a user's identity. It may include:

- something a user knows, such as a passphrase or a response to a security question
- something a user has, such as a passport, physical token or an identity card
- something unique about a user, such as a fingerprint or their face's geometry.

Any two of these methods are required to have multi-factor authentication. If something a user knows is written down, or typed into a file and stored as plaintext, this evidence becomes something that a user has rather than something a user knows.

Privileged users, positions of trust, 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.

When implementing multi-factor authentication, a number of different authentication factors can be implemented in addition to passphrases. Unfortunately, some authentication factors such as those sent via Short Message Service are more susceptible to compromise by an adversary than others. For this reason, a limited number of authentication methods are recommended for use as part of a multi-factor authentication implementation.

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 did not require the use of multi-factor authentication.

Security Control: 0974; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Multi-factor authentication is used to authenticate standard users.

Security Control: 1173; Revision: 3; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Must
Multi-factor authentication is used to authenticate all privileged users and any other positions of trust.

Security Control: 1504; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Multi-factor authentication is used to authenticate all users of remote access solutions.

Security Control: 1505; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Multi-factor authentication is used to authenticate all users when accessing important data repositories.

Security Control: 1401; Revision: 3; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Must
Multi-factor authentication uses at least two of the following authentication factors: passwords with six or more characters, Universal 2nd Factor security keys, physical one-time password tokens, biometrics or smartcards.

Security Control: 1357; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
When multi-factor authentication is implemented, none of the authentication factors on their own can be used for single-factor authentication to another system.

Passphrase authentication

Local Area Network (LAN) Manager's authentication mechanism uses a very weak hashing algorithm known as the LAN Manager hash algorithm. Passphrases hashed using the LAN Manager hash algorithm can easily be compromised using rainbow tables or brute force attacks.

Security Control: 1055; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
LAN Manager is disabled for passphrase authentication on workstations and servers.

Account lockouts

Locking an account after a specified number of failed logon attempts reduces the likelihood of successful passphrase guessing attacks. However, care should be taken as implementing account lockout functionality in a web application can increase the likelihood of a denial of service.

Security Control: 1403; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Accounts are locked after a maximum of five failed logon attempts.

Security Control: 0431; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Repeated account lockouts are investigated before reauthorising access.

Resetting passphrases

To reduce the likelihood of social engineering being used to compromise accounts, users should provide sufficient evidence to verify their identity when requesting a passphrase reset. This evidence could be in the form of the user:

- physically presenting themselves and their security pass to service desk personnel who then reset their passphrase

- physically presenting themselves to a known colleague who uses an approved online tool to reset their passphrase

- establishing their identity by responding correctly to a number of challenge response questions before resetting their own passphrase.

In addition, issuing accounts with unique complex reset passphrases ensures the security of the account is maintained during the passphrase reset process.

Security Control: 0976; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Users provide sufficient evidence to verify their identity when requesting a passphrase reset.

Security Control: 1227; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Passphrases resets are:

- *random for each individual reset*

- *not reused when resetting multiple accounts*

- *not based on a single dictionary word*

- *not based on another identifying factor, such as the user's name or the date.*

Protecting authentication information

Storing authentication information with a system that it grants access to increases the likelihood of an adversary gaining access to the system. For example, a passphrase should never be written down and stuck to a laptop or computer monitor.

If storing authentication information on a system, sufficient protection should be implemented to prevent the authentication information from being compromised as part of a targeted cyber intrusion. For example, usernames and passphrases for databases should be stored in a password vault rather than in a Microsoft Word or Excel document. In addition, secure transmission of authentication information reduces the likelihood of an adversary intercepting and using the authentication information to access a system under the guise of a valid user.

Security Control: 0418; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Authentication information is stored separately from a system to which it grants access.

Security Control: 1402; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Authentication information stored or communicated by a system is protected from unauthorised access.

Session and screen locking

Session and screen locking prevents unauthorised access to a system which a user has already been authenticated to access.

Security Control: 0428; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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*

- *completely conceals all information on the screen*

- *ensures that the screen does not enter a power saving state before the screen or session 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 after they authenticate to a system reminds them of their security responsibilities. Logon banners may cover topics such as:

- 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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
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 at https://www.cyber.gov.au/publications/restricting-administrative-privileges.

Further information on implementing multi-factor authentication can be found in the ACSC's ***Implementing Multi-Factor Authentication*** publication at https://www.cyber.gov.au/publications/multi-factor-authentication.

Further information on mitigating the use of stolen credentials can be found in the ACSC's ***Mitigating the Use of Stolen Credentials*** publication at https://www.cyber.gov.au/publications/mitigating-the-use-of-stolen-credentials.

Guidelines for system management

System administration

What is secure system administration

Secure system administration allows organisations to be resilient in the face of targeted cyber intrusions by protecting administrator workstations and accounts from compromise, as well as making adversary movement throughout a network more difficult. If a secure system administration environment withstands a targeted cyber intrusion, incident response will be far more agile, the damage will be limited and remediation work will be completed faster.

Secure system administration of cloud-based resources

With the increased use of cloud-based resources, organisations may require administrative workstations to communicate with external assets on the Internet. In this scenario it is still important that security controls are put in place to prevent unnecessary communication with arbitrary hosts and protocols.

Administrative accounts

The use of the same credentials on both an administrator workstation and a user workstation puts the administrator workstation at risk of compromise if the user workstation is compromised. The table below provides clarification on the use of different accounts.

Regular User Account	Unprivileged Administration Account	Privileged Administration Account
Unprivileged account	Unprivileged account	Privileged account
Used for web and email access Used for day-to-day non-administrative tasks	Used for authentication to dedicated administrator workstation Used for authentication to jump server(s)	Used for performance of administration tasks
	Different username and passphrase to regular user account	Different username and passphrase to regular user account

Separate administrator workstations

One of the greatest threats to the security of a network as a whole is the compromise of a workstation used for administration activities. Providing a physically separate hardened administrator workstation to privileged users, in addition to their workstation used for unprivileged user access, provides greater assurance that privileged activities and credentials will not be compromised.

Using different physical machines is considered the most secure solution to separate workstations; however, a risk-based approach may determine that a virtualisation-based solution is sufficient. In such cases, the unprivileged user environment should be the 'guest' and the administrative environment should be the 'host'.

Security Control: 1380; Revision: 3; Updated: Sep-18; Applicability: O, P; Priority: Should
Privileged users use a dedicated administrator workstation when performing privileged tasks.

Multi-factor authentication

Multi-factor authentication is vital to any secure system administration implementation as it can limit the consequences of a compromise by preventing or slowing an adversary's ability to gain unrestricted access to assets.

Multi-factor authentication may be implemented as part of the jump server authentication process rather than performing multi-factor authentication on all critical assets, some of which may not support multi-factor authentication.

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.

Restriction of management traffic flows

Limiting the flow of management traffic to only those network elements and segments 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.

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 (such as Remote Desktop Protocol [RDP], Secure Shell [SSH] and similar protocols) 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.
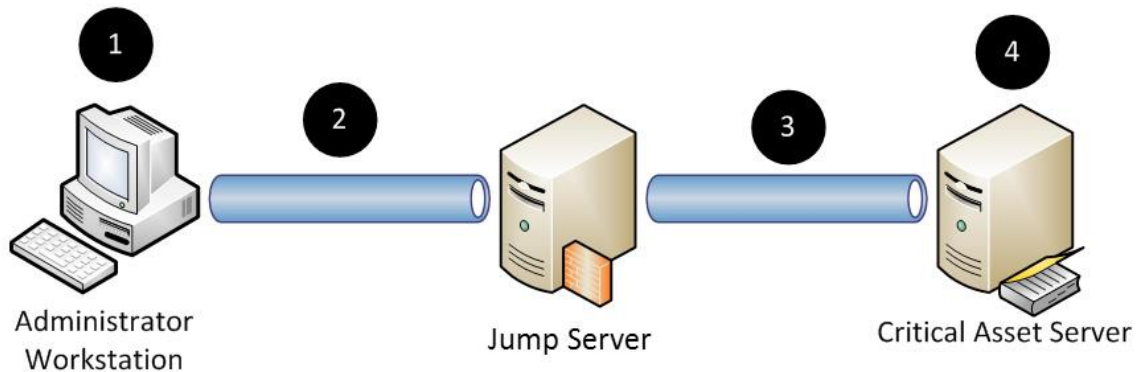
Jump servers

A jump server (also known as a jump host or jump box) is used to manage important or critical 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 RDP or SSH. However, in a jump server setup the privileged user would first connect and authenticate to the jump server, then RDP, SSH, or use 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: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
All administrative actions are conducted through a jump server.

Security Control: 1388; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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 can be found in the *System access* 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 network management*.

Further information on secure system administration can be found in the Australian Cyber Security Centre (ACSC)'s *Secure Administration* publication at https://www.cyber.gov.au/publications/secure-administration.

Further information on mitigating the use of stolen credentials can be found in the ACSC's *Mitigating the Use of Stolen Credentials* publication at https://www.cyber.gov.au/publications/mitigating-the-use-of-stolen-credentials.

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 at https://www.microsoft.com/en-au/download/confirmation.aspx?id=36036.

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 can 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 can be prevented by:

- applying external input sanitisation (if an input triggers the exploit)
- applying filtering or verification on output (if the exploit relates to an information disclosure)
- 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 can 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 can 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.

Patching security vulnerabilities

Applying patches or updates is critical to ensuring the security of systems. To assist in this, information sources should be monitored for information about new security vulnerabilities and associated patches or updates.

Security Control: 1143; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
An overarching strategy is developed and implemented for the patching, updating or mitigation of security vulnerabilities in applications, drivers, operating systems and firmware in workstations, servers, mobile devices, network devices and all other ICT equipment.

Security Control: 1493; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
To maintain visibility of applications, drivers, operating systems and firmware that potentially require patching or updating, an inventory (including details of versions and patching histories) is maintained for workstations, servers, mobile devices, network devices and all other ICT equipment.

When to patch security vulnerabilities

There are multiple information sources that organisations can use to assess the applicability and impact of security vulnerabilities in the context of their environment. This can include information published in vendor security bulletins or in severity ratings assigned to security vulnerabilities using standards such as the Common Vulnerability Scoring System.

Once a patch is released by a vendor, and the associated security vulnerability has been assessed for its applicability and importance, the patch should be deployed in a timeframe that is commensurate with the security risk. Doing so ensures that resources are spent in an effective and efficient manner by focusing effort on the most significant security risks first.

If a patch is released for high assurance ICT equipment, the ACSC will conduct an assessment of the patch and may revise the ICT equipment's usage guidance. Where required, the Australian Signals Directorate will conduct an assessment of any cryptographic security vulnerability and the ACSC may revise usage guidance in the consumer guide or Australian Communications Security Instruction. If a patch for high assurance ICT equipment is approved for deployment, the ACSC will inform organisations of the timeframe in which the patch is to be deployed.

If no patches are immediately available for security vulnerabilities, temporary workarounds may provide the only effective protection until patches become available. These workarounds may be published in conjunction with, or soon after, security vulnerability announcements. Temporary workarounds 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. The decision as to whether a temporary workaround is implemented should be risk-based, as with patching.

Security Control: 1144; Revision: 9; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Security vulnerabilities in applications and drivers assessed as extreme risk are patched, updated or mitigated within 48 hours of the security vulnerabilities being identified by vendors, independent third parties, system managers or users.

Security Control: 0940; Revision: 8; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Security vulnerabilities in applications and drivers assessed as high risk are patched, updated or mitigated within two weeks of the security vulnerability being identified by vendors, independent third parties, system managers or users.

Security Control: 1472; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Security vulnerabilities in applications and drivers assessed as moderate or low risk are patched, updated or mitigated within one month of the security vulnerability being identified by vendors, independent third parties, system managers or users.

Security Control: 1494; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Security vulnerabilities in operating systems and firmware assessed as extreme risk are patched, updated or mitigated within 48 hours of the security vulnerabilities being identified by vendors, independent third parties, system managers or users.

Security Control: 1495; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Security vulnerabilities in operating systems and firmware assessed as high risk are patched, updated or mitigated

within two weeks of the security vulnerability being identified by vendors, independent third parties, system managers or users.

Security Control: 1496; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Security vulnerabilities in operating systems and firmware assessed as moderate or low risk are patched, updated or mitigated within one month of the security vulnerability being identified by vendors, independent third parties, system managers or users.

Security Control: 0300; Revision: 6; Updated: Sep-18; Applicability: S, TS; Priority: Must
High assurance ICT equipment is only patched with patches 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: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Where possible, a centralised and managed approach is used to patch or update applications and drivers.

Security Control: 0303; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Where possible, a centralised and managed approach is used to patch or update operating systems and firmware.

Security Control: 1499; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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.

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.

Security Control: 0304; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Applications that are no longer supported by vendors with patches or updates for security vulnerabilities are updated or replaced with vendor-supported versions.

Security Control: 1501; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Operating systems for workstations, servers and ICT equipment that are no longer supported by vendors with patches or updates for security vulnerabilities are updated or replaced with vendor-supported versions.

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 what constitutes different levels of security risk for security vulnerabilities can be found in the ACSC's *Assessing Security Vulnerabilities and Applying Patches* publication at https://www.cyber.gov.au/publications/assessing-security-vulnerabilities-and-applying-patches.

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 process

As part of any change process, stakeholders should be consulted before a change is made. The use of a change management process ensures that changes are made in an accountable manner and with appropriate approval. Furthermore, a change management process provides an opportunity for the security impact of changes to be considered.

The most likely scenario for bypassing change management processes is when an urgent change needs to be made. Before and after an urgent change is implemented, it is essential that the change management process strongly enforces appropriate actions to be taken.

Security Control: 1211; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A change management process is developed and implemented that includes:

- *identification and documentation of changes to be made*

- *approval required for changes to be made*

- *implementation and testing of approved changes*

- *any actions to be taken before and after approved changes are made.*

Security Control: 0115; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
For routine and urgent changes:

- *the change management process is followed*

- *any proposed change that could impact the security of a system is approved by the system's authorising officer*

- *all associated security documentation is updated to reflect the change.*

Data backups

Backup, restoration and preservation strategies

Having backup, restoration and preservation strategies in place is an important part of business continuity, disaster recovery and digital preservation planning as it can assist in ensuring the integrity and availability of important information and systems is maintained.

Security Control: 1510; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Backup, restoration and preservation strategies are developed and implemented as part of business continuity, disaster recovery and digital preservation planning.

Performing backups

When performing backups, all important information, software and configuration settings for software, network devices and other ICT equipment should be captured on a daily basis. This will ensure that should a system fall victim to a ransomware attack, important information will not be lost and that business operations will have reduced downtime.

Security Control: 1511; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Backups of important information, software and configuration settings are performed at least daily.

Backup storage

To mitigate the likelihood of information becoming unavailable due to accidental or malicious deletion of backups, organisations should ensure that backups are protected from unauthorised modification, corruption and deletion. This can be achieved by storing backups offline, ideally at multiple geographically-dispersed locations, or online but in a non-rewritable and non-erasable manner, such as through the use of write once, read many technologies.

Security Control: 1512; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Backups are stored offline, or online but in a non-rewritable and non-erasable manner.

Security Control: 1513; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Backups are stored at a multiple geographically-dispersed locations.

Retention periods for backups

To prevent backups from being retained for an insufficient amount of time to allow for the recovery of information, organisations are strongly encouraged to store backups for three months or greater. In addition, when determining backup retention times, organisations are encouraged to consult with relevant retention requirements as documented in the National Archives of Australia's *Administrative Functions Disposal Authority* publication.

Security Control: 1514; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Backups are stored for three months or greater.

Testing backup and restoration processes

To ensure that backups can be restored when the need arises, it is important that a full backup and restoration process has been tested at least once following the implementation of backup technologies and processes. Furthermore, full backup and restoration processes should be tested each time fundamental information technology changes occur, such as when deploying new backup technologies. In the intervening time, it is important that regular testing in the form of a partial backup and restoration process is undertaken to maintain assurances that backup and restoration processes still work.

Security Control: 1515; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Full backup and restoration processes are tested at least once when initially implemented and each time fundamental information technology infrastructure changes occur.

Security Control: 1516; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Partial backup and restoration processes are tested on an annual or more frequent basis.

Further information

Further information on business continuity can be found in the *Service continuity for online services* section of the *Guidelines for network management*.

Further information on retention periods for information can be found in the National Archives of Australia's *Administrative Functions Disposal Authority* publication at http://www.naa.gov.au/information-management/records-authorities/types-of-records-authorities/AFDA/index.aspx.

Further information on digital preservation strategies can be found on the National Archives of Australia's website at: http://www.naa.gov.au/information-management/managing-information-and-records/preserving/digital-pres/index.aspx.

Guidelines for system monitoring

Event logging and auditing

Event logging strategy

By developing an event logging strategy, an organisation can ensure the accountability of all user actions on a system and improve their chances of detecting malicious behaviour.

Security Control: 0580; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
An event logging strategy is developed and implemented covering events to be logged, logging facilities to be used, event log retention periods and how event logs will be protected.

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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
For any system requiring authentication, logon, failed logon and logoff events are logged.

Security Control: 0582; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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 (DNS) 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 external media*

- *user or group management*
- *use of special privileges.*

Security Control: 1536; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The following events are logged for databases:

- *access to particularly important information*
- *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.*

Events 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: O, P, S, TS; Priority: Must
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 ensures the integrity and availability of captured event logs.

Security Control: 0586; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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's ***Administrative Functions Disposal Authority*** publication is seven years.

Security Control: 0859; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
*Event logs are retained for a minimum of 7 years in accordance with the National Archives of Australia's **Administrative Functions Disposal Authority** publication.*

Security Control: 0991; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
DNS and proxy logs are retained for at least 18 months.

Event log auditing

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: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Should
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 retaining event logs can be found in the National Archives of Australia's **Administrative Functions Disposal Authority** publication at http://www.naa.gov.au/information-management/records-authorities/types-of-records-authorities/AFDA/index.aspx.

Vulnerability management

Vulnerability management strategy

Vulnerability management activities can assist organisations to be proactive in 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 systems. Undertaking regular vulnerability management activities is important as cyber threats will change over time.

Security Control: 1163; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
A vulnerability management strategy is developed and implemented that includes:

- *conducting vulnerability assessments and penetration tests for systems throughout their life cycle to identify security vulnerabilities*

- *analysing identified security vulnerabilities to determine their potential impact and appropriate mitigations or treatments based on effectiveness, cost and existing security controls*

- *using a risk-based approach to prioritise the implementation of identified mitigations or treatments*

- *monitoring information on new or updated security vulnerabilities in operating systems, software and ICT equipment as well as other elements which may adversely impact the security of a system.*

Conducting vulnerability assessments and penetration tests

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. A penetration test however is designed to exercise real-world targeted cyber intrusion scenarios in an attempt to achieve a specific goal, such as compromising critical business information or services.

Conducting a vulnerability assessment and penetration test prior to systems being deployed, and after significant changes, can allow an organisation to establish a baseline for system monitoring activities. In addition, conducting a vulnerability assessment and penetration test annually can ensure that the latest cyber threats are being addressed.

Overall, a vulnerability assessment or penetration test should be conducted by suitably skilled personnel independent of the system being assessed. Such personnel can be internal to an organisation or a third party. Where possible, it is advisable that system managers do not conduct such activities themselves. This ensures that there is no conflict of interest, perceived or otherwise, and that the activities are undertaken in an objective manner.

Security Control: 0911; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Vulnerability assessments and penetration tests are conducted by suitably skilled personnel before a system is deployed, after a significant change to a system, and at least annually or as specified by the system owner.

Guidelines for software development

Application development

Development environments

Segregating software 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: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Software development, testing and production environments are segregated.

Security Control: 1419; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Development and modification of software only takes place in development environments.

Security Control: 1420; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Information 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: O, P, S, TS; Priority: Should
Unauthorised access to the authoritative source for software is prevented.

Secure software design

Threat modelling is an important part of secure software design. Threat modelling identifies at risk components of software, enabling security controls to be identified to reduce security risks.

Security Control: 1238; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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.

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: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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 and validating all inputs.

Software testing

Software testing will lessen the possibility 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. 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: O, P, S, TS; Priority: Should
Software is tested for security vulnerabilities by software developers, as well as an independent party, before it is used in a production environment.

Further information

An example of a secure development life cycle model, known as the Trustworthy Computing Security Development Lifecycle, and used by Microsoft in the development of all versions of Microsoft Windows since Microsoft Windows 2003, is available at https://msdn.microsoft.com/en-au/library/ms995349.aspx.

Further information on secure coding practices is available at https://www.sei.cmu.edu/research-capabilities/all-work/display.cfm?customel_datapageid_4050=21274.

Web application development

Protecting web applications

Even when a web application only contains public information, there remains a need to protect the integrity and availability of the information 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: O, P, S, TS; Priority: Should
Robust web application frameworks are used to aid in the development of secure web applications.

Input handling

Most web application 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 Hypertext Transfer Protocol (HTTP) 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: O, P, S, TS; Priority: Must
Validation and/or sanitisation is performed on all input handled by a 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: O, P, S, TS; Priority: Must
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, HTTP Strict Transport Security and Frame Options can be leveraged by web applications to help protect both web applications and their users.

These security controls are implemented by the web application via the insertion of HTTP headers containing security policy in outgoing responses. Web browsers then apply the security controls according to the defined security policy. Since the security controls are applied via HTTP 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: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Web browser-based security controls are implemented for web applications in order to help protect both web applications and their users.

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: O, P, S, TS; Priority: Should
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 web browser-based security controls can be found in the Australian Cyber Security Centre's *Protecting Web Applications and Users* publication at https://www.cyber.gov.au/publications/protecting-web-applications-and-users.

Further information on web application security is available at https://www.owasp.org/. The OWASP *Application Security Verification Standard* can be obtained from https://www.owasp.org/index.php/Category:OWASP_Application_Security_Verification_Standard_Project.

Further information on common web application frameworks for different programming languages, including a comparison of their functionality, is available at https://en.wikipedia.org/wiki/Comparison_of_web_frameworks.

Guidelines for database systems management

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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
Database servers and web servers are functionally separated, physically or virtually.

Communications between database servers and web servers

Information communicated between database servers and web applications, especially over the Internet, is susceptible to capture by an adversary.

Security Control: 1277; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Information 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: O, P, S, TS; Priority: Should
Database servers that require network connectivity are placed on a different network segment to an organisation's workstations.

Security Control: 1271; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Network access controls are implemented to restrict database servers' 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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Must
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 using 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 an administrator needs to troubleshoot a failed installation. Information in these files, which can include passphrases in the clear, could provide valuable information to an adversary.

Security Control: 1245; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
DBMS software is configured according to vendor guidance.

Security Control: 1247; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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 an 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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Should
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 tasks, any actions undertaken will not be attributable to an individual database administrator. This can hinder investigations relating to an attempted, or successful, targeted cyber 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 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: O, P, S, TS; Priority: Must
Default database administrator accounts are disabled, renamed or have their passphrases changed.

Security Control: 1262; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Database administrators have unique and identifiable accounts.

Security Control: 1261; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Database administrator accounts are not shared across different databases.

Security Control: 1263; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Database administrator accounts are used exclusively for administrative tasks, with standard database accounts used for general purpose interactions with databases.

Security Control: 1264; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Database administrator access is restricted to defined roles rather than accounts with default administrative permissions, or all permissions.

Further information

Further information on identifying, authenticating and authorising users (including privileged users) can be found in the *System access* 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

Maintaining an accurate inventory of databases

Without knowledge of all the databases in an organisation, and the information they contain, an organisation will be unable to appropriately protect their assets.

Security Control: 1243; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
An accurate inventory of all databases and their contents is maintained and regularly audited.

Protecting database contents

Database contents 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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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 information, 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: 7; Updated: Apr-19; Applicability: O, P, S, TS; Priority: Must
Databases and their contents are classified based on the sensitivity or classification of information that they contain.

Security Control: 1255; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
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 information from within databases could lead to an adversary determining more sensitive or classified information, database views in combination with database user access roles should be implemented. Alternatively, the information 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 information components leading to the aggregated information.

Security Control: 1258; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Where concerns exist that the sum, or aggregation, of separate pieces of information from within databases could lead to a database user determining more sensitive or classified information, database views in combination with database user access roles are implemented.

Separation of production, test and development databases

Using information from production databases in test or development databases could result in inadequate protection being applied to the information.

Security Control: 1274; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Information 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 information 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: O, P, S, TS; Priority: Must
All queries to databases from web applications are filtered for legitimate content and correct syntax.

Security Control: 1276; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Parameterised queries or stored procedures are used for database interaction instead of dynamically generated queries.

Security Control: 1278; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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 management

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, will inform users of precautions to take when using email.

Security Control: 0264; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A policy governing the use of email 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: O, P, S, TS; Priority: Must
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 information, and also helps to prevent unauthorised information being released into the public domain. In doing so, it is important that protective markings accurately reflect the information in the subject, body and attachments of emails.

Security Control: 0270; Revision: 5; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Must
Protective markings are applied to emails and reflect the information in their 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 information 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: O, P, S, TS; Priority: Should
Protective marking tools do not automatically insert protective markings into emails.

Security Control: 0272; Revision: 4; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
Email servers are configured to block, log and report emails with inappropriate protective markings.

Security Control: 1023; Revision: 5; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Should
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 (AUSTEO), Australian Government Access Only (AGAO) or nationality releasability information to distribution lists could accidentally cause a data spill.

Security Control: 1539; Revision: 1; Updated: Mar-19; Applicability: P, S, TS; Priority: Must
Emails containing nationality releasability information 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.

Security Control: 0269; Revision: 2; Updated: Sep-18; Applicability: S, TS; Priority: Must
Emails containing AUSTEO or AGAO information 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 (AGD)'s *Protective Security Policy Framework* (PSPF), *Sensitive and classified information* policy, at https://www.protectivesecurity.gov.au/information/sensitive-classified-information/.

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: O, P, S, TS; Priority: Should
Email is routed through a centralised email gateway.

Security Control: 0571; Revision: 5; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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 Internet Engineering Task Force (IETF) Request for Comments (RFC) 3207 can protect email traffic while ensuring email servers remain compatible with other email servers due to the use of opportunistic TLS encryption.

Security Control: 0572; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Opportunistic TLS encryption, as defined in IETF RFC 3207, is enabled on email servers that make incoming or outgoing email connections over public network infrastructure.

Sender Policy Framework

SPF, and alternative implementations such as Sender ID, aid in the detection of spoofed emails. This is achieved by SPF records specifying a list of Internet Protocol addresses or domains that are allowed to send emails from specific domains. If an email server that sends an email is not in the SPF record for that domain, verification will fail.

Security Control: 0574; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Email servers are specified using SPF or Sender ID.

Security Control: 1183; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
A hard fail SPF record is used when specifying email servers.

Security Control: 1151; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
SPF or Sender ID is used to verify the authenticity of incoming emails.

Security Control: 1152; Revision: 3; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Should
DKIM signing is enabled on emails originating from an organisation's domains.

Security Control: 1025; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
DKIM is used in conjunction with SPF.

Security Control: 1026; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
DKIM signatures on received emails are verified, taking into account that email distribution list software typically invalidates DKIM signatures.

Security Control: 1027; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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 a SPF/Sender ID or DKIM check. 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: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
A DMARC record is configured specifying that emails from an organisation's domains be rejected if they fail SPF/Sender ID 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: O, P, S, TS; Priority: Must
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: 0561; Revision: 5; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Must
Emails addressed to internal email aliases where the source address is from outside the domain are blocked at the email gateway.

Security Control: 1502; Revision: 1; Updated: Mar-19; Applicability: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Should
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 implementing SPF can be found in the ACSC's **Mitigating Spoofed Emails Using Sender Policy Framework** publication at https://www.cyber.gov.au/publications/mitigating-spoofed-emails-sender-policy-framework-explained.

Further information on content filtering can be found in the **Content filtering** section of the **Guidelines for data transfers and content filtering**.

Further information on email content filtering can be found in the ACSC's **Malicious Email Mitigation Strategies** publication at https://www.cyber.gov.au/publications/malicious-email-mitigation-strategies.

Further information on email security-related topics is available from the following documents:

- IETF RFC 3207, **SMTP Service Extension for Secure SMTP over Transport Layer Security**, at https://tools.ietf.org/html/rfc3207.

- IETF RFC 4406, **Sender ID: Authenticating E-Mail**, at https://tools.ietf.org/html/rfc4406.

- IETF RFC 4408, **Sender Policy Framework (SPF) for Authorizing Use of Domains in E-Mail, Version 1**, at https://tools.ietf.org/html/rfc4408

- IETF RFC 4686, **Analysis of Threats Motivating DomainKeys Identified Mail (DKIM)**, at https://tools.ietf.org/html/rfc4686

- IETF RFC 4871, **DomainKeys Identified Mail (DKIM) Signatures**, at https://tools.ietf.org/html/rfc4871

- IETF RFC 5617, **DomainKeys Identified Mail (DKIM) Author Domain Signing Practices (ADSP)**, at https://tools.ietf.org/html/rfc5617.

- IETF RFC 7489, **Domain-based Message Authentication, Reporting, and Conformance (DMARC)**, at https://tools.ietf.org/html/rfc7489.

Further information on email server security can be found in National Institute of Standards and Technology Special Publication 800-45 Rev. 2, **Guidelines on Electronic Mail Security**, at https://csrc.nist.gov/publications/detail/sp/800-45/version-2/final.

Guidelines for network management

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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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 information 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 information and critical services. For example, one network zone may contain user workstations while another network zone contains authentication servers. Proper network segmentation and segregation also assists in the creation and maintenance of proper network access control lists.

Security Control: 1181; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Networks are divided into multiple functional network zones according to the sensitivity or criticality of information or services.

Using Virtual Local Area Networks

Virtual Local Area Networks (VLANs) can be used to implement network segmentation and segregation as long as the networks are all official networks or all the same classification. In such cases, if a data spill occurs between the networks the impact will be lesser than if a data spill occurred between two networks of different classifications or between an official or classified network and public network infrastructure.

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: 1310; Revision: 3; Updated: Sep-18; Applicability: O; Priority: Should
VLANs are not used to separate network traffic between official networks and public network infrastructure.

Security Control: 1532; Revision: 0; Updated: Sep-18; Applicability: P, S, TS; Priority: Must
VLANs are not used to separate network traffic between classified networks and public network infrastructure.

Using Internet Protocol version 6

Internet Protocol version 6 (IPv6) functionality can introduce additional security risks to a network. As such, disabling IPv6 functionality until it is intended to be used will minimise 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 Internet Protocol version 4 (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 (SLAAC) is a method of stateless Internet Protocol (IP) address configuration in IPv6 networks. SLAAC 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.

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 information for specific users with a need-to-know or limiting the flow of information 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.

Accounting for network devices

Maintaining and regularly auditing an inventory 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: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
An inventory of authorised network devices is maintained and regularly audited to detect the presence of any rogue network devices.

Default accounts for network devices

Network devices can come pre-configured with default credentials. For example, wireless access points with an administrator 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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Should
Servers maintain effective functional separation with other servers allowing them to operate independently.

Security Control: 1479; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Servers minimise communications with other servers at both the network and file system level.

Functional separation between server-side 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: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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*

- *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*

- *the underlying operating system running on the server is hardened*

- *patches are applied to the isolation mechanism and underlying operating system in a timely manner*

- *integrity and log monitoring are performed for the isolation mechanism and underlying operating system in a timely manner.*

Security Control: 1461; Revision: 1; Updated: Sep-18; Applicability: P, S, TS; Priority: Must
When using a software-based isolation mechanism to share a physical server's hardware, the physical server and all computing environments running on the physical server are of the same classification.

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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Must
SNMP version 1 and 2 are not used on networks.

Security Control: 1312; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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 information 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: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
NIDS or NIPS are deployed in all gateways between an organisation's networks and other networks they do not manage, including public network infrastructure.

Security Control: 1030; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
NIDS or NIPS in gateways are located immediately inside the outermost firewall and configured to generate a log entry, and an alert, for any information flows that contravene any rule in firewall rule sets.

Security Control: 1185; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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.

Further information

Further information on wireless networks can be found in the *Wireless networks* section of these guidelines.

For 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 gateway management*.

Further information on network segmentation and segregation can be found in the Australian Cyber Security Centre's *Implementing Network Segmentation and Segregation* publication at https://www.cyber.gov.au/publications/network-segmentation-and-segregation.

Further information on network plans can be found in the United States' National Security Agency's *Manageable Network Plan Guide (version 4.0)* publication at https://apps.nsa.gov/iaarchive/library/ia-guidance/security-configuration/networks/manageable-network-plan.cfm.

Wireless networks

Choosing wireless access points

Wireless access points 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 access points that are guaranteed to be interoperable with other wireless access points will prevent any problems on a wireless network.

Security Control: 1314; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
All wireless access points 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 information or disrupt services.

Security Control: 0536; Revision: 6; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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.

Default Service Set Identifiers

Some wireless access points come with a default Service Set Identifier (SSID) which is used to identify a wireless network. As the default SSIDs of wireless access points are often documented on online forums, along with default accounts and passphrases, it is important to change the default SSID of wireless access points.

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.

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.

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 for configuring whitelists of approved MAC addresses, 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.

802.1X authentication

When an organisation chooses to deploy a wireless network, a number of Extensible Authentication Protocol (EAP) methods that are supported by the Wi-Fi Protected Access 2 (WPA2) protocol can be chosen. These EAP methods include WPA2-Enterprise with Extensible Authentication Protocol-Transport Layer Security (EAP-TLS), WPA2-Enterprise with Extensible Authentication Protocol-Tunnelled Transport Layer Security or WPA2-Enterprise with Protected Extensible Authentication Protocol.

WPA2-Enterprise with EAP-TLS is considered one of the most secure EAP methods. Furthermore, due to its inclusion in the initial release of the WPA2 standard, it enjoys wide support in wireless access points and operating systems. EAP-TLS uses a public key infrastructure (PKI) 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 PKI. 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: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
WPA2-Enterprise with EAP-TLS is used to perform mutual authentication for wireless networks.

Evaluation of 802.1X authentication implementation

The security of 802.1X authentication is dependent on three main elements and how they interact with each other. These three elements include supplicants (clients) that support the 802.1X authentication protocol; authenticators (wireless access points) that facilitate communication between supplicants and the authentication server; and the RADIUS server that is used for authentication, authorisation and accounting purposes. To provide assurance that these elements have been implemented correctly, supplicants, authenticators and the authentication server should have completed an evaluation.

Security Control: 1322; Revision: 2; Updated: Sep-18; Applicability: P, S, TS; Priority: Must
Supplicants, authenticators and the authentication server used in wireless networks have completed an Australian Signals Directorate Cryptographic Evaluation (ACE).

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, two-factor authentication can be implemented through the use of personal identification numbers (PINs) on smart cards. This is particularly important when a smart card grants a user any form of administrative access.

Security Control: 1324; Revision: 2; Updated: Sep-18; Applicability: P, S, TS; Priority: Must
Certificates are generated using certificate authority software or a hardware security module that has completed an ACE.

Security Control: 1323; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Both device and user certificates are required for accessing wireless networks.

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, the PMK is 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).

Remote Authentication Dial-In User Service authentication

Separate to the 802.1X authentication process is the RADIUS authentication process that occurs between wireless access points and a RADIUS server. To protect authentication information communicated between wireless access points and a RADIUS server, communications should be encapsulated with an additional layer of encryption.

Encryption

As wireless transmissions are capable of radiating outside of secured areas, organisations cannot rely on the traditional approach of physical security to protect against unauthorised access to information on wireless networks. As such, all information communicated over wireless networks should be encrypted using a suitable encryption protocol. Specifically, the Advanced Encryption Standard-based Counter Mode Cipher Block Chaining Message Authentication Code Protocol (CCMP) introduced in WPA2.

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: O, P, S, TS; Priority: Should
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.

Security Control: 1335; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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 premises. While expensive, this will limit the wireless communications to areas under the control of an organisation. RF shielding on an organisation's premises has the added benefit of preventing the jamming of wireless networks from outside of the premises in which wireless networks are operating.

Security Control: 1338; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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: 5; Updated: Sep-18; Applicability: S, TS; Priority: Should
The effective range of wireless communications outside an organisation's area of control is limited by implementing RF shielding on buildings in which 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 using cryptography**.

Information on Wi-Fi Alliance certification programs can be obtained from https://www.wi-fi.org/certification/programs.

Further information on EAP-TLS can be found in Internet Engineering Task Force Request for Comments 5216, *The EAP-TLS Authentication Protocol*, at https://tools.ietf.org/html/rfc5216.

Service continuity for online services

Denial-of-service attacks

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. Preparing for denial-of-service attacks before they occur is by far the best strategy, it is very difficult to respond once they begin and efforts at this stage are unlikely to be effective.

Determining essential online services

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.

Security Control: 1458; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
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.

Service provider denial of service strategies

The volume of network traffic that can be achieved by an adversary using a botnet or an amplification-based denial-of-service attack can overwhelm the bandwidth of an organisation's internet connection. Assistance from service providers who have the ability to block network traffic upstream from a targeted service or organisation is essential.

Security Control: 1431; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
Denial-of-service attack prevention and mitigation strategies are discussed with service providers, specifically:

- *their capacity to withstand denial-of-service attacks*

- *any costs likely to be incurred by customers resulting from denial-of-service attacks*

- *thresholds for notifying customers or turning off their 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 providers to block malicious traffic as far upstream as possible.*

Domain name registrar locking

The use of domain name registrar locking can prevent a denial of service caused by unauthorised deletion or transferal of a domain, or other unauthorised modification of a domain's registration details.

Security Control: 1432; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
Domain names for online services are protected via registrar locking and confirming domain registration details are correct.

Establishing contact details with service providers

Proper and timely communication is essential in responding to a denial-of-service attack, particularly since normal means of communication such as corporate email or websites may be unavailable or degraded during a denial-of-service attack.

Security Control: 1433; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
24x7 contact details are maintained for service providers and service providers maintain 24x7 contact details for their customers.

Security Control: 1434; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
Organisations and service providers provide each other with additional out-of-band contact details for use when normal communication channels fail.

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: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
Availability monitoring with real-time alerting is implemented 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 publically 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: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
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 or information to customers 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: 0; Updated: Sep-18; Applicability: O, P; Priority: Should
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.

Cloud-based hosting of online services

Using a cloud hosting 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: 2; Updated: Sep-18; Applicability: O, P; Priority: Should
A cloud service provider, preferably multiple different cloud service providers, is used for hosting online services.

Using content delivery networks and denial of service mitigation services

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 the benefits and protections offered by the service provider to be bypassed. Additionally, appropriate network security controls should be applied to only allow communication between an organisation's server, the service provider and the authorised management environment.

Security Control: 1438; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
Where a high availability requirement exists for website hosting, CDNs that cache websites are used.

Security Control: 1439; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
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.

Security Control: 1441; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
Where a requirement for high availability exists for online services, a denial of service mitigation service is used.

Guidelines for using cryptography

Cryptographic fundamentals

Purpose of cryptography

The purpose of cryptography is to provide confidentiality, integrity, authentication and non-repudiation of information. Confidentiality protects information by making it unreadable to all but authorised users, integrity protects information 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 physical storage and handling requirements for ICT equipment and media while encryption of data in transit can be used to provide protection for sensitive or classified information 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 information. However, as the information is encrypted, the consequences of the encrypted information being accessed by an adversary is considered to be less. Therefore, physical storage and handling requirements applied to the encrypted information can be reduced. As the sensitivity or classification of the unencrypted information does not change, additional layers of encryption cannot be used to further lower physical and handling requirements.

Additional cryptographic requirements

This document describes the general use of cryptography. The Australian Signals Directorate (ASD) may specify additional requirements in consumer guides for cryptographic equipment or encryption software once they have completed an ASD Cryptographic Evaluation (ACE). Such requirements supplement this document and where conflicts occur take precedence.

Federal Information Processing Standard 140

The Federal Information Processing Standard (FIPS) 140 is a United States standard for the validation of both hardware and software cryptographic modules. FIPS 140 is in its second iteration and is formally referred to as FIPS 140-2. This document refers to the standard as FIPS 140, but it applies equally to FIPS 140-1, FIPS 140-2 and FIPS 140-3, which had been released in draft but has since been abandoned.

FIPS 140 is not a substitute for an ACE as it is concerned solely with the cryptographic functionality of a module and does not consider any other security functionality. Where a module's cryptographic functionality has been validated under FIPS 140, ASD can at its discretion, and in consultation with the vendor, reduce the scope of an ACE.

High Assurance Cryptographic Equipment

High Assurance Cryptographic Equipment (HACE) is used by organisations to protect highly classified information. HACE is designed to lower the physical storage and handling requirements of highly classified information using cryptography. Due to the sensitive nature of HACE, and the limited information publicly available on it, organisations must contact the Australian Cyber Security Centre (ACSC) before using it.

Reducing physical storage and handling requirements

When encryption is applied to information it provides an additional layer of defence. Encryption does not change the sensitivity or classification of the information, but when encryption is used, the physical storage and handling requirements of ICT equipment and media may be reduced.

Security Control: 1161; Revision: 4; Updated: Sep-18; Applicability: O; Priority: Must
Encryption software that implements an ASD Approved Cryptographic Algorithm (AACA) is used if an organisation wishes to reduce the physical storage or handling requirements for ICT equipment or media that contains sensitive information.

Security Control: 0457; Revision: 5; Updated: Sep-18; Applicability: P; Priority: Must
Encryption software that has completed an ACE is used if an organisation wishes to reduce the physical storage or handling requirements for ICT equipment or media that contains classified information.

Security Control: 0460; Revision: 8; Updated: Sep-18; Applicability: S, TS; Priority: Must
HACE is used if an organisation wishes to reduce the physical storage or handling requirements for ICT equipment or media that contains highly classified information.

Encrypting information at rest

Full disk encryption provides a greater level of protection than file-based encryption. 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: 0459; Revision: 3; Updated: Sep-18; Applicability: O, P; Priority: Should
Encryption software used for data at rest implements full disk encryption, or partial encryption where access controls will only allow writing to the encrypted partition.

Security Control: 0461; Revision: 5; Updated: Sep-18; Applicability: S, TS; Priority: Must
HACE used for data at rest implements full disk encryption, or partial encryption where access controls will only allow writing to the encrypted partition.

Encrypting particularly important information at rest

Due to the sensitivities associated with Australian Eyes Only (AUSTEO) and Australian Government Access Only (AGAO) information, this information needs to be encrypted when at rest.

Security Control: 1080; Revision: 2; Updated: Sep-18; Applicability: S, TS; Priority: Must
In addition to any encryption already in place, an AACA is used to encrypt AUSTEO and AGAO information when at rest on a system.

Data recovery

The requirement for cryptographic equipment and encryption software to provide a key escrow function, where practical, was issued under a cabinet directive in July 1998.

Security Control: 0455; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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 information, the encrypted information 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: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When a user authenticates to encryption functionality for ICT equipment or media storing encrypted information, it is treated in accordance with its original sensitivity or classification until such a time that the user deauthenticates from the encryption functionality.

Reducing network infrastructure requirements

Where insufficient physical security is provided for the protection of information communicated over network infrastructure, encryption can be used to assist in protecting such information from compromise.

Security Control: 1162; Revision: 3; Updated: Sep-18; Applicability: O; Priority: Must
Cryptographic equipment or encryption software that implements an ASD Approved Cryptographic Protocol (AACP) is used to communicate sensitive information over public network infrastructure and through unsecured spaces.

Security Control: 0465; Revision: 6; Updated: Sep-18; Applicability: P; Priority: Must
Cryptographic equipment or encryption software that has completed an ACE is used to communicate classified information over official networks, public network infrastructure and through unsecured spaces.

Security Control: 0467; Revision: 8; Updated: Sep-18; Applicability: S, TS; Priority: Must
HACE is used to communicate highly classified information over networks of a lower classification, official networks, public network infrastructure and through unsecured spaces.

Encrypting particularly important information in transit

Due to the sensitivities associated with AUSTEO and AGAO information, it needs to be encrypted when being communicated across network infrastructure.

Security Control: 0469; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Must
In addition to any encryption already in place, an AACP is used to protect AUSTEO and AGAO information 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 use of HACE can be found in Australian Communications Security Instructions (ACSIs). ACSIs include requirements for the approved use of HACE and can be provided to organisations by the ACSC upon request.

Further information on the storage and transfer of ICT equipment and media can be found in the Attorney-General's Department (AGD)'s ***Protective Security Policy Framework*** (PSPF), ***Physical security for entity resources*** policy, at https://www.protectivesecurity.gov.au/physical/physical-security-entity-resources/.

Further information on the FIPS 140 standards is available at https://csrc.nist.gov/publications/detail/fips/140/2/final.

ASD Approved Cryptographic Algorithms

Evaluated cryptographic implementations

Implementations of the algorithms in this section need to undergo an ACE before they can be approved to protect classified information.

High assurance cryptographic algorithms

High assurance cryptographic algorithms, which are not covered in this section, can be used for the protection of highly classified information if they are suitably implemented in cryptographic equipment that has undergone a High Assurance (HA) evaluation. Further information on high assurance cryptographic algorithms can be obtained by contacting 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 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 approved hashing algorithm is Secure Hashing Algorithm 2 (SHA-2) (i.e. SHA-224, SHA-256, SHA-384 and SHA-512).

The approved symmetric encryption algorithms are Advanced Encryption Standard (AES) using key lengths of 128, 192 and 256 bits, and Triple Data Encryption Standard (3DES) using three distinct keys.

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 as well as AACAs, it is possible that these unapproved algorithms could be configured without a user's knowledge. In combination with an assumed level of security confidence, this can represent a security risk.

When configuring cryptographic equipment or software that implement an AACA, organisations can ensure that only the AACA can be used by disabling the unapproved algorithms (which is preferred) or advising users not to use the unapproved algorithms via usage policies.

Security Control: 0471; Revision: 5; Updated: Sep-18; Applicability: O, P; Priority: Must
If using cryptographic equipment or software that implements an AACA, only AACAs can be used.

Approved asymmetric/public key algorithms

Over the last decade, DSA and DH cryptosystems have been subject to increasingly successful sub-exponential index-calculus-based attacks. ECDH and ECDSA offer more security per bit increase in key size than DH or DSA and are considered more secure alternatives.

Security Control: 0994; Revision: 5; Updated: Sep-18; Applicability: O, P; Priority: Should
ECDH and ECDSA are used in preference to DH and DSA.

Using Diffie-Hellman

A modulus of at least 2048 bits for DH is considered best practice by the cryptographic community. A modulus smaller than 1024 bits for DH is considered cryptographically weak.

Security Control: 0472; Revision: 4; Updated: Sep-18; Applicability: O, P; Priority: Must
When using DH for agreeing on encryption session keys, a modulus of at least 1024 bits, preferably 2048 bits, is used.

Using the Digital Signature Algorithm

A modulus of at least 2048 bits for DSA is considered best practice by the cryptographic community. A modulus smaller than 1024 bits for DSA is considered cryptographically weak.

Security Control: 0473; Revision: 4; Updated: Sep-18; Applicability: O, P; Priority: Must
When using DSA for digital signatures, a modulus of at least 1024 bits, preferably 2048 bits, is used.

Using Elliptic Curve Cryptography

The curve used within an elliptic curve algorithm can affect the security of the algorithm. Only approved curves should be used.

Security Control: 1446; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Must
When using elliptic curve cryptography, a curve from FIPS 186-4 is used.

Using Elliptic Curve Diffie-Hellman

A field/key size of at least 256 bits for ECDH is considered best practice by the cryptographic community. A field/key size smaller than 160 bits for ECDH is considered cryptographically weak.

Security Control: 0474; Revision: 4; Updated: Sep-18; Applicability: O, P; Priority: Must
When using ECDH for agreeing on encryption session keys, a field/key size of at least 160 bits, preferably 256 bits, is used.

Using the Elliptic Curve Digital Signature Algorithm

A field/key size of at least 256 bits for ECDSA is considered best practice by the cryptographic community. A field/key size smaller than 160 bits for ECDSA is considered cryptographically weak.

Security Control: 0475; Revision: 4; Updated: Sep-18; Applicability: O, P; Priority: Must
When using ECDSA for digital signatures, a field/key size of at least 160 bits, preferably 256 bits, is used.

Using Rivest-Shamir-Adleman

A modulus of at least 2048 bits for RSA is considered best practice by the cryptographic community. A modulus smaller than 1024 bits for RSA is considered cryptographically weak.

Security Control: 0476; Revision: 5; Updated: Sep-18; Applicability: O, P; Priority: Must
When using RSA for digital signatures, and passing encryption session keys or similar keys, a modulus of at least 1024 bits, preferably 2048 bits, is used.

Security Control: 0477; Revision: 6; Updated: Sep-18; Applicability: O, P; Priority: Must
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 hashing algorithms

Research conducted by the cryptographic community has shown Secure Hashing Algorithm 1 (SHA-1) is susceptible to collision attacks. In 2017, researchers demonstrated a SHA-1 collision with Portable Document Format files. A hashing algorithm from the SHA-2 family should be used instead of SHA-1.

Security Control: 1054; Revision: 4; Updated: Sep-18; Applicability: O, P; Priority: Must
A hashing algorithm from the SHA-2 family is used instead of SHA-1.

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: 4; Updated: Sep-18; Applicability: O, P; Priority: Should
Symmetric cryptographic algorithms are not used in Electronic Codebook Mode.

Using the Triple Data Encryption Standard

Using three distinct keys for 3DES is deemed the only secure option for practical purposes. All other keying options are susceptible to attacks that reduce the security of 3DES and are therefore not deemed secure. Where practical, organisations should use an approved implementation of AES, instead of 3DES.

Security Control: 0480; Revision: 6; Updated: Sep-18; Applicability: O, P; Priority: Must
3DES is used with three distinct keys.

Protecting highly classified information

ASD has approved the following cryptographic algorithms for the protection of highly classified information when used in an evaluated implementation. Recommended algorithms and key sizes should be given preference where possible for 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: 5; Updated: May-19; Applicability: S, TS; Priority: Must
AACAs are used in an evaluated implementation.

Security Control: 1468; Revision: 4; Updated: May-19; Applicability: S, TS; Priority: Should
Preference is given to using the CNSA Suite algorithms and key sizes where possible.

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 DH can be found in Diffie, W and Hellman, ME, *New Directions in Cryptography*, IEEE Transactions on Information Theory, vol. 22, is. 6, pp. 644-654, November 1976.

Further information on DSA can be found in FIPS 186-4, *Digital Signature Standard (DSS)*, at https://csrc.nist.gov/publications/detail/fips/186/4/final.

Further information on ECDH can be found in:

- American National Standards Institute (ANSI) X9.63-2011 (R2017), *Public Key Cryptography for the Financial Services Industry, Key Agreement and Key Transport Using Elliptic Curve Cryptography*, at https://infostore.saiglobal.com/en-au/Standards/ANSI-X9-63-2011-R2017--1531401/

- ANSI X9.42-2003 (R2013), *Public Key Cryptography for the Financial Services Industry, Agreement of Symmetric Keys Using Discrete Logarithm Cryptography*, at https://infostore.saiglobal.com/en-au/Standards/ANSI-X9-42-2003-R2013--803077/

- National Institute of Standards and Technology Special Publication 800-56A Rev. 3, *Recommendation for Pair-Wise Key-Establishment Schemes Using Discrete Logarithm Cryptography*, at https://csrc.nist.gov/publications/detail/sp/800-56a/rev-3/final.

Further information on ECDSA can be found in:

- ANSI X9.63-2011 (R2017), *Public Key Cryptography for the Financial Services Industry, Key Agreement and Key Transport Using Elliptic Curve Cryptography*, at https://infostore.saiglobal.com/en-au/Standards/ANSI-X9-63-2011-R2017--1531401/

- ANSI X9.62-2005, *Public Key Cryptography for the Financial Services Industry, The Elliptic Curve Digital Signature Algorithm (ECDSA)*, at https://infostore.saiglobal.com/en-au/standards/ansi-x9-62-2005-205647/

- FIPS 186-4, *Digital Signature Standard (DSS)*, at https://csrc.nist.gov/publications/detail/fips/186/4/final.

Further information on the CNSA Suite can be found in the *CNSA Suite and Quantum Computing FAQ* at https://apps.nsa.gov/iaarchive/library/ia-guidance/ia-solutions-for-classified/algorithm-guidance/cnsa-suite-and-quantum-computing-faq.cfm.

Further information on RSA can be found in Internet Engineering Task Force (IETF) Request for Comments (RFC) 3447, *Public-Key Cryptography Standards (PKCS) #1: RSA Cryptography Specifications Version 2.1*, at https://tools.ietf.org/html/rfc3447.

Further information on SHA can be found in FIPS 180-4, *Secure Hash Standard (SHS)*, at https://csrc.nist.gov/publications/detail/fips/180/4/final.

Further information on AES can be found in FIPS 197, *Advanced Encryption Standard (AES)*, at https://csrc.nist.gov/publications/detail/fips/197/final.

ASD Approved Cryptographic Protocols

Evaluated cryptographic implementations

Implementations of the protocols in this section need to undergo an ACE before they can be approved to protect classified information.

High assurance cryptographic protocols

Protocols for HACE, which are not covered in this section, can be used for the protection of highly classified information if they are suitably implemented in cryptographic equipment that has undergone a HA evaluation. Further information on high assurance cryptographic protocols can be obtained by contacting 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 by ASD. This approval is limited to cases where they are used in accordance with this document.

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 (WPA2).

Using ASD Approved Cryptographic Protocols

If cryptographic equipment or software implements unapproved protocols, as well as AACPs, it is possible that relatively weak protocols could be configured without a user's knowledge. In combination with an assumed level of security confidence, this represents a security risk.

When configuring cryptographic equipment or software that implements an AACP, organisations can ensure that only AACPs can be used by disabling unapproved protocols (which is preferred) or advising users not to use unapproved protocols via usage policies.

While many AACPs support authentication, organisations should be aware that these authentication mechanisms are not foolproof. To be effective, these mechanisms should also be securely implemented and protected. This can be achieved by providing appropriate private key protection, ensuring the correct management of certificate authentication processes, including certificate revocation checking, and using a legitimate identity registration scheme.

Security Control: 0481; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
If using cryptographic equipment or software that implements an AACP, only AACAs can be used.

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 WPA2 in wireless networks can be found in the *Wireless networks* section of the *Guidelines for network management*.

Further information on the OpenPGP Message Format can be found in IETF RFC 3156, *MIME Security with OpenPGP*, at https://tools.ietf.org/html/rfc3156.

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: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The latest version of TLS is used.

Security Control: 1369; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
AES in Galois Counter Mode is used for symmetric encryption when available.

Security Control: 1370; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
A TLS implementation that supports secure renegotiation is used.

Security Control: 1371; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
If secure renegotiation is not available, renegotiation is disabled.

Security Control: 1372; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
DH or ECDH is used for key establishment.

Security Control: 1448; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
When using DH or ECDH for key establishment, the ephemeral variant is used.

Security Control: 1373; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Anonymous DH is not used.

Security Control: 1374; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
SHA-2-based certificates are used where possible.

Security Control: 1375; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Cipher suites are configured to use SHA-2 as part of the Message Authentication Code and Pseudo-Random Function where possible.

Perfect Forward Secrecy

Using Perfect Forward Secrecy (PFS) reduces the impact of the compromise of a TLS session.

Further information

Further information on handling TLS traffic through gateways can be found in the ***Web content and connections*** section of the ***Guidelines for gateway management***.

Further information on TLS can be found in IETF RFC 8446, ***The Transport Layer Security (TLS) Protocol Version 1.3***, at https://tools.ietf.org/html/rfc8446.

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.

Configuration	Description
ListenAddress xxx.xxx.xxx.xxx	*On machines with multiple interfaces, configure the SSH daemon to listen only on the required interfaces*
AllowTCPForwarding no	*Disable connection forwarding*
GatewayPorts no	*Disable gateway ports*
PermitRootLogin no	*Disable the ability to login directly as root*
HostbasedAuthentication no	*Disable host-based authentication*
IgnoreRhosts yes	*Disable rhosts-based authentication*
PermitEmptyPasswords no	*Do not allow empty passphrases*
Banner x	*Configure a suitable login banner*

LoginGraceTime xx	*Configure a login authentication timeout of no more than 60 seconds*
X11Forwarding no	*Disable X11 forwarding*

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: O, P, S, TS; Priority: Should
Public key-based authentication is used for SSH connections.

Security Control: 1449; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
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 SSH can be found in IETF RFC 4252, **The Secure Shell (SSH) Authentication Protocol**, at https://tools.ietf.org/html/rfc4252.

Further information on configuring OpenSSH can be found at https://www.openssh.com/manual.html and https://man.openbsd.org/sshd_config.

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 this document. Version 3.0 was the first version to become an IETF 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: O, P, S, TS; Priority: Should
Versions of S/MIME earlier than 3.0 are not used.

Further information

Further information on S/MIME can be found in IETF RFC 5751, **Secure/Multipurpose Internet Mail Extensions (S/MIME) Version 3.2 Message Specification**, at https://tools.ietf.org/html/rfc5751.

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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
PFS is used for IPsec connections.

Internet Key Exchange Extended Authentication

XAuth using IKE version 1 has documented vulnerabilities associated with its use.

Security Control: 1001; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The use of XAuth is disabled for IPsec connections using IKE version 1.

Further information

Further information on IPsec can be found in IETF RFC 4301, *Security Architecture for the Internet Protocol*, at https://tools.ietf.org/html/rfc4301.

Cryptographic system management

Cryptographic systems

Cryptographic systems are comprised of cryptographic equipment and keying material. In general, security controls specified for systems in this document apply equally to cryptographic systems. However, where security controls for cryptographic systems are different, the variations are contained in this section and overrule security controls specified elsewhere in this document.

Commercial grade cryptographic equipment

Transporting Commercial Grade Cryptographic Equipment (CGCE) in a keyed state may expose the keying material in it to potential compromise. Therefore, if CGCE is transported in a keyed state it should be done based on the sensitivity or classification of the keying material in it.

If CGCE 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: 4; Updated: Sep-18; Applicability: O, P; Priority: Must
Keyed CGCE is transported based on the sensitivity or classification of the keying material in it.

Security Control: 0142; Revision: 3; Updated: Jun-19; Applicability: O, P; Priority: Must
The compromise or suspected compromise of CGCE 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: 5; Updated: Jun-19; Applicability: O, P; Priority: Must
Keying material is changed when compromised or suspected of being compromised.

High Assurance Cryptographic Equipment

HACE can be used by organisations to protect highly classified information. ACSI 53 E, ACSI 103 A, ACSI 105 B, ACSI 107 B, ACSI 173 A and equipment-specific doctrine outline the requirements that need to be complied with for the use of HACE.

Security Control: 0499; Revision: 8; Updated: Apr-19; Applicability: S, TS; Priority: Must
ACSI 53 E, ACSI 103 A, ACSI 105 B, ACSI 107 B, ACSI 173 A and the latest equipment-specific doctrine is complied with when using HACE.

Storing cryptographic equipment

As cryptographic equipment can protect sensitive or classified information, additional physical security controls should be applied to its storage.

Security Control: 0505; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Cryptographic equipment is stored in a room that meets the requirements for a server room based on the sensitivity or classification of the information the cryptographic equipment processes.

Security Control: 0506; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Should
Areas in which HACE is used are separated from other areas and designated as a cryptographic controlled area.

Further information

Further information on the use of HACE can be found in associated ACSIs. ACSIs can be provided to organisations by the ACSC upon request.

Further information on Security Zones and secure rooms can be found in AGD's PSPF, *Entity facilities* policy, at https://www.protectivesecurity.gov.au/physical/entity-facilities/.

Guidelines for gateway management

Gateways

Purpose of gateways

Gateways act as information flow control mechanisms at the network layer and may also control information 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 this document 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.

- For all gateways, see the ***Guidelines for data transfers and content filtering***.

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 information 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: O, P, S, TS; Priority: Must
All systems are protected from systems in other security domains by one or more gateways.

Security Control: 1192; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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: 5; Updated: Jun-19; Applicability: O, P, S, TS; Priority: Must
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)*

- *are protected by authentication, logging and auditing of all physical and logical access to gateway components*

- *have all security controls tested to verify their effectiveness after any changes to their configuration.*

Security Control: 1427; Revision: 2; Updated: Jun-19; Applicability: O, P, S, TS; Priority: Should
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 separate secure log server increases the difficulty for an adversary to delete logging information in order to destroy evidence of a targeted cyber intrusion.

Security Control: 0634; Revision: 7; Updated: Jun-19; Applicability: O, P, S, TS; Priority: Must
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 information and services on internal networks. Organisations that require certain information 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: O, P, S, TS; Priority: Must
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 security risk assessment

Performing a security risk assessment on the gateway architecture and the proposed configuration before implementation allows for the early identification and mitigation of security risks to the gateway environment and connected systems. In addition, gateways can connect networks in different security domains, including across administrative and organisational boundaries. By understanding and formally accepting security risks from all other networks before gateways are implemented, system owners can make informed decisions about changes to their gateway environment.

Security Control: 0598; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A security risk assessment is performed on gateways and their configuration before their implementation.

Security Control: 1519; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A security risk assessment is performed on all systems before they are connected to a gateway.

Security Control: 0605; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
All system owners of systems connected via a gateway understand and accept security risks associated with the gateway and any connected security domains, including those connected via a cascaded connection.

Security Control: 1041; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The security architecture of a gateway, and security risks associated with all connected security domains, including those connected via a cascaded connection, is reviewed at least annually.

Gateway configuration control

Changes that could introduce security vulnerabilities or change security risks in a gateway should be appropriately considered and documented before being implemented.

Security Control: 0624; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Any associated security risk assessments are updated before changes are made to a gateway to ensure all relevant security risks have been documented and accepted.

Security Control: 0625; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
All changes to a gateway architecture are considered prior to implementation, documented and assessed in accordance with the organisation's change management process.

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: O, P, S, TS; Priority: Should
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

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 information, 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: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Must
System administrators are formally trained to manage gateways.

Security Control: 1520; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
All system administrators of gateways are cleared to access the highest level of information communicated or processed by the gateway.

Security Control: 0613; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
All system administrators of gateways that process Australian Eyes Only (AUSTEO) or Australian Government Access Only (AGAO) information are Australian nationals.

Security Control: 0616; Revision: 3; Updated: Sep-18; Applicability: O, P; Priority: Should
Roles for the administration of gateways are separated.

Security Control: 0617; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Must
Roles for the administration of gateways are separated.

Security Control: 0629; Revision: 3; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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 information stakeholders in other security domains to which they are connected via a gateway.

Security Control: 0607; Revision: 2; Updated: Sep-18; Applicability: O, P; Priority: Should
Once connectivity is established, system owners become information stakeholders for all connected security domains.

Security Control: 0608; Revision: 2; Updated: Sep-18; Applicability: S, TS; Priority: Must
Once connectivity is established, system owners become information 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: O, P, S, TS; Priority: Must
Users and services accessing networks through gateways are authenticated.

Security Control: 0620; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Only users and services authenticated and authorised to a gateway can use the gateway.

Security Control: 1039; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
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 authorising systems*
- *Guidelines for cyber security incidents*
- *Guidelines for physical security*
- *Guidelines for evaluated products*
- *Guidelines for ICT equipment management*
- *Guidelines for system hardening*
- *Guidelines for system management*
- *Guidelines for system monitoring*
- *Guidelines for network management*
- *Guidelines for data transfers and content filtering*.

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* at https://tools.ietf.org/html/bcp38.

Cross Domain Solutions

Purpose of Cross Domain Solutions

Cross Domain Solutions (CDS) provide robust information flow control mechanisms at each layer of the OSI model in gateway environments where high levels of assurance are required. This section extends the preceding *Gateways* section.

Introduction to Cross Domain Solutions

This section describes the security controls applicable to CDS. CDS systems should apply controls from both the *Gateways* and *Cross Domain Solutions* sections. Furthermore, the *Guidelines for data transfers and content filtering* also applies to all gateways and CDS. Finally, additional sections of this document should be consulted depending on the specific type of CDS deployed.

CDS are systems comprising security-enforcing functions tailored to mitigate the specific security risks of accessing or transferring information 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.
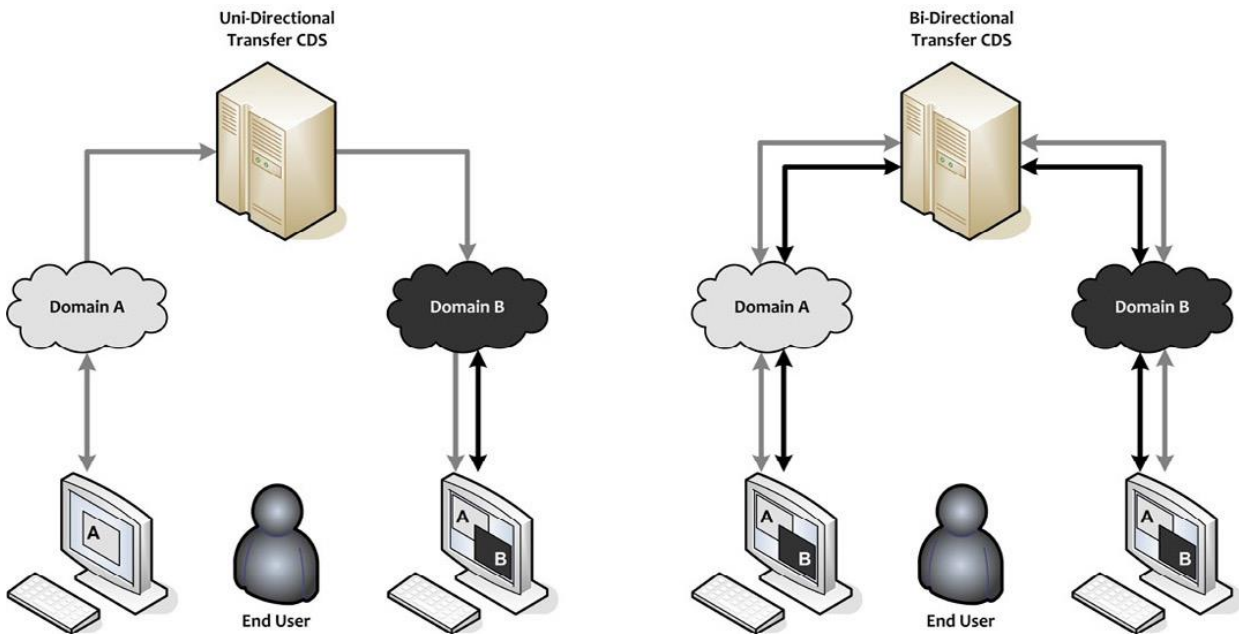
Personnel involved in the planning, analysis, design, implementation or assessment of CDS should refer to the Australian Cyber Security Centre (ACSC)'s *Introduction to Cross Domain Solutions* and *Guide to the Secure Configuration of Cross Domain Solutions* publications.
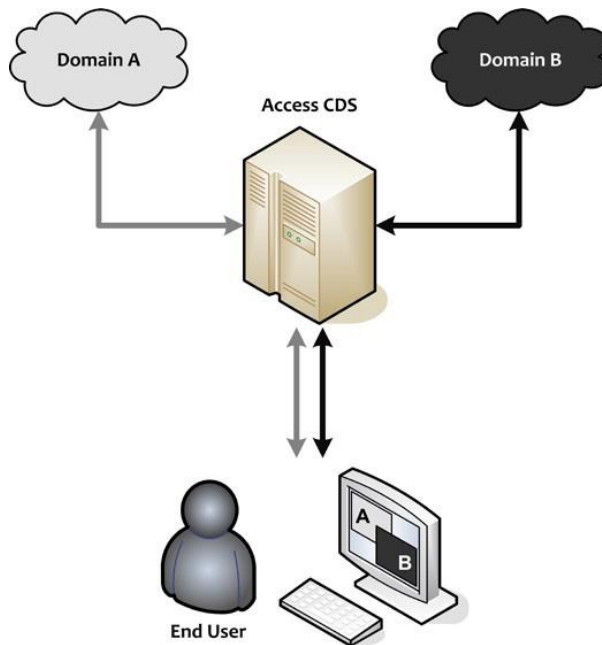
Types of Cross Domain Solutions

This document defines two logical types of CDS: Transfer CDS and Access CDS. These logical definitions are more closely aligned with how CDS are 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 information, 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.

Requirements to use Cross Domain Solutions

There are significant security risks associated with connecting highly classified systems to the Internet or to a lower classified system. An adversary having control of, or access to, a gateway or CDS can invoke a serious security risk.

Security Control: 0626; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
When connecting a highly classified network to any other network from a different security domain, a CDS is implemented.

Consultation when implementing or modifying Cross Domain Solutions

CDS environments can be complex to deploy and manage securely, as such, the likelihood of a network compromise is increased. Secure CDS implementations ensure 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; Priority: Must
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; Priority: Must
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

CDS connecting highly classified systems to other potentially internet-connected systems should implement robust security enforcing functions, including content filtering and isolated paths, to ensure data flows are appropriately controlled.

Security Control: 0635; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
All CDS between highly classified networks and any other network implement isolated upward and downward network paths.

Security Control: 1521; Revision: 0; Updated: Sep-18; Applicability: S, TS; Priority: Must
All CDS between highly classified networks and any other network implement protocol breaks at each layer of the OSI model.

Security Control: 1522; Revision: 0; Updated: Sep-18; Applicability: S, TS; Priority: Must
All CDS between highly classified networks and any other network implement 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*, 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 CDS, organisations should regularly assess the performance of CDS 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; Priority: Must
All security-relevant events generated by a CDS are logged and regularly analysed.

Security Control: 1523; Revision: 0; Updated: Sep-18; Applicability: S, TS; Priority: Should
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.

Further information

Further information on topics covered in this section can be found in the following cyber security guidelines:

- *Guidelines for authorising systems*
- *Guidelines for cyber security incidents*
- *Guidelines for physical security*
- *Guidelines for evaluated products*
- *Guidelines for ICT equipment management*
- *Guidelines for system hardening*
- *Guidelines for system management*
- *Guidelines for system monitoring*
- *Guidelines for network management*
- *Guidelines for data transfers and content filtering*.

Further information on the basics of CDS can be found in the ACSC's *Introduction to Cross Domain Solutions* publication at https://www.cyber.gov.au/publications/introduction-to-cross-domain-solutions.

Further information regarding the planning, analysis, design, implementation or assessment of CDS can be found in the ACSC's *Guide to the Secure Configuration of Cross Domain Solutions* publication available via request from the ACSC.

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.

Firewalls for particularly important networks

As AUSTEO and AGAO networks are particularly important, additional assurances should be put in place when connecting such networks to other networks.

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 information afterwards.

Diodes for particularly important networks

While diodes between networks at the same classification are generally not needed, AUSTEO and AGAO networks require additional assurances to be put in place when connecting such networks to other networks.

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: O, P, S, TS; Priority: Should
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 content and connections

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: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A policy governing appropriate web usage is developed and implemented.

Web proxies

Web proxies are a key component in detecting and responding to cyber security incidents. Thorough web proxy logs are also valuable in responding to user violation of web usage policies.

Security Control: 0260; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
All web access, including that by internal servers, is conducted through a web proxy.

Security Control: 0261; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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.*

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. In doing so, organisations may choose to allow websites that have a low risk of delivering malicious code and have a high privacy requirement, such as internet banking websites, to continue using end-to-end TLS encryption.

Security Control: 0263; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
If permitting TLS through internet gateways, either of the following approaches is implemented:

- *a solution that decrypts and inspects TLS traffic as per content filtering security controls*
- *a whitelist specifying the addresses (uniform resource locators) to which encrypted connections are permitted, with all other addresses blocked or decrypted and inspected as per content filtering security controls.*

Inspection of Transport Layer Security traffic

As encrypted TLS traffic may contain personally identifiable 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: O, P, S, TS; Priority: Should
Legal advice is sought regarding the inspection of TLS traffic by internet gateways.

Whitelisting websites

Defining a whitelist of permitted websites and blocking all unlisted 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 whitelist offers better security than relying on blacklists, or no restrictions at all, while still reducing implementation costs. An example of a permissive whitelist could be whitelisting the entire Australian subdomain, that is '*.au', or whitelisting the top 1,000 sites from the Alexa site ranking (after filtering Dynamic Domain Name System domains and other inappropriate domains).

Security Control: 0958; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Whitelisting is implemented for all Hypertext Transfer Protocol (HTTP) traffic communicated through internet gateways.

Security Control: 0995; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
If using a whitelist on internet gateways to specify the external addresses to which connections are permitted, it specifies whitelisted addresses by domain name or IP address.

Categorising websites

Websites can be grouped into categories and prohibited categories can be blocked via a web content filter.

Security Control: 1170; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
If websites are not whitelisted, categories are implemented for all websites and prohibited and uncategorised websites are blocked.

Blacklisting websites

Blacklists are collections of websites that have been deemed to be inappropriate due to their content or hosting of malicious content.

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: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
If whitelisting of websites is not implemented, blacklisting of websites is implemented to prevent access to known malicious websites.

Security Control: 0960; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
If blacklisting websites, the blacklist is updated on a daily basis to ensure that it remains effective.

Security Control: 1171; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
Dynamic domains and other domains where domain names can be registered anonymously for free are blocked.

Web content filter

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 email or other content filters while other types of content filtering are specific to web-based content.

Security Control: 0963; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
A web content filter is used to filter potentially harmful web-based content.

Security Control: 0961; Revision: 5; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Client-side active content, such as Java, is restricted to a whitelist of approved websites which may be the same as the HTTP whitelist or a separate active content whitelist.

Security Control: 1237; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
Web content filtering controls are applied to outbound web traffic where appropriate.

Further information

Further information on web content filtering can be found in the ***Guidelines for data transfers and content filtering***.

A website whitelisting software application that allows for the management of whitelists can be obtained from http://whitetrash.sourceforge.net/.

Examples of client-side JavaScript controls are available at https://noscript.net/.

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 information 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: 6; Updated: Sep-18; Applicability: O, P; Priority: Must
An evaluated peripheral switch is used when sharing peripherals between official and classified systems.

Security Control: 1480; Revision: 0; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
A high assurance peripheral switch is used when sharing peripherals between official or classified systems and highly classified systems.

Security Control: 1457; Revision: 2; Updated: Sep-18; Applicability: S, TS; Priority: Must
An evaluated, preferably high assurance, peripheral switch is used when sharing peripherals between systems of different classifications.

Security Control: 0593; Revision: 9; Updated: Apr-19; Applicability: O, P, S, TS; Priority: Must
An evaluated peripheral switch is used when sharing peripherals between official systems, or classified systems at the same classification, that belong to different security domains.

Peripheral switches for particularly important systems

As AUSTEO and AGAO systems are particularly important, additional assurances should be put in place when such systems share a peripheral switch with other systems.

Security Control: 0594; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Should
An evaluated peripheral switch is used when accessing a system containing AUSTEO or AGAO information and a system of the same classification that is not authorised to process the same caveat.

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 and content filtering

Data transfers

Data transfer procedures

Ensuring that correct procedures are adhered to facilitates the appropriate and consistent application of security controls as well as the generation of necessary audit records.

Security Control: 0663; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Data transfers are performed in accordance with approved procedures.

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 systems 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: O, P, S, TS; Priority: Must
Users transferring data to and from a system are held accountable for the data they transfer.

Trusted sources

Trusted sources are responsible for authorising data exports based on a formal assessment. Trusted sources include an organisation's Chief Information Security Officer (CISO) and their delegates.

Security Control: 0665; Revision: 4; Updated: May-19; Applicability: S, TS; Priority: Must
Trusted sources are a strictly limited number of personnel that have been authorised as such by an organisation's CISO.

Security Control: 0675; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Must
A trusted source makes an informed decision to sign all data authorised for export from a security domain.

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 for data transfers.

Security Control: 0664; Revision: 5; Updated: Sep-18; Applicability: S, TS; Priority: Must
All data transferred to a system of a lesser sensitivity or classification is reviewed and approved by a trusted source.

Import of data

Scanning imported data for malicious and active content reduces the likelihood of a system being infected with malicious code.

Security Control: 0657; Revision: 4; Updated: Sep-18; Applicability: O, P; Priority: Must
Data imported to a system is scanned for malicious and active content.

Security Control: 0658; Revision: 4; Updated: Sep-18; Applicability: S, TS; Priority: Must
Data imported to a system is scanned for malicious and active content, undergoes data format checks and logging, and is monitored to detect overuse/unusual usage patterns.

Export of data

When data is exported between systems, the classification should be assessed to determine if the export is permitted. Thorough inspection, including protective marking checks, can reduce the likelihood of data being transferred to a system that is not authorised to handle it or into the public domain.

Security Control: 1187; Revision: 1; Updated: Sep-18; Applicability: O, P; Priority: Must
When exporting data, protective marking checks are undertaken.

Security Control: 0669; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Must
When exporting data, the following activities are undertaken:

- *protective marking checks*

- *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 particularly important 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 procedures are developed to detect AUSTEO and AGAO data and to prevent it from crossing into foreign systems.

Security Control: 1535; Revision: 0; Updated: Sep-18; Applicability: S, TS; Priority: Must
Procedures are developed to prevent AUSTEO and AGAO data in both textual and non-textual formats from being exported to foreign systems.

Security Control: 0678; Revision: 2; Updated: Sep-18; Applicability: S, TS; Priority: Must
When exporting data from an AUSTEO or AGAO 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 Cross Domain Solutions (CDS), gateways and removable media.

Security Control: 0667; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
Data exported from each security domain, including through a gateway, is only permitted once the classification has been assessed including a protective marking check.

Security Control: 0660; Revision: 5; Updated: Sep-18; Applicability: S, TS; Priority: Must
When importing data to each security domain, by any means including through a gateway, the complete data transfer logs are audited at least monthly.

Security Control: 0673; Revision: 5; Updated: Sep-18; Applicability: S, TS; Priority: Must
When exporting data out of each security domain, by any means including through a gateway, the complete data transfer logs are audited at least monthly.

Security Control: 1294; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
When importing content to a security domain, including through a gateway, monthly audits of the imported content are performed.

Security Control: 1295; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
When exporting content out of a security domain, including through a gateway, monthly audits of the exported content are performed.

Further information

Further information on data transfers using removable media can be found in the ***Media usage*** section of the ***Guidelines for media management***.

Further information on data transfers via gateways or security domains can be found in the ***Content filtering*** section of these guidelines.

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
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.

When content filters are protecting classified environments as a component of a CDS, their assurance requirements necessitate rigorous security testing.

Security Control: 0659; Revision: 4; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
When importing data into a security domain, by any means including a CDS, the data is filtered by a content filter designed for that purpose.

Security Control: 1524; Revision: 0; Updated: Sep-18; Applicability: S, TS; Priority: Should
Content filters deployed in 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: O, P, S, TS; Priority: Must
All suspicious, malicious and active content is blocked from entering a security domain.

Security Control: 0652; Revision: 2; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Must
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: O, P, S, TS; Priority: Should
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. Content validation can be an effective means of identifying malformed content, allowing organisations to block potentially malicious content. Content validation operates on a whitelisting principle, blocking all content except for that which is explicitly permitted.

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: 1; Updated: Sep-18; Applicability: O, P; Priority: Should
Content validation is performed on all data passing through a content filter with content which fails content validation blocked.

Security Control: 1285; Revision: 1; Updated: Sep-18; Applicability: S, TS; Priority: Must
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 Joint Photographic Experts Group (JPEG) images
- 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: O, P, S, TS; Priority: Should
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, where possible will assist in mitigating the threat of content exploitation. Examples include:

- removal of document property information in Microsoft Office documents
- removal or renaming of JavaScript sections from PDF files
- removal of metadata from within JPEG files.

Security Control: 1287; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
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 the content filtering process recognises 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 a security administrator alerted.

Security Control: 1289; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
The contents from archive/container files are extracted and subjected to content filter checks.

Security Control: 1290; Revision: 1; Updated: Sep-18; Applicability: O, P, S, TS; Priority: Should
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: O, P, S, TS; Priority: Should
Files that cannot be inspected are blocked and generate an alert or notification.

Whitelisting permitted content

Creating and enforcing a whitelist of allowed content is a strong content filtering method. Only allowing content that satisfies a business requirement can reduce the attack surface of the system. As a simple example, an email content filter might only allow Microsoft Office documents and PDF files.

Security Control: 0649; Revision: 3; Updated: Sep-18; Applicability: O, P; Priority: Should
A whitelist of permitted content types is created and enforced based on business requirements and the results of a security risk assessment.

Security Control: 0650; Revision: 3; Updated: Sep-18; Applicability: S, TS; Priority: Must
A whitelist of permitted content types is created and enforced based on business requirements and the results of a security risk assessment.

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 information). 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.

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 information 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.

Supporting information

Glossary of abbreviations

Abbreviation	Meaning
3DES	Triple Data Encryption Standard
ACMA	Australian Communications and Media Authority
AACA	ASD Approved Cryptographic Algorithm
AACP	ASD Approved Cryptographic Protocol
ACE	ASD Cryptographic Evaluation
ACSC	Australian Cyber Security Centre
ACSI	Australian Communications Security Instruction
AES	Advanced Encryption Standard
AGAO	Australian Government Access Only
AGD	Attorney-General's Department
AH	Authentication Header
AISEP	Australasian Information Security Evaluation Program
ANSI	American National Standards Institute
ASD	Australian Signals Directorate
ASIO	Australian Security Intelligence Organisation
ATA	Advanced Technology Attachment
AUSTEO	Australian Eyes Only
CCMP	Counter Mode Cipher Block Chaining Message Authentication Code Protocol
CCRA	Common Criteria Recognition Arrangement

CDN	content delivery network
CDS	Cross Domain Solutions
CGCE	Commercial Grade Cryptographic Equipment
CISO	Chief Information Security Officer
CNSA	Commercial National Security Algorithm
CSO	Chief Security Officer
DBMS	database management system
DH	Diffie-Hellman
DKIM	DomainKeys Identified Mail
DMA	Direct Memory Access
DMARC	Domain-based Message Authentication, Reporting and Conformance
DNS	Domain Name System
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
EMET	Enhanced Mitigation Experience Toolkit
EPROM	erasable programmable read-only memory
ESP	Encapsulating Security Payload

FIPS	Federal Information Processing Standard
HA	High Assurance
HACE	High Assurance Cryptographic Equipment
HIPS	Host-based Intrusion Prevention System
HMAC	Hashed Message Authentication Code
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
ICT	Information and Communications Technology
IETF	Internet Engineering Task Force
IKE	Internet Key Exchange
IP	Internet Protocol
IPsec	Internet Protocol Security
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
IRAP	Information Security Registered Assessors Program
IRP	Incident Response Plan
ISAKMP	Internet Security Association Key Management Protocol
ISO	International Organization for Standardization
JPEG	Joint Photographic Experts Group
LAN	Local Area Network
MAC	Media Access Control
MFD	multifunction device
mSATA	Mini-Serial Advanced Technology Attachment

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
PIN	personal identification number
PKI	Public Key Infrastructure
PMK	Pairwise Master Key
PSC	Protective Security Circular
PSPF	Protective Security Policy Framework
PSTN	Public Switched Telephone Network
RADIUS	Remote Access Dial-In User Service
RAM	random-access memory
RDP	Remote Desktop Protocol
RF	Radio Frequency
RFC	Request for Comments
RSA	Rivest-Sharmir-Adleman
RTP	Real-time Traffic Protocol
SCEC	Security Construction and Equipment Committee
SEG	Security Equipment Guide
SHA-1	Secure Hashing Algorithm 1

SHA-2	Secure Hashing Algorithm 2
SIP	Session Initiation Protocol
SLAAC	Stateless Address Autoconfiguration
S/MIME	Secure/Multipurpose Internet Mail Extension
SNMP	Simple Network Management Protocol
SoA	Statement of Applicability
SOE	Standard Operating Environment
SOP	Standard Operating Procedure
SP	Special Publication
SPF	Sender Policy Framework
SSD	solid state drive
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Sockets Layer
SSP	System Security Plan
TLS	Transport Layer Security
USB	Universal Serial Bus
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
WPA2	Wi-Fi Protocol Access 2
XML	Extensible Markup Language

Glossary of cyber security terms

Term	Meaning
access control	The process of granting or denying requests for access to information and systems. Can also refer to the process of granting or denying requests to enter 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 information that may require a higher level of protection than their component parts.
application whitelisting	An approach in which only an explicitly defined set of applications are permitted to execute on system.
asset	Anything of value, such as ICT equipment, software or information.
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.
Australasian 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 Cyber Security Centre (ACSC) which is responsible for the overall operation of the program.
Australian Eyes Only	A caveat indicating that information is not to be passed to, or accessed by, foreign nationals.
Australian Government Access Only	A caveat used by the Australian Secret Intelligence Service, the Australian Security Intelligence Organisation (ASIO), the Australian Signals Directorate (ASD), the Department of Defence and the Office of National Assessments indicating information is 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 information are accessible and useable by authorised entities when required.
biometrics	Measurable physical characteristics used to identify or verify an individual.
blacklist	A list of things that are considered to be unacceptable and should not be trusted. A blacklist is the opposite of a whitelist.
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 information has special requirements in addition to those indicated by its classification. This term covers codewords, source codewords, releasability indicators and special-handling caveats.
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 information or systems according to the business impact level associated with that information or system.
classified information	Information that requires increased security to protect its confidentiality (i.e. information marked 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 software and ICT equipment 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 measures taken to deny unauthorised personnel information derived from telecommunications and to ensure the authenticity of such telecommunications.
conduit	A tube, duct or pipe used to protect cables.
confidentiality	The assurance that information 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.
consumer guide	Specific guidance for evaluated products and services.
content filter	A filter that examines content to assess conformance against a security policy.
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 Grade 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 information.
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 security	Measures used to protect systems and information processed, stored or communicated on such systems from compromise of confidentiality, integrity and availability.
cyber security event	An identified occurrence of a system, service or network state indicating a possible breach of security policy or failure of safeguards.
cyber security incident	An occurrence or activity that may threaten the confidentiality, integrity or availability of a system or the information stored, processed or communicated by it.
Cyber Security Incident Reporting Scheme	A scheme established by the ACSC to collect information on cyber security incidents.
cyber threat	Any circumstance or event with the potential to harm a system or information.
data at rest	Information that resides on media or a system.
data in transit	Information that is being communicated across a communication medium.
data spill	The accidental or deliberate exposure of information into an uncontrolled or unauthorised environment, or to people without a need-to-know.

declassification	A process whereby information is reduced to an OFFICIAL level 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 information 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 information 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 using a whitelisting approach 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 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.
escort	A person who ensures that when maintenance or repairs are undertaken to ICT equipment that uncleared personnel are not exposed to information 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.
flash memory media	A specific type of electrically erasable programmable read-only memory.
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 solely owned and managed by 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 information to ensure its protection. This can include electronic information, paper-based information or media containing information.
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	A subset of high assurance ICT equipment which contains cryptographic components.
High Assurance evaluation	The rigorous investigation, analysis, verification and validation of ICT equipment by ASD against a stringent security standard.
high assurance ICT equipment	ICT equipment that has been approved for the protection of information classified SECRET or above.
highly classified information	Information that requires the highest level of security to protect its confidentiality (i.e. information marked SECRET or TOP SECRET).
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 flash memory media or battery backed random-access memory (RAM).
ICT equipment	Any device that can process, store or communicate electronic information (e.g. computers, multifunction devices, mobile phones, digital cameras, electronic storage media and other radio devices).
Incident Response Plan	A plan for responding to cyber security incidents.

Information Security Registered Assessors Program	An initiative of the ACSC 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 information has been created, amended or deleted only by authorised individuals.
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.

logical access controls	Measures used to control access to systems and their information.
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 information relating to the management of the network.
media	A generic term for hardware, often portable in nature, which is used to store information.
media destruction	The process of physically damaging media with the intent of making information stored on it inaccessible. To destroy media effectively, only the actual material in which information 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 information stored on media so that it cannot be retrieved or reconstructed.
metadata	Descriptive information about the content and context used to identify information.
mobile device	A portable computing or communications device with information storage capability that can be used from a non-fixed location. Mobile devices include mobile phones, smartphones, tablets, laptops, portable electronic devices and other portable internet-connected devices.
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.

nationality releasable information	A caveat indicating that information is not to be passed to, or accessed by, foreign nationals beyond those belonging to specific countries which the information has been authorised for release to.
need-to-know	The principle of restricting an individual's access to only the information 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 information.
network infrastructure	The infrastructure used to carry information between workstations and servers or other network devices.
non-repudiation	Providing proof that a user performed an action, and in doing so preventing a user from denying that they did so.
non-shared government facility	A facility where the entire facility and personnel are cleared to the highest level of information processed in the facility.
non-volatile media	A type of media which retains its information when power is removed.
official information	Non-classified information identified as requiring basic protection (i.e. information marked as OFFICIAL or OFFICIAL: Sensitive).
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 characters or words used for authentication. Also known as a password.
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 targeted cyber intrusion scenarios in an attempt to achieve a specific goal, such as compromising critical business information or services.
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.
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, administrators or privileged users.
privileged user	A user who can alter or circumvent a system's security measures. This can also apply to users who could have only limited privileges, such as software developers, who can still bypass security measures. A privileged user can have the capability to modify system configurations, account privileges, audit logs, data files or 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 information. 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 information that not only shows the value of the information but also defines the level of protection to be provided.
public information	Information 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.
reclassification	An administrative decision to change the security measures afforded to information based on a reassessment of the potential impact of its unauthorised disclosure. The lowering of the security measures for media containing sensitive or classified information often requires sanitisation or destruction processes to be undertaken prior to a formal decision to lower the security measures protecting the information.
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 information. 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 Zone 2 to Zone 5 area, as defined in the Attorney-General's Department (AGD)'s *Protective Security Policy Framework* (PSPF), *Entity facilities* policy, to allow for the processing or storage of sensitive or classified information.
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 association	A collection of connection-specific parameters containing information about a one-way connection in IPsec that is required for each protocol used.
security association lifetime	The duration security association information 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 ASIO.
security domain	A system or collection of systems operating under a consistent security policy that defines the classification, releasability and special handling caveats for information 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 information 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.
server	A computer that provides services to users or other systems. For example, a file server, email server or database server.
shared government facility	A facility where the facility and personnel are cleared at different levels.
shared non-government facility	A facility where the facility is shared by government organisations and non-government organisations.
softphone	An application that allows a workstation to act as a phone using a built-in, or externally connected, microphone and speaker.
software component	An element of a system including, but not limited to, a database, operating system, network or web application.
solid state drive	Non-volatile media that uses flash memory media to retain its information 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 (VPN) 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 measures.
system	A related set of hardware and software used for the processing, storage or communication of information 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 information which the system is authorised to store, process or communicate.
System Security Plan	A plan documenting the security controls and procedures for a 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.
TEMPEST	A short name referring to investigations and studies of compromising emanations.
TEMPEST-rated ICT equipment	ICT equipment that has been specifically designed to minimise TEMPEST emanations.
TOP SECRET area	An area that has been authorised to process, store or communicate TOP SECRET information. 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 information, 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 information meeting certain defined parameters, such as a maximum data classification and reliably reviewing information 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.
unsecured space	An area not been certified to the physical security requirements for a Zone 2 to Zone 5 area, as defined in AGD's PSPF, *Entity facilities* policy, to allow for the processing or storage of sensitive or classified information.
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 private data network that maintains privacy through a tunnelling protocol and security procedures. VPNs 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 RAM, which gradually loses its information 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 flash memory to prolong the life of the media. As data can be written to and erased from an address on flash memory a finite number of times, wear-levelling helps to distribute writes evenly across each memory block, thereby decreasing the wear on the media and increasing its lifetime.
whitelist	A list of things that are considered to be acceptable and should be trusted. A whitelist is the opposite of a blacklist.
Wi-Fi Protected Access 2	A protocol designed to replace the Wi-Fi Protected Access protocol for communicating information 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.