NIST Special Publication 800-53
Revision 3 Excerpt

Recommended Security Controls for Federal Information Systems and Organizations

JOINT TASK FORCE
TRANSFORMATION INITIATIVE

HIGH-IMPACT BASELINE

I N F O R M A T I O N S E C U R I T Y

ANNEX 3

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ANNEX THREE

BASELINE SECURITY CONTROLS

HIGH-IMPACT INFORMATION SYSTEMS

Organizations are required to employ security controls to meet security requirements derived from applicable laws, Executive Orders, directives, policies, standards, instructions, regulations, procedures or organizational mission/business case needs. The challenge for organizations is to determine the appropriate set of security controls, which if implemented and determined to be effective in their application, would most cost-effectively comply with the stated security requirements. Selecting the appropriate set of security controls to meet the specific, and sometimes unique, security requirements of an organization is an important task – a task that demonstrates the organization's commitment to security and the due diligence exercised in protecting the confidentiality, integrity, and availability of its information systems that are dependable in the face of threats.

To assist organizations in making the appropriate selection of security controls for their information systems, the concept of *baseline* controls is introduced. Baseline controls are the starting point for the security control selection process and are chosen based on the security category and associated impact level of the information system determined in accordance with FIPS 199[1] and FIPS 200, respectively. Table 1 provides a summary of the security controls and control enhancements in the high-impact baseline from Appendix D, NIST Special Publication 800-53 (as amended). Part one follows, containing the full descriptions of the controls and associated enhancements listed in the table. Part two provides the minimum assurance requirements for high-impact information systems from Appendix E, NIST Special Publication 800-53 (as amended).

Organizations are expected to apply the tailoring guidance described in Section 3.3 of NIST Special Publication 800-53 (as amended) to the initial high-impact baseline security controls—producing a tailored baseline. The tailored security control baseline serves as the starting point for organizations in determining the appropriate safeguards and countermeasures necessary to protect their information systems. Supplements to the tailored baseline (see Section 3.3 of NIST Special Publication 800-53, as amended) will likely be necessary in order to adequately mitigate risks to organizational operations (including mission, functions, image, and reputation), organizational assets, and individuals. The tailored baseline is supplemented based on an organizational assessment of risk with the supplemented baseline documented in the security plan for the information system. The supplemented security control baseline, along with any information system use restrictions required to achieve adequate risk mitigation, represents the organization's definition for information system security due diligence.

[1] FIPS 199 security categories are based on the potential impact on an organization or individuals should certain events occur which jeopardize the information and information systems needed by the organization to accomplish its assigned mission, protect its assets, fulfill its legal responsibilities, maintain its day-to-day functions, and protect individuals.

TABLE 1: SUMMARY OF BASELINE SECRUITY CONTROLS

CNTL NO.	CONTROL NAME	PRIORITY	CONTROL BASELINES		
			LOW	MOD	HIGH
Access Control					
AC-1	Access Control Policy and Procedures	P1	AC-1	AC-1	AC-1
AC-2	Account Management	P1	AC-2	AC-2 (1) (2) (3) (4)	AC-2 (1) (2) (3) (4)
AC-3	Access Enforcement	P1	AC-3	AC-3	AC-3
AC-4	Information Flow Enforcement	P1	Not Selected	AC-4	AC-4
AC-5	Separation of Duties	P1	Not Selected	AC-5	AC-5
AC-6	Least Privilege	P1	Not Selected	AC-6 (1) (2)	AC-6 (1) (2)
AC-7	Unsuccessful Login Attempts	P2	AC-7	AC-7	AC-7
AC-8	System Use Notification	P1	AC-8	AC-8	AC-8
AC-9	Previous Logon (Access) Notification	P0	Not Selected	Not Selected	Not Selected
AC-10	Concurrent Session Control	P2	Not Selected	Not Selected	AC-10
AC-11	Session Lock	P3	Not Selected	AC-11	AC-11
AC-12	Session Termination (Withdrawn)	---	---	---	---
AC-13	Supervision and Review—Access Control (Withdrawn)	---	---	---	---
AC-14	Permitted Actions without Identification or Authentication	P1	AC-14	AC-14 (1)	AC-14 (1)
AC-15	Automated Marking (Withdrawn)	---	---	---	---
AC-16	Security Attributes	P0	Not Selected	Not Selected	Not Selected
AC-17	Remote Access	P1	AC-17	AC-17 (1) (2) (3) (4) (5) (7) (8)	AC-17 (1) (2) (3) (4) (5) (7) (8)
AC-18	Wireless Access	P1	AC-18	AC-18 (1)	AC-18 (1) (2) (4) (5)
AC-19	Access Control for Mobile Devices	P1	AC-19	AC-19 (1) (2) (3)	AC-19 (1) (2) (3)
AC-20	Use of External Information Systems	P1	AC-20	AC-20 (1) (2)	AC-20 (1) (2)
AC-21	User-Based Collaboration and Information Sharing	P0	Not Selected	Not Selected	Not Selected
AC-22	Publicly Accessible Content	P2	AC-22	AC-22	AC-22
Awareness and Training					
AT-1	Security Awareness and Training Policy and Procedures	P1	AT-1	AT-1	AT-1
AT-2	Security Awareness	P1	AT-2	AT-2	AT-2
AT-3	Security Training	P1	AT-3	AT-3	AT-3
AT-4	Security Training Records	P3	AT-4	AT-4	AT-4
AT-5	Contacts with Security Groups and Associations	P0	Not Selected	Not Selected	Not Selected
Audit and Accountability					
AU-1	Audit and Accountability Policy and Procedures	P1	AU-1	AU-1	AU-1
AU-2	Auditable Events	P1	AU-2	AU-2 (3) (4)	AU-2 (3) (4)
AU-3	Content of Audit Records	P1	AU-3	AU-3 (1)	AU-3 (1) (2)
AU-4	Audit Storage Capacity	P1	AU-4	AU-4	AU-4

CNTL NO.	CONTROL NAME	PRIORITY	CONTROL BASELINES		
			LOW	MOD	HIGH
AU-5	Response to Audit Processing Failures	P1	AU-5	AU-5	AU-5 (1) (2)
AU-6	Audit Review, Analysis, and Reporting	P1	AU-6	AU-6	AU-6 (1)
AU-7	Audit Reduction and Report Generation	P2	Not Selected	AU-7 (1)	AU-7 (1)
AU-8	Time Stamps	P1	AU-8	AU-8 (1)	AU-8 (1)
AU-9	Protection of Audit Information	P1	AU-9	AU-9	AU-9
AU-10	Non-repudiation	P1	Not Selected	Not Selected	AU-10
AU-11	Audit Record Retention	P3	AU-11	AU-11	AU-11
AU-12	Audit Generation	P1	AU-12	AU-12	AU-12 (1)
AU-13	Monitoring for Information Disclosure	P0	Not Selected	Not Selected	Not Selected
AU-14	Session Audit	P0	Not Selected	Not Selected	Not Selected
Security Assessment and Authorization					
CA-1	Security Assessment and Authorization Policies and Procedures	P1	CA-1	CA-1	CA-1
CA-2	Security Assessments	P2	CA-2	CA-2 (1)	CA-2 (1) (2)
CA-3	Information System Connections	P1	CA-3	CA-3	CA-3
CA-4	Security Certification (Withdrawn)	---	---	---	---
CA-5	Plan of Action and Milestones	P3	CA-5	CA-5	CA-5
CA-6	Security Authorization	P3	CA-6	CA-6	CA-6
CA-7	Continuous Monitoring	P3	CA-7	CA-7	CA-7
Configuration Management					
CM-1	Configuration Management Policy and Procedures	P1	CM-1	CM-1	CM-1
CM-2	Baseline Configuration	P1	CM-2	CM-2 (1) (3) (4)	CM-2 (1) (2) (3) (5) (6)
CM-3	Configuration Change Control	P1	Not Selected	CM-3 (2)	CM-3 (1) (2)
CM-4	Security Impact Analysis	P2	CM-4	CM-4	CM-4 (1)
CM-5	Access Restrictions for Change	P1	Not Selected	CM-5	CM-5 (1) (2) (3)
CM-6	Configuration Settings	P1	CM-6	CM-6 (3)	CM-6 (1) (2) (3)
CM-7	Least Functionality	P1	CM-7	CM-7 (1)	CM-7 (1) (2)
CM-8	Information System Component Inventory	P1	CM-8	CM-8 (1) (5)	CM-8 (1) (2) (3) (4) (5)
CM-9	Configuration Management Plan	P1	Not Selected	CM-9	CM-9
Contingency Planning					
CP-1	Contingency Planning Policy and Procedures	P1	CP-1	CP-1	CP-1
CP-2	Contingency Plan	P1	CP-2	CP-2 (1)	CP-2 (1) (2) (3)
CP-3	Contingency Training	P2	CP-3	CP-3	CP-3 (1)
CP-4	Contingency Plan Testing and Exercises	P2	CP-4	CP-4 (1)	CP-4 (1) (2) (4)
CP-5	Contingency Plan Update (Withdrawn)	---	---	---	---
CP-6	Alternate Storage Site	P1	Not Selected	CP-6 (1) (3)	CP-6 (1) (2) (3)
CP-7	Alternate Processing Site	P1	Not Selected	CP-7 (1) (2) (3) (5)	CP-7 (1) (2) (3) (4) (5)
CP-8	Telecommunications Services	P1	Not Selected	CP-8 (1) (2)	CP-8 (1) (2) (3) (4)
CP-9	Information System Backup	P1	CP-9	CP-9 (1)	CP-9 (1) (2) (3)

CNTL NO.	CONTROL NAME	PRIORITY	CONTROL BASELINES		
			LOW	MOD	HIGH
CP-10	Information System Recovery and Reconstitution	P1	CP-10	CP-10 (2) (3)	CP-10 (2) (3) (4)
Identification and Authentication					
IA-1	Identification and Authentication Policy and Procedures	P1	IA-1	IA-1	IA-1
IA-2	Identification and Authentication (Organizational Users)	P1	IA-2 (1)	IA-2 (1) (2) (3) (8)	IA-2 (1) (2) (3) (4) (8) (9)
IA-3	Device Identification and Authentication	P1	Not Selected	IA-3	IA-3
IA-4	Identifier Management	P1	IA-4	IA-4	IA-4
IA-5	Authenticator Management	P1	IA-5 (1)	IA-5 (1) (2) (3)	IA-5 (1) (2) (3)
IA-6	Authenticator Feedback	P1	IA-6	IA-6	IA-6
IA-7	Cryptographic Module Authentication	P1	IA-7	IA-7	IA-7
IA-8	Identification and Authentication (Non-Organizational Users)	P1	IA-8	IA-8	IA-8
Incident Response					
IR-1	Incident Response Policy and Procedures	P1	IR-1	IR-1	IR-1
IR-2	Incident Response Training	P2	IR-2	IR-2	IR-2 (1) (2)
IR-3	Incident Response Testing and Exercises	P2	Not Selected	IR-3	IR-3 (1)
IR-4	Incident Handling	P1	IR-4	IR-4 (1)	IR-4 (1)
IR-5	Incident Monitoring	P1	IR-5	IR-5	IR-5 (1)
IR-6	Incident Reporting	P1	IR-6	IR-6 (1)	IR-6 (1)
IR-7	Incident Response Assistance	P3	IR-7	IR-7 (1)	IR-7 (1)
IR-8	Incident Response Plan	P1	IR-8	IR-8	IR-8
Maintenance					
MA-1	System Maintenance Policy and Procedures	P1	MA-1	MA-1	MA-1
MA-2	Controlled Maintenance	P2	MA-2	MA-2 (1)	MA-2 (1) (2)
MA-3	Maintenance Tools	P2	Not Selected	MA-3 (1) (2)	MA-3 (1) (2) (3)
MA-4	Non-Local Maintenance	P1	MA-4	MA-4 (1) (2)	MA-4 (1) (2) (3)
MA-5	Maintenance Personnel	P1	MA-5	MA-5	MA-5
MA-6	Timely Maintenance	P1	Not Selected	MA-6	MA-6
Media Protection					
MP-1	Media Protection Policy and Procedures	P1	MP-1	MP-1	MP-1
MP-2	Media Access	P1	MP-2	MP-2 (1)	MP-2 (1)
MP-3	Media Marking	P1	Not Selected	MP-3	MP-3
MP-4	Media Storage	P1	Not Selected	MP-4	MP-4
MP-5	Media Transport	P1	Not Selected	MP-5 (2) (4)	MP-5 (2) (3) (4)
MP-6	Media Sanitization	P1	MP-6	MP-6	MP-6 (1) (2) (3)
Physical and Environmental Protection					
PE-1	Physical and Environmental Protection Policy and Procedures	P1	PE-1	PE-1	PE-1
PE-2	Physical Access Authorizations	P1	PE-2	PE-2	PE-2
PE-3	Physical Access Control	P1	PE-3	PE-3	PE-3 (1)
PE-4	Access Control for Transmission Medium	P1	Not Selected	PE-4	PE-4
PE-5	Access Control for Output Devices	P1	Not Selected	PE-5	PE-5
PE-6	Monitoring Physical Access	P1	PE-6	PE-6 (1)	PE-6 (1) (2)

CNTL NO.	CONTROL NAME	PRIORITY	CONTROL BASELINES		
			LOW	MOD	HIGH
PE-7	Visitor Control	P1	PE-7	PE-7 (1)	PE-7 (1)
PE-8	Access Records	P3	PE-8	PE-8	PE-8 (1) (2)
PE-9	Power Equipment and Power Cabling	P1	Not Selected	PE-9	PE-9
PE-10	Emergency Shutoff	P1	Not Selected	PE-10	PE-10
PE-11	Emergency Power	P1	Not Selected	PE-11	PE-11 (1)
PE-12	Emergency Lighting	P1	PE-12	PE-12	PE-12
PE-13	Fire Protection	P1	PE-13	PE-13 (1) (2) (3)	PE-13 (1) (2) (3)
PE-14	Temperature and Humidity Controls	P1	PE-14	PE-14	PE-14
PE-15	Water Damage Protection	P1	PE-15	PE-15	PE-15 (1)
PE-16	Delivery and Removal	P1	PE-16	PE-16	PE-16
PE-17	Alternate Work Site	P1	Not Selected	PE-17	PE-17
PE-18	Location of Information System Components	P2	Not Selected	PE-18	PE-18 (1)
PE-19	Information Leakage	P0	Not Selected	Not Selected	Not Selected
Planning					
PL-1	Security Planning Policy and Procedures	P1	PL-1	PL-1	PL-1
PL-2	System Security Plan	P1	PL-2	PL-2	PL-2
PL-3	System Security Plan Update (Withdrawn)	---	---	---	---
PL-4	Rules of Behavior	P1	PL-4	PL-4	PL-4
PL-5	Privacy Impact Assessment	P1	PL-5	PL-5	PL-5
PL-6	Security-Related Activity Planning	P3	Not Selected	PL-6	PL-6
Personnel Security					
PS-1	Personnel Security Policy and Procedures	P1	PS-1	PS-1	PS-1
PS-2	Position Categorization	P1	PS-2	PS-2	PS-2
PS-3	Personnel Screening	P1	PS-3	PS-3	PS-3
PS-4	Personnel Termination	P2	PS-4	PS-4	PS-4
PS-5	Personnel Transfer	P2	PS-5	PS-5	PS-5
PS-6	Access Agreements	P3	PS-6	PS-6	PS-6
PS-7	Third-Party Personnel Security	P1	PS-7	PS-7	PS-7
PS-8	Personnel Sanctions	P3	PS-8	PS-8	PS-8
Risk Assessment					
RA-1	Risk Assessment Policy and Procedures	P1	RA-1	RA-1	RA-1
RA-2	Security Categorization	P1	RA-2	RA-2	RA-2
RA-3	Risk Assessment	P1	RA-3	RA-3	RA-3
RA-4	Risk Assessment Update (Withdrawn)	---	---	---	---
RA-5	Vulnerability Scanning	P1	RA-5	RA-5 (1)	RA-5 (1) (2) (3) (4) (5) (7)
System and Services Acquisition					
SA-1	System and Services Acquisition Policy and Procedures	P1	SA-1	SA-1	SA-1
SA-2	Allocation of Resources	P1	SA-2	SA-2	SA-2
SA-3	Life Cycle Support	P1	SA-3	SA-3	SA-3
SA-4	Acquisitions	P1	SA-4	SA-4 (1) (4)	SA-4 (1) (2) (4)
SA-5	Information System Documentation	P2	SA-5	SA-5 (1) (3)	SA-5 (1) (2) (3)

CNTL NO.	CONTROL NAME	PRIORITY	CONTROL BASELINES		
			LOW	MOD	HIGH
SA-6	Software Usage Restrictions	P1	SA-6	SA-6	SA-6
SA-7	User-Installed Software	P1	SA-7	SA-7	SA-7
SA-8	Security Engineering Principles	P1	Not Selected	SA-8	SA-8
SA-9	External Information System Services	P1	SA-9	SA-9	SA-9
SA-10	Developer Configuration Management	P1	Not Selected	SA-10	SA-10
SA-11	Developer Security Testing	P2	Not Selected	SA-11	SA-11
SA-12	Supply Chain Protection	P1	Not Selected	Not Selected	SA-12
SA-13	Trustworthiness	P1	Not Selected	Not Selected	SA-13
SA-14	Critical Information System Components	P0	Not Selected	Not Selected	Not Selected
System and Communications Protection					
SC-1	System and Communications Protection Policy and Procedures	P1	SC-1	SC-1	SC-1
SC-2	Application Partitioning	P1	Not Selected	SC-2	SC-2
SC-3	Security Function Isolation	P1	Not Selected	Not Selected	SC-3
SC-4	Information in Shared Resources	P1	Not Selected	SC-4	SC-4
SC-5	Denial of Service Protection	P1	SC-5	SC-5	SC-5
SC-6	Resource Priority	P0	Not Selected	Not Selected	Not Selected
SC-7	Boundary Protection	P1	SC-7	SC-7 (1) (2) (3) (4) (5) (7)	SC-7 (1) (2) (3) (4) (5) (6) (7) (8)
SC-8	Transmission Integrity	P1	Not Selected	SC-8 (1)	SC-8 (1)
SC-9	Transmission Confidentiality	P1	Not Selected	SC-9 (1)	SC-9 (1)
SC-10	Network Disconnect	P2	Not Selected	SC-10	SC-10
SC-11	Trusted Path	P0	Not Selected	Not Selected	Not Selected
SC-12	Cryptographic Key Establishment and Management	P1	SC-12	SC-12	SC-12 (1)
SC-13	Use of Cryptography	P1	SC-13	SC-13	SC-13
SC-14	Public Access Protections	P1	SC-14	SC-14	SC-14
SC-15	Collaborative Computing Devices	P1	SC-15	SC-15	SC-15
SC-16	Transmission of Security Attributes	P0	Not Selected	Not Selected	Not Selected
SC-17	Public Key Infrastructure Certificates	P1	Not Selected	SC-17	SC-17
SC-18	Mobile Code	P1	Not Selected	SC-18	SC-18
SC-19	Voice Over Internet Protocol	P1	Not Selected	SC-19	SC-19
SC-20	Secure Name /Address Resolution Service (Authoritative Source)	P1	SC-20 (1)	SC-20 (1)	SC-20 (1)
SC-21	Secure Name /Address Resolution Service (Recursive or Caching Resolver)	P1	Not Selected	Not Selected	SC-21
SC-22	Architecture and Provisioning for Name/Address Resolution Service	P1	Not Selected	SC-22	SC-22
SC-23	Session Authenticity	P1	Not Selected	SC-23	SC-23
SC-24	Fail in Known State	P1	Not Selected	Not Selected	SC-24
SC-25	Thin Nodes	P0	Not Selected	Not Selected	Not Selected
SC-26	Honeypots	P0	Not Selected	Not Selected	Not Selected
SC-27	Operating System-Independent Applications	P0	Not Selected	Not Selected	Not Selected
SC-28	Protection of Information at Rest	P1	Not Selected	SC-28	SC-28

CNTL NO.	CONTROL NAME	PRIORITY	CONTROL BASELINES		
			LOW	MOD	HIGH
SC-29	Heterogeneity	P0	Not Selected	Not Selected	Not Selected
SC-30	Virtualization Techniques	P0	Not Selected	Not Selected	Not Selected
SC-31	Covert Channel Analysis	P0	Not Selected	Not Selected	Not Selected
SC-32	Information System Partitioning	P0	Not Selected	SC-32	SC-32
SC-33	Transmission Preparation Integrity	P0	Not Selected	Not Selected	Not Selected
SC-34	Non-Modifiable Executable Programs	P0	Not Selected	Not Selected	Not Selected
System and Information Integrity					
SI-1	System and Information Integrity Policy and Procedures	P1	SI-1	SI-1	SI-1
SI-2	Flaw Remediation	P1	SI-2	SI-2 (2)	SI-2 (1) (2)
SI-3	Malicious Code Protection	P1	SI-3	SI-3 (1) (2) (3)	SI-3 (1) (2) (3)
SI-4	Information System Monitoring	P1	Not Selected	SI-4 (2) (4) (5) (6)	SI-4 (2) (4) (5) (6)
SI-5	Security Alerts, Advisories, and Directives	P1	SI-5	SI-5	SI-5 (1)
SI-6	Security Functionality Verification	P1	Not Selected	Not Selected	SI-6
SI-7	Software and Information Integrity	P1	Not Selected	SI-7 (1)	SI-7 (1) (2)
SI-8	Spam Protection	P1	Not Selected	SI-8	SI-8 (1)
SI-9	Information Input Restrictions	P2	Not Selected	SI-9	SI-9
SI-10	Information Input Validation	P1	Not Selected	SI-10	SI-10
SI-11	Error Handling	P2	Not Selected	SI-11	SI-11
SI-12	Information Output Handling and Retention	P2	SI-12	SI-12	SI-12
SI-13	Predictable Failure Prevention	P0	Not Selected	Not Selected	Not Selected

Industrial Control System Supplements to the Security Control Baselines

The following table lists the recommended Industrial Control System supplements (highlighted in **bold** text) to the security controls baselines in Appendix D, NIST Special Publication 800-53 (as amended).

CNTL NO.	CONTROL NAME	CONTROL BASELINES		
		LOW	MOD	HIGH
Access Control				
AC-3	Access Enforcement	AC-3	AC-3 **(2)**	AC-3 **(2)**
Physical and Environmental Protection				
PE-9	Power Equipment and Power Cabling	Not Selected	PE-9 **(1)**	PE-9 **(1)**
PE-11	Emergency Power	**PE-11**	PE-11 **(1)**	PE-11 (1) **(2)**
System and Communications Protection				
SC-24	Fail in Known State	Not Selected	**SC-24**	SC-24
System and Information Integrity				
SI-13	Predictable Failure Prevention	Not Selected	Not Selected	**SI-13**

PART ONE

SECURITY CONTROLS AND ENHANCEMENTS

HIGH-IMPACT INFORMATION SYSTEMS

FAMILY: ACCESS CONTROL **CLASS:** TECHNICAL

AC-1 ACCESS CONTROL POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented access control policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the access control policy and associated access controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the access control family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The access control policy can be included as part of the general information security policy for the organization. Access control procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the access control policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-100.

AC-2 ACCOUNT MANAGEMENT

Control: The organization manages information system accounts, including:

a. Identifying account types (i.e., individual, group, system, application, guest/anonymous, and temporary);

b. Establishing conditions for group membership;

c. Identifying authorized users of the information system and specifying access privileges;

d. Requiring appropriate approvals for requests to establish accounts;

e. Establishing, activating, modifying, disabling, and removing accounts;

f. Specifically authorizing and monitoring the use of guest/anonymous and temporary accounts;

g. Notifying account managers when temporary accounts are no longer required and when information system users are terminated, transferred, or information system usage or need-to-know/need-to-share changes;

h. Deactivating: (i) temporary accounts that are no longer required; and (ii) accounts of terminated or transferred users;

i. Granting access to the system based on: (i) a valid access authorization; (ii) intended system usage; and (iii) other attributes as required by the organization or associated missions/business functions; and

j. Reviewing accounts [*Assignment: organization-defined frequency*].

Supplemental Guidance: The identification of authorized users of the information system and the specification of access privileges is consistent with the requirements in other security controls in the security plan. Users requiring administrative privileges on information system accounts receive additional scrutiny by organizational officials responsible for approving such accounts and privileged access. Related controls: AC-3, AC-4, AC-5, AC-6, AC-10, AC-17, AC-19, AC-20, AU-9, IA-4, IA-5, CM-5, CM-6, MA-3, MA-4, MA-5, SA-7, SC-13, SI-9.

Control Enhancements:

(1) The organization employs automated mechanisms to support the management of information system accounts.

(2) The information system automatically terminates temporary and emergency accounts after [*Assignment: organization-defined time period for each type of account*].

(3) The information system automatically disables inactive accounts after [*Assignment: organization-defined time period*].

(4) The information system automatically audits account creation, modification, disabling, and termination actions and notifies, as required, appropriate individuals.

References: None.

AC-3 ACCESS ENFORCEMENT

Control: The information system enforces approved authorizations for logical access to the system in accordance with applicable policy.

Supplemental Guidance: Access control policies (e.g., identity-based policies, role-based policies, attribute-based policies) and access enforcement mechanisms (e.g., access control lists, access control matrices, cryptography) are employed by organizations to control access between users (or processes acting on behalf of users) and objects (e.g., devices, files, records, processes, programs, domains) in the information system. In addition to enforcing authorized access at the information-system level, access enforcement mechanisms are employed at the application level, when necessary, to provide increased information security for the organization. Consideration is given to the implementation of an audited, explicit override of automated mechanisms in the event of emergencies or other serious events. If encryption of stored information is employed as an access enforcement mechanism, the cryptography used is FIPS 140-2 (as amended) compliant. For classified information, the cryptography used is largely dependent on the classification level of the information and the clearances of the individuals having access to the information. Mechanisms implemented by AC-3 are configured to enforce authorizations determined by other security controls. Related controls: AC-2, AC-4, AC-5, AC-6, AC-16, AC-17, AC-18, AC-19, AC-20, AC-21, AC-22, AU-9, CM-5, CM-6, MA-3, MA-4, MA-5, SA-7, SC-13, SI-9.

References: None.

AC-4 INFORMATION FLOW ENFORCEMENT

Control: The information system enforces approved authorizations for controlling the flow of information within the system and between interconnected systems in accordance with applicable policy.

Supplemental Guidance: Information flow control regulates where information is allowed to travel within an information system and between information systems (as opposed to who is allowed to access the information) and without explicit regard to subsequent accesses to that information. A few examples of flow control restrictions include: keeping export controlled information from being transmitted in the clear to the Internet, blocking outside traffic that claims to be from within the organization, and not passing any web requests to the Internet that are not from the internal web proxy. Information flow control policies and enforcement mechanisms are commonly employed by organizations to control the flow of information between designated sources and destinations (e.g., networks, individuals, devices) within information systems and between interconnected systems. Flow control is based on the characteristics of the information and/or the

information path. Specific examples of flow control enforcement can be found in boundary protection devices (e.g., proxies, gateways, guards, encrypted tunnels, firewalls, and routers) that employ rule sets or establish configuration settings that restrict information system services, provide a packet-filtering capability based on header information, or message-filtering capability based on content (e.g., using key word searches or document characteristics). Mechanisms implemented by AC-4 are configured to enforce authorizations determined by other security controls. Related controls: AC-17, AC-19, AC-21, CM-7, SA-8, SC-2, SC-5, SC-7, SC-18.

References: None.

AC-5 SEPARATION OF DUTIES

Control: The organization:

a. Separates duties of individuals as necessary, to prevent malevolent activity without collusion;

b. Documents separation of duties; and

c. Implements separation of duties through assigned information system access authorizations.

Supplemental Guidance: Examples of separation of duties include: (i) mission functions and distinct information system support functions are divided among different individuals/roles; (ii) different individuals perform information system support functions (e.g., system management, systems programming, configuration management, quality assurance and testing, network security); (iii) security personnel who administer access control functions do not administer audit functions; and (iv) different administrator accounts for different roles. Access authorizations defined in this control are implemented by control AC-3. Related controls: AC-3.

References: None.

AC-6 LEAST PRIVILEGE

Control: The organization employs the concept of least privilege, allowing only authorized accesses for users (and processes acting on behalf of users) which are necessary to accomplish assigned tasks in accordance with organizational missions and business functions.

Supplemental Guidance: The access authorizations defined in this control are largely implemented by control AC-3. The organization employs the concept of least privilege for specific duties and information systems (including specific ports, protocols, and services) in accordance with risk assessments as necessary to adequately mitigate risk to organizational operations and assets, individuals, other organizations, and the Nation. Related controls: AC-2, AC-3, CM-7.

Control Enhancements:

(1) The organization explicitly authorizes access to [*Assignment: organization-defined list of security functions (deployed in hardware, software, and firmware) and security-relevant information*].

Enhancement Supplemental Guidance: Establishing system accounts, configuring access authorizations (i.e., permissions, privileges), setting events to be audited, and setting intrusion detection parameters are examples of security functions. Explicitly authorized personnel include, for example, security administrators, system and network administrators, system security officers, system maintenance personnel, system programmers, and other privileged users. Related control: AC-17.

(2) The organization requires that users of information system accounts, or roles, with access to [*Assignment: organization-defined list of security functions or security-relevant information*], use non-privileged accounts, or roles, when accessing other system functions, and if feasible, audits any use of privileged accounts, or roles, for such functions.

Enhancement Supplemental Guidance: This control enhancement is intended to limit exposure due to operating from within a privileged account or role. The inclusion of *role* is intended to address those situations where an access control policy such as *Role Based Access Control (RBAC)* is being implemented and where a change of role provides the same degree of

assurance in the change of access authorizations for both the user and all processes acting on behalf of the user as would be provided by a change between a privileged and non-privileged account. Audit of privileged activity may require physical separation employing information systems on which the user does not have privileged access.

References: None.

AC-7 UNSUCCESSFUL LOGIN ATTEMPTS

Control: The information system:

a. Enforces a limit of [*Assignment: organization-defined number*] consecutive invalid login attempts by a user during a [*Assignment: organization-defined time period*]; and

b. Automatically [*Selection: locks the account/node for an* [*Assignment: organization-defined time period*]; *locks the account/node until released by an administrator; delays next login prompt according to* [*Assignment: organization-defined delay algorithm*]] when the maximum number of unsuccessful attempts is exceeded. The control applies regardless of whether the login occurs via a local or network connection.

Supplemental Guidance: Due to the potential for denial of service, automatic lockouts initiated by the information system are usually temporary and automatically release after a predetermined time period established by the organization. If a delay algorithm is selected, the organization may chose to employ different algorithms for different information system components based on the capabilities of those components. Response to unsuccessful login attempts may be implemented at both the operating system and the application levels. This control applies to all accesses other than those accesses explicitly identified and documented by the organization in AC-14.

References: None.

AC-8 SYSTEM USE NOTIFICATION

Control: The information system:

a. Displays an approved system use notification message or banner before granting access to the system that provides privacy and security notices consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance and states that: (i) users are accessing a U.S. Government information system; (ii) system usage may be monitored, recorded, and subject to audit; (iii) unauthorized use of the system is prohibited and subject to criminal and civil penalties; and (iv) use of the system indicates consent to monitoring and recording;

b. Retains the notification message or banner on the screen until users take explicit actions to log on to or further access the information system; and

c. For publicly accessible systems: (i) displays the system use information when appropriate, before granting further access; (ii) displays references, if any, to monitoring, recording, or auditing that are consistent with privacy accommodations for such systems that generally prohibit those activities; and (iii) includes in the notice given to public users of the information system, a description of the authorized uses of the system.

Supplemental Guidance: System use notification messages can be implemented in the form of warning banners displayed when individuals log in to the information system. System use notification is intended only for information system access that includes an interactive login interface with a human user and is not intended to require notification when an interactive interface does not exist.

References: None.

AC-10 CONCURRENT SESSION CONTROL

Control: The information system limits the number of concurrent sessions for each system account to [*Assignment: organization-defined number*].

Supplemental Guidance: The organization may define the maximum number of concurrent sessions for an information system account globally, by account type, by account, or a combination. This control addresses concurrent sessions for a given information system account and does not address concurrent sessions by a single user via multiple system accounts.

Control Enhancements: None.

References: None.

AC-11 SESSION LOCK

Control: The information system:

a. Prevents further access to the system by initiating a session lock after [*Assignment: organization-defined time period*] of inactivity or upon receiving a request from a user; and

b. Retains the session lock until the user reestablishes access using established identification and authentication procedures.

Supplemental Guidance: A session lock is a temporary action taken when a user stops work and moves away from the immediate physical vicinity of the information system but does not want to log out because of the temporary nature of the absence. The session lock is implemented at the point where session activity can be determined. This is typically at the operating system-level, but may be at the application-level. A session lock is not a substitute for logging out of the information system, for example, if the organization requires users to log out at the end of the workday.

References: OMB Memorandum 06-16.

AC-14 PERMITTED ACTIONS WITHOUT IDENTIFICATION OR AUTHENTICATION

Control: The organization:

a. Identifies specific user actions that can be performed on the information system without identification or authentication; and

b. Documents and provides supporting rationale in the security plan for the information system, user actions not requiring identification and authentication.

Supplemental Guidance: This control is intended for those specific instances where an organization determines that no identification and authentication is required; it is not, however, mandating that such instances exist in given information system. The organization may allow a limited number of user actions without identification and authentication (e.g., when individuals access public websites or other publicly accessible federal information systems such as http://www.usa.gov). Organizations also identify any actions that normally require identification or authentication but may under certain circumstances (e.g., emergencies), allow identification or authentication mechanisms to be bypassed. Such bypass may be, for example, via a software-readable physical switch that commands bypass of the login functionality and is protected from accidental or unmonitored use. This control does not apply to situations where identification and authentication have already occurred and are not being repeated, but rather to situations where identification and/or authentication have not yet occurred. Related control: CP-2, IA-2.

Control Enhancements:

(1) The organization permits actions to be performed without identification and authentication only to the extent necessary to accomplish mission/business objectives.

References: None.

AC-17 REMOTE ACCESS

Control: The organization:

a. Documents allowed methods of remote access to the information system;

b. Establishes usage restrictions and implementation guidance for each allowed remote access method;

c. Monitors for unauthorized remote access to the information system;

d. Authorizes remote access to the information system prior to connection; and

e. Enforces requirements for remote connections to the information system.

Supplemental Guidance: This control requires explicit authorization prior to allowing remote access to an information system without specifying a specific format for that authorization. For example, while the organization may deem it appropriate to use a system interconnection agreement to authorize a given remote access, such agreements are not required by this control. Remote access is any access to an organizational information system by a user (or process acting on behalf of a user) communicating through an external network (e.g., the Internet). Examples of remote access methods include dial-up, broadband, and wireless (see AC-18 for wireless access). A virtual private network when adequately provisioned with appropriate security controls, is considered an internal network (i.e., the organization establishes a network connection between organization-controlled endpoints in a manner that does not require the organization to depend on external networks to protect the confidentiality or integrity of information transmitted across the network). Remote access controls are applicable to information systems other than public web servers or systems specifically designed for public access. Enforcing access restrictions associated with remote connections is accomplished by control AC-3. Related controls: AC-3, AC-18, AC-20, IA-2, IA-3, IA-8, MA-4.

Control Enhancements:

(1) The organization employs automated mechanisms to facilitate the monitoring and control of remote access methods.

Enhancement Supplemental Guidance: Automated monitoring of remote access sessions allows organizations to audit user activities on a variety of information system components (e.g., servers, workstations, notebook/laptop computers) and to ensure compliance with remote access policy.

(2) The organization uses cryptography to protect the confidentiality and integrity of remote access sessions.

Enhancement Supplemental Guidance: The encryption strength of mechanism is selected based on the security categorization of the information. Related controls: SC-8, SC-9, SC-13.

(3) The information system routes all remote accesses through a limited number of managed access control points.

Enhancement Supplemental Guidance: Related control: SC-7.

(4) The organization authorizes the execution of privileged commands and access to security-relevant information via remote access only for compelling operational needs and documents the rationale for such access in the security plan for the information system.

Enhancement Supplemental Guidance: Related control: AC-6.

(5) The organization monitors for unauthorized remote connections to the information system [*Assignment: organization-defined frequency*], and takes appropriate action if an unauthorized connection is discovered.

(7) The organization ensures that remote sessions for accessing [*Assignment: organization-defined list of security functions and security-relevant information*] employ [*Assignment: organization-defined additional security measures*] and are audited.

Enhancement Supplemental Guidance: Additional security measures are typically above and beyond standard bulk or session layer encryption (e.g., Secure Shell [SSH], Virtual Private Networking [VPN] with blocking mode enabled). Related controls: SC-8, SC-9.

(8) The organization disables [*Assignment: organization-defined networking protocols within the information system deemed to be nonsecure*] except for explicitly identified components in support of specific operational requirements.

Enhancement Supplemental Guidance: The organization can either make a determination of the relative security of the networking protocol or base the security decision on the assessment of other entities. Bluetooth and peer-to-peer networking are examples of less than secure networking protocols.

References: NIST Special Publications 800-46, 800-77, 800-113, 800-114, 800-121.

AC-18 WIRELESS ACCESS

Control: The organization:

a. Establishes usage restrictions and implementation guidance for wireless access;

b. Monitors for unauthorized wireless access to the information system;

c. Authorizes wireless access to the information system prior to connection; and

d. Enforces requirements for wireless connections to the information system.

Supplemental Guidance: Wireless technologies include, but are not limited to, microwave, satellite, packet radio (UHF/VHF), 802.11x, and Bluetooth. Wireless networks use authentication protocols (e.g., EAP/TLS, PEAP), which provide credential protection and mutual authentication. In certain situations, wireless signals may radiate beyond the confines and control of organization-controlled facilities. Related controls: AC-3, IA-2, IA-3, IA-8.

Control Enhancements:

(1) The information system protects wireless access to the system using authentication and encryption.

Enhancement Supplemental Guidance: Authentication applies to user, device, or both as necessary. Related control: SC-13.

(2) The organization monitors for unauthorized wireless connections to the information system, including scanning for unauthorized wireless access points [*Assignment: organization-defined frequency*], and takes appropriate action if an unauthorized connection is discovered.

Enhancement Supplemental Guidance: Organizations proactively search for unauthorized wireless connections including the conduct of thorough scans for unauthorized wireless access points. The scan is not necessarily limited to only those areas within the facility containing the information systems, yet is conducted outside of those areas only as needed to verify that unauthorized wireless access points are not connected to the system.

(4) The organization does not allow users to independently configure wireless networking capabilities.

(5) The organization confines wireless communications to organization-controlled boundaries.

Enhancement Supplemental Guidance: Actions that may be taken by the organization to confine wireless communications to organization-controlled boundaries include: (i) reducing the power of the wireless transmission such that it cannot transit the physical perimeter of the organization; (ii) employing measures such as TEMPEST to control wireless emanations; and (iii) configuring the wireless access such that it is point to point in nature.

References: NIST Special Publications 800-48, 800-94, 800-97.

AC-19 ACCESS CONTROL FOR MOBILE DEVICES

Control: The organization:

a. Establishes usage restrictions and implementation guidance for organization-controlled mobile devices;

b. Authorizes connection of mobile devices meeting organizational usage restrictions and implementation guidance to organizational information systems;

c. Monitors for unauthorized connections of mobile devices to organizational information systems;

d. Enforces requirements for the connection of mobile devices to organizational information systems;

e. Disables information system functionality that provides the capability for automatic execution of code on mobile devices without user direction;

f. Issues specially configured mobile devices to individuals traveling to locations that the organization deems to be of significant risk in accordance with organizational policies and procedures; and

g. Applies [*Assignment: organization-defined inspection and preventative measures*] to mobile devices returning from locations that the organization deems to be of significant risk in accordance with organizational policies and procedures.

Supplemental Guidance: Mobile devices include portable storage media (e.g., USB memory sticks, external hard disk drives) and portable computing and communications devices with information storage capability (e.g., notebook/laptop computers, personal digital assistants, cellular telephones, digital cameras, and audio recording devices). Organization-controlled mobile devices include those devices for which the organization has the authority to specify and the ability to enforce specific security requirements. Usage restrictions and implementation guidance related to mobile devices include, for example, configuration management, device identification and authentication, implementation of mandatory protective software (e.g., malicious code detection, firewall), scanning devices for malicious code, updating virus protection software, scanning for critical software updates and patches, conducting primary operating system (and possibly other resident software) integrity checks, and disabling unnecessary hardware (e.g., wireless, infrared). Examples of information system functionality that provide the capability for automatic execution of code are AutoRun and AutoPlay.

Organizational policies and procedures for mobile devices used by individuals departing on and returning from travel include, for example, determining which locations are of concern, defining required configurations for the devices, ensuring that the devices are configured as intended before travel is initiated, and applying specific measures to the device after travel is completed. Specially configured mobile devices include, for example, computers with sanitized hard drives, limited applications, and additional hardening (e.g., more stringent configuration settings). Specified measures applied to mobile devices upon return from travel include, for example, examining the device for signs of physical tampering and purging/reimaging the hard disk drive. Protecting information residing on mobile devices is covered in the media protection family. Related controls: MP-4, MP-5.

Control Enhancements:

(1) The organization restricts the use of writable, removable media in organizational information systems.

(2) The organization prohibits the use of personally owned, removable media in organizational information systems.

(3) The organization prohibits the use of removable media in organizational information systems when the media has no identifiable owner.

Enhancement Supplemental Guidance: An identifiable owner (e.g., individual, organization, or project) for removable media helps to reduce the risk of using such technology by assigning responsibility and accountability for addressing known vulnerabilities in the media (e.g., malicious code insertion).

References: NIST Special Publications 800-114, 800-124.

AC-20 USE OF EXTERNAL INFORMATION SYSTEMS

Control: The organization establishes terms and conditions, consistent with any trust relationships established with other organizations owning, operating, and/or maintaining external information systems, allowing authorized individuals to:

a. Access the information system from the external information systems; and

b. Process, store, and/or transmit organization-controlled information using the external information systems.

Supplemental Guidance: External information systems are information systems or components of information systems that are outside of the authorization boundary established by the organization and for which the organization typically has no direct supervision and authority over the application of required security controls or the assessment of security control effectiveness. External information systems include, but are not limited to: (i) personally owned information systems (e.g., computers, cellular telephones, or personal digital assistants); (ii) privately owned computing and communications devices resident in commercial or public facilities (e.g., hotels, convention centers, or airports); (iii) information systems owned or controlled by nonfederal governmental organizations; and (iv) federal information systems that are not owned by, operated by, or under the direct supervision and authority of the organization. For some external systems, in particular those systems operated by other federal agencies, including organizations subordinate to those agencies, the trust relationships that have been established between those organizations and the originating organization may be such, that no explicit terms and conditions are required. In effect, the information systems of these organizations would not be considered external. These situations typically occur when, for example, there is some pre-existing sharing or trust agreement (either implicit or explicit) established between federal agencies and/or organizations subordinate to those agencies, or such trust agreements are specified by applicable laws, Executive Orders, directives, or policies. Authorized individuals include organizational personnel, contractors, or any other individuals with authorized access to the organizational information system and over which the organization has the authority to impose rules of behavior with regard to system access. The restrictions that an organization imposes on authorized individuals need not be uniform, as those restrictions are likely to vary depending upon the trust relationships between organizations. Thus, an organization might impose more stringent security restrictions on a contractor than on a state, local, or tribal government.

This control does not apply to the use of external information systems to access public interfaces to organizational information systems and information (e.g., individuals accessing federal information through www.usa.gov). The organization establishes terms and conditions for the use of external information systems in accordance with organizational security policies and procedures. The terms and conditions address as a minimum; (i) the types of applications that can be accessed on the organizational information system from the external information system; and (ii) the maximum security categorization of information that can be processed, stored, and transmitted on the external information system. This control defines access authorizations enforced by AC-3, rules of behavior requirements enforced by PL-4, and session establishment rules enforced by AC-17. Related controls: AC-3, AC-17, PL-4.

Control Enhancements:

(1) The organization permits authorized individuals to use an external information system to access the information system or to process, store, or transmit organization-controlled information only when the organization:

(a) Can verify the implementation of required security controls on the external system as specified in the organization's information security policy and security plan; or

(b) Has approved information system connection or processing agreements with the organizational entity hosting the external information system.

(2) The organization limits the use of organization-controlled portable storage media by authorized individuals on external information systems.

Enhancement Supplemental Guidance: Limits on the use of organization-controlled portable storage media in external information systems can include, for example, complete prohibition of the use of such devices or restrictions on how the devices may be used and under what conditions the devices may be used.

References: FIPS Publication 199.

AC-22 PUBLICLY ACCESSIBLE CONTENT

Control: The organization:

a. Designates individuals authorized to post information onto an organizational information system that is publicly accessible;

b. Trains authorized individuals to ensure that publicly accessible information does not contain nonpublic information;

c. Reviews the proposed content of publicly accessible information for nonpublic information prior to posting onto the organizational information system;

d. Reviews the content on the publicly accessible organizational information system for nonpublic information [*Assignment: organization-defined frequency*]; and

e. Removes nonpublic information from the publicly accessible organizational information system, if discovered.

Supplemental Guidance: Nonpublic information is any information for which the general public is not authorized access in accordance with federal laws, Executive Orders, directives, policies, regulations, standards, or guidance. Information protected under the Privacy Act and vendor proprietary information are examples of nonpublic information. This control addresses posting information on an organizational information system that is accessible to the general public, typically without identification or authentication. The posting of information on non-organization information systems is covered by appropriate organizational policy. Related controls: AC-3, AU-13.

References: None.

FAMILY: AWARENESS AND TRAINING **CLASS:** OPERATIONAL

AT-1 SECURITY AWARENESS AND TRAINING POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented security awareness and training policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the security awareness and training policy and associated security awareness and training controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the security awareness and training family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The security awareness and training policy can be included as part of the general information security policy for the organization. Security awareness and training procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the security awareness and training policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-16, 800-50, 800-100.

AT-2 SECURITY AWARENESS

Control: The organization provides basic security awareness training to all information system users (including managers, senior executives, and contractors) as part of initial training for new users, when required by system changes, and [*Assignment: organization-defined frequency*] thereafter.

Supplemental Guidance: The organization determines the appropriate content of security awareness training and security awareness techniques based on the specific requirements of the organization and the information systems to which personnel have authorized access. The content includes a basic understanding of the need for information security and user actions to maintain security and to respond to suspected security incidents. The content also addresses awareness of the need for operations security as it relates to the organization's information security program. Security awareness techniques can include, for example, displaying posters, offering supplies inscribed with security reminders, generating email advisories/notices from senior organizational officials, displaying logon screen messages, and conducting information security awareness events.

References: C.F.R. Part 5 Subpart C (5 C.F.R 930.301); NIST Special Publication 800-50.

AT-3 SECURITY TRAINING

Control: The organization provides role-based security-related training: (i) before authorizing access to the system or performing assigned duties; (ii) when required by system changes; and (iii) [*Assignment: organization-defined frequency*] thereafter.

Supplemental Guidance: The organization determines the appropriate content of security training based on assigned roles and responsibilities and the specific requirements of the organization and the information systems to which personnel have authorized access. In addition, the organization provides information system managers, system and network administrators, personnel performing independent verification and validation activities, security control assessors, and other personnel having access to system-level software, adequate security-related technical training to perform

their assigned duties. Organizational security training addresses management, operational, and technical roles and responsibilities covering physical, personnel, and technical safeguards and countermeasures. The organization also provides the training necessary for these individuals to carry out their responsibilities related to operations security within the context of the organization's information security program. Related controls: AT-2, SA-3.

References: C.F.R. Part 5 Subpart C (5 C.F.R 930.301); NIST Special Publications 800-16, 800-50.

AT-4 SECURITY TRAINING RECORDS

Control: The organization:

a. Documents and monitors individual information system security training activities including basic security awareness training and specific information system security training; and

b. Retains individual training records for [*Assignment: organization-defined time period*].

Supplemental Guidance: While an organization may deem that organizationally mandated individual training programs and the development of individual training plans are necessary, this control does not mandate either. Documentation for specialized training may be maintained by individual supervisors at the option of the organization.

References: None.

FAMILY: AUDIT AND ACCOUNTABILITY **CLASS:** TECHNICAL

AU-1 AUDIT AND ACCOUNTABILITY POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented audit and accountability policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the audit and accountability policy and associated audit and accountability controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the audit and accountability family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The audit and accountability policy can be included as part of the general information security policy for the organization. Audit and accountability procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the audit and accountability policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-100.

AU-2 AUDITABLE EVENTS

Control: The organization:

a. Determines, based on a risk assessment and mission/business needs, that the information system must be capable of auditing the following events: [*Assignment: organization-defined list of auditable events*];

b. Coordinates the security audit function with other organizational entities requiring audit-related information to enhance mutual support and to help guide the selection of auditable events;

c. Provides a rationale for why the list of auditable events are deemed to be adequate to support after-the-fact investigations of security incidents; and

d. Determines, based on current threat information and ongoing assessment of risk, that the following events are to be audited within the information system: [*Assignment: organization-defined subset of the auditable events defined in AU-2 a. to be audited along with the frequency of (or situation requiring) auditing for each identified event*].

Supplemental Guidance: The purpose of this control is for the organization to identify events which need to be auditable as significant and relevant to the security of the information system; giving an overall system requirement in order to meet ongoing and specific audit needs. To balance auditing requirements with other information system needs, this control also requires identifying that subset of *auditable* events that are to be *audited* at a given point in time. For example, the organization may determine that the information system must have the capability to log every file access both successful and unsuccessful, but not activate that capability except for specific circumstances due to the extreme burden on system performance. In addition, audit records can be generated at various levels of abstraction, including at the packet level as information traverses the network. Selecting the right level of abstraction for audit record generation is a critical aspect of an audit capability and can facilitate the identification of root causes to problems. Related control: AU-3.

Control Enhancements:

(3) The organization reviews and updates the list of auditable events [*Assignment: organization-defined frequency*].

Enhancement Supplemental Guidance: The list of auditable events is defined in AU-2.

(4) The organization includes execution of privileged functions in the list of events to be audited by the information system.

References: NIST Special Publication 800-92; Web: CSRC.NIST.GOV/PCIG/CIG.HTML.

AU-3 CONTENT OF AUDIT RECORDS

Control: The information system produces audit records that contain sufficient information to, at a minimum, establish what type of event occurred, when (date and time) the event occurred, where the event occurred, the source of the event, the outcome (success or failure) of the event, and the identity of any user/subject associated with the event.

Supplemental Guidance: Audit record content that may be necessary to satisfy the requirement of this control, includes, for example, time stamps, source and destination addresses, user/process identifiers, event descriptions, success/fail indications, filenames involved, and access control or flow control rules invoked. Related controls: AU-2, AU-8.

Control Enhancements:

(1) The information system includes [*Assignment: organization-defined additional, more detailed information*] in the audit records for audit events identified by type, location, or subject.

Enhancement Supplemental Guidance: An example of detailed information that the organization may require in audit records is full-text recording of privileged commands or the individual identities of group account users.

(2) The organization centrally manages the content of audit records generated by [*Assignment: organization-defined information system components*].

References: None.

AU-4 AUDIT STORAGE CAPACITY

Control: The organization allocates audit record storage capacity and configures auditing to reduce the likelihood of such capacity being exceeded.

Supplemental Guidance: The organization considers the types of auditing to be performed and the audit processing requirements when allocating audit storage capacity. Related controls: AU-2, AU-5, AU-6, AU-7, SI-4.

References: None.

AU-5 RESPONSE TO AUDIT PROCESSING FAILURES

Control: The information system:

a. Alerts designated organizational officials in the event of an audit processing failure; and

b. Takes the following additional actions: [*Assignment: organization-defined actions to be taken (e.g., shut down information system, overwrite oldest audit records, stop generating audit records)*].

Supplemental Guidance: Audit processing failures include, for example, software/hardware errors, failures in the audit capturing mechanisms, and audit storage capacity being reached or exceeded. Related control: AU-4.

Control Enhancements:

(1) The information system provides a warning when allocated audit record storage volume reaches [*Assignment: organization-defined percentage*] of maximum audit record storage capacity.

(2) The information system provides a real-time alert when the following audit failure events occur: [*Assignment: organization-defined audit failure events requiring real-time alerts*].

References: None.

AU-6 AUDIT REVIEW, ANALYSIS, AND REPORTING

Control: The organization:

a. Reviews and analyzes information system audit records [*Assignment: organization-defined frequency*] for indications of inappropriate or unusual activity, and reports findings to designated organizational officials; and

b. Adjusts the level of audit review, analysis, and reporting within the information system when there is a change in risk to organizational operations, organizational assets, individuals, other organizations, or the Nation based on law enforcement information, intelligence information, or other credible sources of information.

Supplemental Guidance: Related control: AU-7.

Control Enhancements:

(1) The information system integrates audit review, analysis, and reporting processes to support organizational processes for investigation and response to suspicious activities.

References: None.

AU-7 AUDIT REDUCTION AND REPORT GENERATION

Control: The information system provides an audit reduction and report generation capability.

Supplemental Guidance: An audit reduction and report generation capability provides support for near real-time audit review, analysis, and reporting requirements described in AU-6 and after-the-fact investigations of security incidents. Audit reduction and reporting tools do not alter original audit records. Related control: AU-6.

Control Enhancements:

(1) The information system provides the capability to automatically process audit records for events of interest based on selectable event criteria.

References: None.

AU-8 TIME STAMPS

Control: The information system uses internal system clocks to generate time stamps for audit records.

Supplemental Guidance: Time stamps generated by the information system include both date and time. The time may be expressed in Coordinated Universal Time (UTC), a modern continuation of Greenwich Mean Time (GMT), or local time with an offset from UTC. Related control: AU-3.

Control Enhancements:

(1) The information system synchronizes internal information system clocks [*Assignment: organization-defined frequency*] with [*Assignment: organization-defined authoritative time source*].

References: None.

AU-9 PROTECTION OF AUDIT INFORMATION

Control: The information system protects audit information and audit tools from unauthorized access, modification, and deletion.

Supplemental Guidance: Audit information includes all information (e.g., audit records, audit settings, and audit reports) needed to successfully audit information system activity. Related controls: AC-3, AC-6.

References: None.

AU-10 NON-REPUDIATION

Control: The information system protects against an individual falsely denying having performed a particular action.

Supplemental Guidance: Examples of particular actions taken by individuals include creating information, sending a message, approving information (e.g., indicating concurrence or signing a contract), and receiving a message. Non-repudiation protects individuals against later claims by an author of not having authored a particular document, a sender of not having transmitted a message, a receiver of not having received a message, or a signatory of not having signed a document. Non-repudiation services can be used to determine if information originated from an individual, or if an individual took specific actions (e.g., sending an email, signing a contract, approving a procurement request) or received specific information. Non-repudiation services are obtained by employing various techniques or mechanisms (e.g., digital signatures, digital message receipts).

References: None.

AU-11 AUDIT RECORD RETENTION

Control: The organization retains audit records for [*Assignment: organization-defined time period consistent with records retention policy*] to provide support for after-the-fact investigations of security incidents and to meet regulatory and organizational information retention requirements.

Supplemental Guidance: The organization retains audit records until it is determined that they are no longer needed for administrative, legal, audit, or other operational purposes. This includes, for example, retention and availability of audit records relative to Freedom of Information Act (FOIA) requests, subpoena, and law enforcement actions. Standard categorizations of audit records relative to such types of actions and standard response processes for each type of action are developed and disseminated. The National Archives and Records Administration (NARA) General Records Schedules (GRS) provide federal policy on record retention.

References: None.

AU-12 AUDIT GENERATION

Control: The information system:

a. Provides audit record generation capability for the list of auditable events defined in AU-2 at [*Assignment: organization-defined information system components*];

b. Allows designated organizational personnel to select which auditable events are to be audited by specific components of the system; and

c. Generates audit records for the list of audited events defined in AU-2 with the content as defined in AU-3.

Supplemental Guidance: Audits records can be generated from various components within the information system. The list of audited events is the set of events for which audits are to be

generated. This set of events is typically a subset of the list of all events for which the system is capable of generating audit records (i.e., auditable events). Related controls: AU-2, AU-3.

Control Enhancements:

(1) The information system compiles audit records from [*Assignment: organization-defined information system components*] into a system-wide (logical or physical) audit trail that is time-correlated to within [*Assignment: organization-defined level of tolerance for relationship between time stamps of individual records in the audit trail*].

Enhancement Supplemental Guidance: The audit trail is time-correlated if the time stamp in the individual audit records can be reliably related to the time stamp in other audit records to achieve a time ordering of the records within the organization-defined tolerance.

References: None.

FAMILY: SECURITY ASSESSMENT AND AUTHORIZATION **CLASS:** MANAGEMENT

CA-1 SECURITY ASSESSMENT AND AUTHORIZATION POLICIES AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. Formal, documented security assessment and authorization policies that address purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the security assessment and authorization policies and associated security assessment and authorization controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the security assessment and authorization family. The policies and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The security assessment/authorization policies can be included as part of the general information security policy for the organization. Security assessment/authorization procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the security assessment and authorization policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-37, 800-53A, 800-100.

CA-2 SECURITY ASSESSMENTS

Control: The organization:

a. Develops a security assessment plan that describes the scope of the assessment including:

- Security controls and control enhancements under assessment;
- Assessment procedures to be used to determine security control effectiveness; and
- Assessment environment, assessment team, and assessment roles and responsibilities;

b. Assesses the security controls in the information system [*Assignment: organization-defined frequency*] to determine the extent to which the controls are implemented correctly, operating as intended, and producing the desired outcome with respect to meeting the security requirements for the system;

c. Produces a security assessment report that documents the results of the assessment; and

d. Provides the results of the security control assessment, in writing, to the authorizing official or authorizing official designated representative.

Supplemental Guidance: The organization assesses the security controls in an information system as part of: (i) security authorization or reauthorization; (ii) meeting the FISMA requirement for annual assessments; (iii) continuous monitoring; and (iv) testing/evaluation of the information system as part of the system development life cycle process. The assessment report documents the assessment results in sufficient detail as deemed necessary by the organization, to determine the accuracy and completeness of the report and whether the security controls are implemented correctly, operating as intended, and producing the desired outcome with respect to meeting the security requirements of the information system. The FISMA requirement for (at least) annual security control assessments should *not* be interpreted by organizations as adding additional assessment requirements to those requirements already in place in the security authorization process. To satisfy the FISMA annual assessment requirement, organizations can draw upon the security control assessment results from any of the following sources, including but not limited to:

(i) assessments conducted as part of an information system authorization or reauthorization process; (ii) continuous monitoring (see CA-7); or (iii) testing and evaluation of an information system as part of the ongoing system development life cycle (provided that the testing and evaluation results are current and relevant to the determination of security control effectiveness). Existing security control assessment results are reused to the extent that they are still valid and are supplemented with additional assessments as needed.

Subsequent to the initial authorization of the information system and in accordance with OMB policy, the organization assesses a subset of the security controls annually during continuous monitoring. The organization establishes the security control selection criteria and subsequently selects a subset of the security controls within the information system and its environment of operation for assessment. Those security controls that are the most volatile (i.e., controls most affected by ongoing changes to the information system or its environment of operation) or deemed critical by the organization to protecting organizational operations and assets, individuals, other organizations, and the Nation are assessed more frequently in accordance with an organizational assessment of risk. All other controls are assessed at least once during the information system's three-year authorization cycle. The organization can use the current year's assessment results from any of the above sources to meet the FISMA annual assessment requirement provided that the results are current, valid, and relevant to determining security control effectiveness. External audits (e.g., audits conducted by external entities such as regulatory agencies) are outside the scope of this control. Related controls: CA-6, CA-7, PM-9, SA-11.

Control Enhancements:

(1) The organization employs an independent assessor or assessment team to conduct an assessment of the security controls in the information system.

Enhancement Supplemental Guidance: An independent assessor or assessment team is any individual or group capable of conducting an impartial assessment of an organizational information system. Impartiality implies that the assessors are free from any perceived or actual conflicts of interest with respect to the developmental, operational, and/or management chain associated with the information system or to the determination of security control effectiveness. Independent security assessment services can be obtained from other elements within the organization or can be contracted to a public or private sector entity outside of the organization. Contracted assessment services are considered independent if the information system owner is not directly involved in the contracting process or cannot unduly influence the impartiality of the assessor or assessment team conducting the assessment of the security controls in the information system. The authorizing official determines the required level of assessor independence based on the security categorization of the information system and/or the ultimate risk to organizational operations and assets, and to individuals. The authorizing official determines if the level of assessor independence is sufficient to provide confidence that the assessment results produced are sound and can be used to make a credible, risk-based decision. In special situations, for example when the organization that owns the information system is small or the organizational structure requires that the assessment be accomplished by individuals that are in the developmental, operational, and/or management chain of the system owner, independence in the assessment process can be achieved by ensuring that the assessment results are carefully reviewed and analyzed by an independent team of experts to validate the completeness, accuracy, integrity, and reliability of the results.

(2) The organization includes as part of security control assessments, [*Assignment: organization-defined frequency*], [*Selection: announced; unannounced*], [*Selection: in-depth monitoring; malicious user testing; penetration testing; red team exercises;* [*Assignment: organization-defined other forms of security testing*]].

Enhancement Supplemental Guidance: Penetration testing exercises both physical and technical security controls. A standard method for penetration testing consists of: (i) pretest analysis based on full knowledge of the target system; (ii) pretest identification of potential vulnerabilities based on pretest analysis; and (iii) testing designed to determine exploitability of identified vulnerabilities. Detailed rules of engagement are agreed upon by all parties before the commencement of any penetration testing scenario. These rules of engagement are

correlated with the tools, techniques, and procedures that are anticipated to be employed by threat-sources in carrying out attacks. An organizational assessment of risk guides the decision on the level of independence required for penetration agents or penetration teams conducting penetration testing. Red team exercises are conducted as a simulated adversarial attempt to compromise organizational missions and/or business processes to provide a comprehensive assessment of the security capability of the information system and organization. While penetration testing may be laboratory-based testing, red team exercises are intended to be more comprehensive in nature and reflect real-world conditions. Information system monitoring, malicious user testing, penetration testing, red-team exercises, and other forms of security testing (e.g., independent verification and validation) are conducted to improve the readiness of the organization by exercising organizational capabilities and indicating current performance levels as a means of focusing organizational actions to improve the security state of the system and organization. Testing is conducted in accordance with applicable federal laws, Executive Orders, directives, policies, regulations, and standards. Testing methods are approved by authorizing officials in coordination with the organization's Risk Executive Function. Vulnerabilities uncovered during red team exercises are incorporated into the vulnerability remediation process. Related controls: RA-5, SI-2.

References: FIPS Publication 199; NIST Special Publications 800-37, 800-53A, 800-115.

CA-3 INFORMATION SYSTEM CONNECTIONS

Control: The organization:

a. Authorizes connections from the information system to other information systems outside of the authorization boundary through the use of Interconnection Security Agreements;

b. Documents, for each connection, the interface characteristics, security requirements, and the nature of the information communicated; and

c. Monitors the information system connections on an ongoing basis verifying enforcement of security requirements.

Supplemental Guidance: This control applies to dedicated connections between information systems and does not apply to transitory, user-controlled connections such as email and website browsing. The organization carefully considers the risks that may be introduced when information systems are connected to other systems with different security requirements and security controls, both within the organization and external to the organization. Authorizing officials determine the risk associated with each connection and the appropriate controls employed. If the interconnecting systems have the same authorizing official, an Interconnection Security Agreement is not required. Rather, the interface characteristics between the interconnecting information systems are described in the security plans for the respective systems. If the interconnecting systems have different authorizing officials but the authorizing officials are in the same organization, the organization determines whether an Interconnection Security Agreement is required, or alternatively, the interface characteristics between systems are described in the security plans of the respective systems. Instead of developing an Interconnection Security Agreement, organizations may choose to incorporate this information into a formal contract, especially if the interconnection is to be established between a federal agency and a nonfederal (private sector) organization. In every case, documenting the interface characteristics is required, yet the formality and approval process vary considerably even though all accomplish the same fundamental objective of managing the risk being incurred by the interconnection of the information systems. Risk considerations also include information systems sharing the same networks. Information systems may be identified and authenticated as devices in accordance with IA-3. Related controls: AC-4, IA-3, SC-7, SA-9.

References: FIPS Publication 199; NIST Special Publication 800-47.

CA-5 PLAN OF ACTION AND MILESTONES

Control: The organization:

a. Develops a plan of action and milestones for the information system to document the organization's planned remedial actions to correct weaknesses or deficiencies noted during the assessment of the security controls and to reduce or eliminate known vulnerabilities in the system; and

b. Updates existing plan of action and milestones [*Assignment: organization-defined frequency*] based on the findings from security controls assessments, security impact analyses, and continuous monitoring activities.

Supplemental Guidance: The plan of action and milestones is a key document in the security authorization package and is subject to federal reporting requirements established by OMB. Related control: PM-4.

References: OMB Memorandum 02-01; NIST Special Publication 800-37.

CA-6 SECURITY AUTHORIZATION

Control: The organization:

a. Assigns a senior-level executive or manager to the role of authorizing official for the information system;

b. Ensures that the authorizing official authorizes the information system for processing before commencing operations; and

c. Updates the security authorization [*Assignment: organization-defined frequency*].

Supplemental Guidance: Security authorization is the official management decision, conveyed through the authorization decision document, given by a senior organizational official or executive (i.e., authorizing official) to authorize operation of an information system and to explicitly accept the risk to organizational operations and assets, individuals, other organizations, and the Nation based on the implementation of an agreed-upon set of security controls. Authorizing officials typically have budgetary oversight for information systems or are responsible for the mission or business operations supported by the systems. Security authorization is an inherently federal responsibility and therefore, authorizing officials must be federal employees. Through the security authorization process, authorizing officials are accountable for the security risks associated with information system operations. Accordingly, authorizing officials are in management positions with a level of authority commensurate with understanding and accepting such information system-related security risks. Through the employment of a comprehensive continuous monitoring process, the critical information contained in the authorization package (i.e., the security plan (including risk assessment), the security assessment report, and the plan of action and milestones) is updated on an ongoing basis, providing the authorizing official and the information system owner with an up-to-date status of the security state of the information system. To reduce the administrative cost of security reauthorization, the authorizing official uses the results of the continuous monitoring process to the maximum extent possible as the basis for rendering a reauthorization decision. OMB policy requires that federal information systems are reauthorized at least every three years or when there is a significant change to the system. The organization defines what constitutes a significant change to the information system. Related controls: CA-2, CA-7, PM-9, PM-10.

References: OMB Circular A-130; NIST Special Publication 800-37.

CA-7 CONTINUOUS MONITORING

Control: The organization establishes a continuous monitoring strategy and implements a continuous monitoring program that includes:

a. A configuration management process for the information system and its constituent components;

b. A determination of the security impact of changes to the information system and environment of operation;

c. Ongoing security control assessments in accordance with the organizational continuous monitoring strategy; and

d. Reporting the security state of the information system to appropriate organizational officials [*Assignment: organization-defined frequency*].

Supplemental Guidance: A continuous monitoring program allows an organization to maintain the security authorization of an information system over time in a highly dynamic environment of operation with changing threats, vulnerabilities, technologies, and missions/business processes. Continuous monitoring of security controls using automated support tools facilitates near real-time risk management and promotes organizational situational awareness with regard to the security state of the information system. The implementation of a continuous monitoring program results in ongoing updates to the security plan, the security assessment report, and the plan of action and milestones, the three principal documents in the security authorization package. A rigorous and well executed continuous monitoring program significantly reduces the level of effort required for the reauthorization of the information system. Continuous monitoring activities are scaled in accordance with the security categorization of the information system. Related controls: CA-2, CA-5, CA-6, CM-3, CM-4.

References: NIST Special Publications 800-37, 800-53A; US-CERT Technical Cyber Security Alerts; DOD Information Assurance Vulnerability Alerts.

FAMILY: CONFIGURATION MANAGEMENT **CLASS:** OPERATIONAL

CM-1 CONFIGURATION MANAGEMENT POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented configuration management policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the configuration management policy and associated configuration management controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the configuration management family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The configuration management policy can be included as part of the general information security policy for the organization. Configuration management procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the configuration management policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-100.

CM-2 BASELINE CONFIGURATION

Control: The organization develops, documents, and maintains under configuration control, a current baseline configuration of the information system.

Supplemental Guidance: This control establishes a baseline configuration for the information system and its constituent components including communications and connectivity-related aspects of the system. The baseline configuration provides information about the components of an information system (e.g., the standard software load for a workstation, server, network component, or mobile device including operating system/installed applications with current version numbers and patch information), network topology, and the logical placement of the component within the system architecture. The baseline configuration is a documented, up-to-date specification to which the information system is built. Maintaining the baseline configuration involves creating new baselines as the information system changes over time. The baseline configuration of the information system is consistent with the organization's enterprise architecture. Related controls: CM-3, CM-6, CM-8, CM-9.

Control Enhancements:

(1) The organization reviews and updates the baseline configuration of the information system:

(a) [*Assignment: organization-defined frequency*];

(b) When required due to [*Assignment organization-defined circumstances*]; and

(c) As an integral part of information system component installations and upgrades.

(2) The organization employs automated mechanisms to maintain an up-to-date, complete, accurate, and readily available baseline configuration of the information system.

Enhancement Supplemental Guidance: Software inventory tools are examples of automated mechanisms that help organizations maintain consistent baseline configurations for information systems. Software inventory tools can be deployed for each operating system in use within the organization (e.g., on workstations, servers, network components, mobile devices) and used to track operating system version numbers, applications and types of software installed on the operating systems, and current patch levels. Software inventory

tools can also scan information systems for unauthorized software to validate organization-defined lists of authorized and unauthorized software programs.

(3) The organization retains older versions of baseline configurations as deemed necessary to support rollback.

(5) The organization:

(a) Develops and maintains [*Assignment: organization-defined list of software programs authorized to execute on the information system*]; and

(b) Employs a deny-all, permit-by-exception authorization policy to identify software allowed to execute on the information system.

(6) The organization maintains a baseline configuration for development and test environments that is managed separately from the operational baseline configuration.

References: NIST Special Publication 800-128.

CM-3 CONFIGURATION CHANGE CONTROL

Control: The organization:

a. Determines the types of changes to the information system that are configuration controlled;

b. Approves configuration-controlled changes to the system with explicit consideration for security impact analyses;

c. Documents approved configuration-controlled changes to the system;

d. Retains and reviews records of configuration-controlled changes to the system;

e. Audits activities associated with configuration-controlled changes to the system; and

f. Coordinates and provides oversight for configuration change control activities through [*Assignment: organization-defined configuration change control element (e.g., committee, board*] that convenes [*Selection: (one or more):* [*Assignment: organization-defined frequency*]; [*Assignment: organization-defined configuration change conditions*]].

Supplemental Guidance: The organization determines the types of changes to the information system that are configuration controlled. Configuration change control for the information system involves the systematic proposal, justification, implementation, test/evaluation, review, and disposition of changes to the system, including upgrades and modifications. Configuration change control includes changes to components of the information system, changes to the configuration settings for information technology products (e.g., operating systems, applications, firewalls, routers), emergency changes, and changes to remediate flaws. A typical organizational process for managing configuration changes to the information system includes, for example, a chartered Configuration Control Board that approves proposed changes to the system. Auditing of changes refers to changes in activity before and after a change is made to the information system and the auditing activities required to implement the change. Related controls: CM-4, CM-5, CM-6, SI-2.

Control Enhancements:

(1) The organization employs automated mechanisms to:

(a) Document proposed changes to the information system;

(b) Notify designated approval authorities;

(c) Highlight approvals that have not been received by [*Assignment: organization-defined time period*];

(d) Inhibit change until designated approvals are received; and

(e) Document completed changes to the information system.

(2) The organization tests, validates, and documents changes to the information system before implementing the changes on the operational system.

Enhancement Supplemental Guidance: The organization ensures that testing does not interfere with information system operations. The individual/group conducting the tests understands the organizational information security policies and procedures, the information system security policies and procedures, and the specific health, safety, and environmental risks associated with a particular facility and/or process. An operational system may need to be taken off-line, or replicated to the extent feasible, before testing can be conducted. If an information system must be taken off-line for testing, the tests are scheduled to occur during planned system outages whenever possible. In situations where the organization cannot conduct testing of an operational system, the organization employs compensating controls (e.g., providing a replicated system to conduct testing) in accordance with the general tailoring guidance.

References: NIST Special Publication 800-128.

CM-4 SECURITY IMPACT ANALYSIS

Control: The organization analyzes changes to the information system to determine potential security impacts prior to change implementation.

Supplemental Guidance: Security impact analyses are conducted by organizational personnel with information security responsibilities, including for example, Information System Administrators, Information System Security Officers, Information System Security Managers, and Information System Security Engineers. Individuals conducting security impact analyses have the appropriate skills and technical expertise to analyze the changes to information systems and the associated security ramifications. Security impact analysis may include, for example, reviewing information system documentation such as the security plan to understand how specific security controls are implemented within the system and how the changes might affect the controls. Security impact analysis may also include an assessment of risk to understand the impact of the changes and to determine if additional security controls are required. Security impact analysis is scaled in accordance with the security categorization of the information system. Related controls: CA-2, CA-7, CM-3, CM-9, SI-2.

Control Enhancements:

(1) The organization analyzes new software in a separate test environment before installation in an operational environment, looking for security impacts due to flaws, weaknesses, incompatibility, or intentional malice.

References: NIST Special Publication 800-128.

CM-5 ACCESS RESTRICTIONS FOR CHANGE

Control: The organization defines, documents, approves, and enforces physical and logical access restrictions associated with changes to the information system.

Supplemental Guidance: Any changes to the hardware, software, and/or firmware components of the information system can potentially have significant effects on the overall security of the system. Accordingly, only qualified and authorized individuals are allowed to obtain access to information system components for purposes of initiating changes, including upgrades and modifications. Additionally, maintaining records of access is essential for ensuring that configuration change control is being implemented as intended and for supporting after-the-fact actions should the organization become aware of an unauthorized change to the information system. Access restrictions for change also include software libraries. Examples of access restrictions include, for example, physical and logical access controls (see AC-3 and PE-3), workflow automation, media libraries, abstract layers (e.g., changes are implemented into a third-party interface rather than directly into the information system component), and change windows (e.g., changes occur only during specified times, making unauthorized changes outside the window easy to discover). Some or all of the enforcement mechanisms and processes necessary to implement this security control are included in other controls. For measures implemented in other controls, this control provides

information to be used in the implementation of the other controls to cover specific needs related to enforcing authorizations to make changes to the information system, auditing changes, and retaining and review records of changes. Related controls: AC-3, AC-6, PE-3.

Control Enhancements:

(1) The organization employs automated mechanisms to enforce access restrictions and support auditing of the enforcement actions.

(2) The organization conducts audits of information system changes [*Assignment: organization-defined frequency*] and when indications so warrant to determine whether unauthorized changes have occurred.

(3) The information system prevents the installation of [*Assignment: organization-defined critical software programs*] that are not signed with a certificate that is recognized and approved by the organization.

Enhancement Supplemental Guidance: Critical software programs and/or modules include, for example, patches, service packs, and where applicable, device drivers.

References: None.

CM-6 CONFIGURATION SETTINGS

Control: The organization:

a. Establishes and documents mandatory configuration settings for information technology products employed within the information system using [*Assignment: organization-defined security configuration checklists*] that reflect the most restrictive mode consistent with operational requirements;

b. Implements the configuration settings;

c. Identifies, documents, and approves exceptions from the mandatory configuration settings for individual components within the information system based on explicit operational requirements; and

d. Monitors and controls changes to the configuration settings in accordance with organizational policies and procedures.

Supplemental Guidance: Configuration settings are the configurable security-related parameters of information technology products that are part of the information system. Security-related parameters are those parameters impacting the security state of the system including parameters related to meeting other security control requirements. Security-related parameters include, for example, registry settings; account, file, and directory settings (i.e., permissions); and settings for services, ports, protocols, and remote connections. Organizations establish organization-wide mandatory configuration settings from which the settings for a given information system are derived. A *security configuration checklist* (sometimes referred to as a lockdown guide, hardening guide, security guide, security technical implementation guide [STIG], or benchmark) is a series of instructions or procedures for configuring an information system component to meet operational requirements. Checklists can be developed by information technology developers and vendors, consortia, academia, industry, federal agencies (and other government organizations), and others in the public and private sectors. An example of a security configuration checklist is the Federal Desktop Core Configuration (FDCC) which potentially affects the implementation of CM-6 and other controls such as AC-19 and CM-7. The Security Content Automation Protocol (SCAP) and defined standards within the protocol (e.g., Common Configuration Enumeration) provide an effective method to uniquely identify, track, and control configuration settings. OMB establishes federal policy on configuration requirements for federal information systems. Related controls: CM-2, CM-3, SI-4.

Control Enhancements:

(1) The organization employs automated mechanisms to centrally manage, apply, and verify configuration settings.

(2) The organization employs automated mechanisms to respond to unauthorized changes to [*Assignment: organization-defined configuration settings*].

Enhancement Supplemental Guidance: Responses to unauthorized changes to configuration settings can include, for example, alerting designated organizational personnel, restoring mandatory/organization-defined configuration settings, or in the extreme case, halting affected information system processing.

(3) The organization incorporates detection of unauthorized, security-relevant configuration changes into the organization's incident response capability to ensure that such detected events are tracked, monitored, corrected, and available for historical purposes.

Enhancement Supplemental Guidance: Related controls: IR-4, IR-5.

References: OMB Memoranda 07-11, 07-18, 08-22; NIST Special Publications 800-70, 800-128; Web: NVD.NIST.GOV; WWW.NSA.GOV.

CM-7 LEAST FUNCTIONALITY

Control: The organization configures the information system to provide only essential capabilities and specifically prohibits or restricts the use of the following functions, ports, protocols, and/or services: [*Assignment: organization-defined list of prohibited or restricted functions, ports, protocols, and/or services*].

Supplemental Guidance: Information systems are capable of providing a wide variety of functions and services. Some of the functions and services, provided by default, may not be necessary to support essential organizational operations (e.g., key missions, functions). Additionally, it is sometimes convenient to provide multiple services from a single component of an information system, but doing so increases risk over limiting the services provided by any one component. Where feasible, organizations limit component functionality to a single function per device (e.g., email server or web server, not both). The functions and services provided by organizational information systems, or individual components of information systems, are carefully reviewed to determine which functions and services are candidates for elimination (e.g., Voice Over Internet Protocol, Instant Messaging, auto-execute, file sharing). Organizations consider disabling unused or unnecessary physical and logical ports and protocols (e.g., Universal Serial Bus [USB], File Transfer Protocol [FTP], Internet Protocol Version 6 [IPv6], Hyper Text Transfer Protocol [HTTP]) on information system components to prevent unauthorized connection of devices, unauthorized transfer of information, or unauthorized tunneling. Organizations can utilize network scanning tools, intrusion detection and prevention systems, and end-point protections such as firewalls and host-based intrusion detection systems to identify and prevent the use of prohibited functions, ports, protocols, and services. Related control: RA-5.

Control Enhancements:

(1) The organization reviews the information system [*Assignment: organization-defined frequency*] to identify and eliminate unnecessary functions, ports, protocols, and/or services.

(2) The organization employs automated mechanisms to prevent program execution in accordance with [*Selection (one or more): list of authorized software programs; list of unauthorized software programs; rules authorizing the terms and conditions of software program usage*].

Enhancement Supplemental Guidance: Related control: CM-2.

References: None.

CM-8 INFORMATION SYSTEM COMPONENT INVENTORY

Control: The organization develops, documents, and maintains an inventory of information system components that:

a. Accurately reflects the current information system;

b. Is consistent with the authorization boundary of the information system;

c. Is at the level of granularity deemed necessary for tracking and reporting;

d. Includes [*Assignment: organization-defined information deemed necessary to achieve effective property accountability*]; and

e. Is available for review and audit by designated organizational officials.

Supplemental Guidance: Information deemed to be necessary by the organization to achieve effective property accountability can include, for example, hardware inventory specifications (manufacturer, type, model, serial number, physical location), software license information, information system/component owner, and for a networked component/device, the machine name and network address. Related controls: CM-2, CM-6.

Control Enhancements:

(1) The organization updates the inventory of information system components as an integral part of component installations, removals, and information system updates.

(2) The organization employs automated mechanisms to help maintain an up-to-date, complete, accurate, and readily available inventory of information system components.

Enhancement Supplemental Guidance: Organizations maintain the information system inventory to the extent feasible. Virtual machines, for example, can be difficult to monitor because they are not visible to the network when not in use. In such cases, the intent of this control enhancement is to maintain as up-to-date, complete, and accurate an inventory as is reasonable.

(3) The organization:

(a) Employs automated mechanisms [*Assignment: organization-defined frequency*] to detect the addition of unauthorized components/devices into the information system; and

(b) Disables network access by such components/devices or notifies designated organizational officials.

Enhancement Supplemental Guidance: This control enhancement is applied in addition to the monitoring for unauthorized remote connections in AC-17 and for unauthorized mobile devices in AC-19. The monitoring for unauthorized components/devices on information system networks may be accomplished on an ongoing basis or by the periodic scanning of organizational networks for that purpose. Automated mechanisms can be implemented within the information system and/or in another separate information system or device. Related controls: AC-17, AC-19.

(4) The organization includes in property accountability information for information system components, a means for identifying by [*Selection (one or more): name; position; role*] individuals responsible for administering those components.

(5) The organization verifies that all components within the authorization boundary of the information system are either inventoried as a part of the system or recognized by another system as a component within that system.

References: NIST Special Publication 800-128.

CM-9 CONFIGURATION MANAGEMENT PLAN

Control: The organization develops, documents, and implements a configuration management plan for the information system that:

a. Addresses roles, responsibilities, and configuration management processes and procedures;

b. Defines the configuration items for the information system and when in the system development life cycle the configuration items are placed under configuration management; and

c. Establishes the means for identifying configuration items throughout the system development life cycle and a process for managing the configuration of the configuration items.

Supplemental Guidance: Configuration items are the information system items (hardware, software, firmware, and documentation) to be configuration managed. The configuration management plan satisfies the requirements in the organization's configuration management policy while being tailored to the individual information system. The configuration management plan defines detailed processes and procedures for how configuration management is used to support system development life cycle activities at the information system level. The plan describes how to move a change through the change management process, how configuration settings and configuration baselines are updated, how the information system component inventory is maintained, how development, test, and operational environments are controlled, and finally, how documents are developed, released, and updated. The configuration management approval process includes designation of key management stakeholders that are responsible for reviewing and approving proposed changes to the information system, and security personnel that would conduct an impact analysis prior to the implementation of any changes to the system. Related control: SA-10.

References: NIST Special Publication 800-128.

FAMILY: CONTINGENCY PLANNING **CLASS:** OPERATIONAL

CP-1 CONTINGENCY PLANNING POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented contingency planning policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the contingency planning policy and associated contingency planning controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the contingency planning family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The contingency planning policy can be included as part of the general information security policy for the organization. Contingency planning procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the contingency planning policy. Related control: PM-9.

References: Federal Continuity Directive 1; NIST Special Publications 800-12, 800-34, 800-100.

CP-2 CONTINGENCY PLAN

Control: The organization:

a. Develops a contingency plan for the information system that:

- Identifies essential missions and business functions and associated contingency requirements;
- Provides recovery objectives, restoration priorities, and metrics;
- Addresses contingency roles, responsibilities, assigned individuals with contact information;
- Addresses maintaining essential missions and business functions despite an information system disruption, compromise, or failure;
- Addresses eventual, full information system restoration without deterioration of the security measures originally planned and implemented; and
- Is reviewed and approved by designated officials within the organization;

b. Distributes copies of the contingency plan to [*Assignment: organization-defined list of key contingency personnel (identified by name and/or by role) and organizational elements*];

c. Coordinates contingency planning activities with incident handling activities;

d. Reviews the contingency plan for the information system [*Assignment: organization-defined frequency*];

e. Revises the contingency plan to address changes to the organization, information system, or environment of operation and problems encountered during contingency plan implementation, execution, or testing; and

f. Communicates contingency plan changes to [*Assignment: organization-defined list of key contingency personnel (identified by name and/or by role) and organizational elements*].

Supplemental Guidance: Contingency planning for information systems is part of an overall organizational program for achieving continuity of operations for mission/business operations. Contingency planning addresses both information system restoration and implementation of alternative mission/business processes when systems are compromised. Information system recovery objectives are consistent with applicable laws, Executive Orders, directives, policies, standards, or regulations. In addition to information system availability, contingency plans also address other security-related events resulting in a reduction in mission/business effectiveness, such as malicious attacks compromising the confidentiality or integrity of the information system. Examples of actions to call out in contingency plans include, for example, graceful degradation, information system shutdown, fall back to a manual mode, alternate information flows, or operating in a mode that is reserved solely for when the system is under attack. Related controls: AC-14, CP-6, CP-7, CP-8, IR-4, PM-8, PM-11.

Control Enhancements:

(1) The organization coordinates contingency plan development with organizational elements responsible for related plans.

Enhancement Supplemental Guidance: Examples of related plans include Business Continuity Plan, Disaster Recovery Plan, Continuity of Operations Plan, Crisis Communications Plan, Critical Infrastructure Plan, Cyber Incident Response Plan, and Occupant Emergency Plan.

(2) The organization conducts capacity planning so that necessary capacity for information processing, telecommunications, and environmental support exists during contingency operations.

(3) The organization plans for the resumption of essential missions and business functions within [*Assignment: organization-defined time period*] of contingency plan activation.

References: Federal Continuity Directive 1; NIST Special Publication 800-34.

CP-3 CONTINGENCY TRAINING

Control: The organization trains personnel in their contingency roles and responsibilities with respect to the information system and provides refresher training [*Assignment: organization-defined frequency*].

Supplemental Guidance: None.

Control Enhancements:

(1) The organization incorporates simulated events into contingency training to facilitate effective response by personnel in crisis situations.

References: NIST Special Publications 800-16, 800-50.

CP-4 CONTINGENCY PLAN TESTING AND EXERCISES

Control: The organization:

a. Tests and/or exercises the contingency plan for the information system [*Assignment: organization-defined frequency*] using [*Assignment: organization-defined tests and/or exercises*] to determine the plan's effectiveness and the organization's readiness to execute the plan; and

b. Reviews the contingency plan test/exercise results and initiates corrective actions.

Supplemental Guidance: There are several methods for testing and/or exercising contingency plans to identify potential weaknesses (e.g., checklist, walk-through/tabletop, simulation: parallel, full interrupt). Contingency plan testing and/or exercises include a determination of the effects on organizational operations and assets (e.g., reduction in mission capability) and individuals arising due to contingency operations in accordance with the plan.

Control Enhancements:

(1) The organization coordinates contingency plan testing and/or exercises with organizational elements responsible for related plans.

Enhancement Supplemental Guidance: Examples of related plans include Business Continuity Plan, Disaster Recovery Plan, Continuity of Operations Plan, Crisis Communications Plan, Critical Infrastructure Plan, Cyber Incident Response Plan, and Occupant Emergency Plan.

(2) The organization tests/exercises the contingency plan at the alternate processing site to familiarize contingency personnel with the facility and available resources and to evaluate the site's capabilities to support contingency operations.

(4) The organization includes a full recovery and reconstitution of the information system to a known state as part of contingency plan testing.

Enhancement Supplemental Guidance: Related controls: CP-10, SC-24.

References: FIPS Publication 199; NIST Special Publications 800-34, 800-84.

CP-6 ALTERNATE STORAGE SITE

Control: The organization establishes an alternate storage site including necessary agreements to permit the storage and recovery of information system backup information.

Supplemental Guidance: Related controls: CP-2, CP-9, MP-4.

Control Enhancements:

(1) The organization identifies an alternate storage site that is separated from the primary storage site so as not to be susceptible to the same hazards.

Enhancement Supplemental Guidance: Hazards of concern to the organization are typically defined in an organizational assessment of risk.

(2) The organization configures the alternate storage site to facilitate recovery operations in accordance with recovery time and recovery point objectives.

(3) The organization identifies potential accessibility problems to the alternate storage site in the event of an area-wide disruption or disaster and outlines explicit mitigation actions.

Enhancement Supplemental Guidance: Explicit mitigation actions include, for example, duplicating backup information at another alternate storage site if access to the first alternate site is hindered; or, if electronic accessibility to the alternate site is disrupted, planning for physical access to retrieve backup information.

References: NIST Special Publication 800-34.

CP-7 ALTERNATE PROCESSING SITE

Control: The organization:

a. Establishes an alternate processing site including necessary agreements to permit the resumption of information system operations for essential missions and business functions within [*Assignment: organization-defined time period consistent with recovery time objectives*] when the primary processing capabilities are unavailable; and

b. Ensures that equipment and supplies required to resume operations are available at the alternate site or contracts are in place to support delivery to the site in time to support the organization-defined time period for resumption.

Supplemental Guidance: Related control: CP-2.

Control Enhancements:

(1) The organization identifies an alternate processing site that is separated from the primary processing site so as not to be susceptible to the same hazards.

Enhancement Supplemental Guidance: Hazards that might affect the information system are typically defined in the risk assessment.

(2) The organization identifies potential accessibility problems to the alternate processing site in the event of an area-wide disruption or disaster and outlines explicit mitigation actions.

(3) The organization develops alternate processing site agreements that contain priority-of-service provisions in accordance with the organization's availability requirements.

(4) The organization configures the alternate processing site so that it is ready to be used as the operational site supporting essential missions and business functions.

(5) The organization ensures that the alternate processing site provides information security measures equivalent to that of the primary site.

References: NIST Special Publication 800-34.

CP-8 TELECOMMUNICATIONS SERVICES

Control: The organization establishes alternate telecommunications services including necessary agreements to permit the resumption of information system operations for essential missions and business functions within [*Assignment: organization-defined time period*] when the primary telecommunications capabilities are unavailable.

Supplemental Guidance: Related control: CP-2.

Control Enhancements:

(1) The organization:

(a) Develops primary and alternate telecommunications service agreements that contain priority-of-service provisions in accordance with the organization's availability requirements; and

(b) Requests Telecommunications Service Priority for all telecommunications services used for national security emergency preparedness in the event that the primary and/or alternate telecommunications services are provided by a common carrier.

(2) The organization obtains alternate telecommunications services with consideration for reducing the likelihood of sharing a single point of failure with primary telecommunications services.

(3) The organization obtains alternate telecommunications service providers that are separated from primary service providers so as not to be susceptible to the same hazards.

(4) The organization requires primary and alternate telecommunications service providers to have contingency plans.

References: NIST Special Publication 800-34; Web: TSP.NCS.GOV.

CP-9 INFORMATION SYSTEM BACKUP

Control: The organization:

a. Conducts backups of user-level information contained in the information system [*Assignment: organization-defined frequency consistent with recovery time and recovery point objectives*];

b. Conducts backups of system-level information contained in the information system [*Assignment: organization-defined frequency consistent with recovery time and recovery point objectives*];

c. Conducts backups of information system documentation including security-related documentation [*Assignment: organization-defined frequency consistent with recovery time and recovery point objectives*]; and

d. Protects the confidentiality and integrity of backup information at the storage location.

Supplemental Guidance: System-level information includes, for example, system-state information, operating system and application software, and licenses. Digital signatures and cryptographic hashes are examples of mechanisms that can be employed by organizations to protect the integrity of information system backups. An organizational assessment of risk guides the use of encryption

for protecting backup information. The protection of system backup information while in transit is beyond the scope of this control. Related controls: CP-6, MP-4.

Control Enhancements:

(1) The organization tests backup information [*Assignment: organization-defined frequency*] to verify media reliability and information integrity.

(2) The organization uses a sample of backup information in the restoration of selected information system functions as part of contingency plan testing.

(3) The organization stores backup copies of the operating system and other critical information system software, as well as copies of the information system inventory (including hardware, software, and firmware components) in a separate facility or in a fire-rated container that is not colocated with the operational system.

References: NIST Special Publication 800-34.

CP-10 INFORMATION SYSTEM RECOVERY AND RECONSTITUTION

Control: The organization provides for the recovery and reconstitution of the information system to a known state after a disruption, compromise, or failure.

Supplemental Guidance: Recovery is executing information system contingency plan activities to restore essential missions and business functions. Reconstitution takes place following recovery and includes activities for returning the information system to its original functional state before contingency plan activation. Recovery and reconstitution procedures are based on organizational priorities, established recovery point/time and reconstitution objectives, and appropriate metrics. Reconstitution includes the deactivation of any interim information system capability that may have been needed during recovery operations. Reconstitution also includes an assessment of the fully restored information system capability, a potential system reauthorization and the necessary activities to prepare the system against another disruption, compromise, or failure. Recovery and reconstitution capabilities employed by the organization can be a combination of automated mechanisms and manual procedures. Related controls: CA-2, CA-6, CA-7, SC-24.

Control Enhancements:

(2) The information system implements transaction recovery for systems that are transaction-based.

Enhancement Supplemental Guidance: Database management systems and transaction processing systems are examples of information systems that are transaction-based. Transaction rollback and transaction journaling are examples of mechanisms supporting transaction recovery.

(3) The organization provides compensating security controls for [*Assignment: organization-defined circumstances that can inhibit recovery and reconstitution to a known state*].

(4) The organization provides the capability to reimage information system components within [*Assignment: organization-defined restoration time-periods*] from configuration-controlled and integrity-protected disk images representing a secure, operational state for the components.

References: NIST Special Publication 800-34.

FAMILY: IDENTIFICATION AND AUTHENTICATION **CLASS:** TECHNICAL

IA-1 IDENTIFICATION AND AUTHENTICATION POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented identification and authentication policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the identification and authentication policy and associated identification and authentication controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the identification and authentication family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The identification and authentication policy can be included as part of the general information security policy for the organization. Identification and authentication procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the identification and authentication policy. Related control: PM-9.

References: FIPS Publication 201; NIST Special Publications 800-12, 800-63, 800-73, 800-76, 800-78, 800-100.

IA-2 IDENTIFICATION AND AUTHENTICATION (ORGANIZATIONAL USERS)

Control: The information system uniquely identifies and authenticates organizational users (or processes acting on behalf of organizational users).

Supplemental Guidance: Organizational users include organizational employees or individuals the organization deems to have equivalent status of employees (e.g., contractors, guest researchers, individuals from allied nations). Users are uniquely identified and authenticated for all accesses other than those accesses explicitly identified and documented by the organization in AC-14. Unique identification of individuals in group accounts (e.g., shared privilege accounts) may need to be considered for detailed accountability of activity. Authentication of user identities is accomplished through the use of passwords, tokens, biometrics, or in the case of multifactor authentication, some combination thereof. Access to organizational information systems is defined as either local or network. Local access is any access to an organizational information system by a user (or process acting on behalf of a user) where such access is obtained by direct connection without the use of a network. Network access is any access to an organizational information system by a user (or process acting on behalf of a user) where such access is obtained through a network connection. Remote access is a type of network access which involves communication through an external network (e.g., the Internet). Internal networks include local area networks, wide area networks, and virtual private networks that are under the control of the organization. For a virtual private network (VPN), the VPN is considered an internal network if the organization establishes the VPN connection between organization-controlled endpoints in a manner that does not require the organization to depend on any external networks across which the VPN transits to protect the confidentiality and integrity of information transmitted. Identification and authentication requirements for information system access by other than organizational users are described in IA-8.

The identification and authentication requirements in this control are satisfied by complying with Homeland Security Presidential Directive 12 consistent with organization-specific implementation plans provided to OMB. In addition to identifying and authenticating users at the information-system level (i.e., at logon), identification and authentication mechanisms are employed at the

application level, when necessary, to provide increased information security for the organization. Related controls: AC-14, AC-17, AC-18, IA-4, IA-5.

Control Enhancements:

(1) The information system uses multifactor authentication for network access to privileged accounts.

(2) The information system uses multifactor authentication for network access to non-privileged accounts.

(3) The information system uses multifactor authentication for local access to privileged accounts.

(4) The information system uses multifactor authentication for local access to non-privileged accounts.

(8) The information system uses [*Assignment: organization-defined replay-resistant authentication mechanisms*] for network access to privileged accounts.

Enhancement Supplemental Guidance: An authentication process resists replay attacks if it is impractical to achieve a successful authentication by recording and replaying a previous authentication message. Techniques used to address this include protocols that use nonces or challenges (e.g., TLS), and time synchronous or challenge-response one-time authenticators.

(9) The information system uses [*Assignment: organization-defined replay-resistant authentication mechanisms*] for network access to non-privileged accounts.

Enhancement Supplemental Guidance: An authentication process resists replay attacks if it is impractical to achieve a successful authentication by recording and replaying a previous authentication message. Techniques used to address this include protocols that use nonces or challenges (e.g., TLS), and time synchronous or challenge-response one-time authenticators.

References: HSPD 12; OMB Memorandum 04-04; FIPS Publication 201; NIST Special Publications 800-63, 800-73, 800-76, 800-78.

IA-3 DEVICE IDENTIFICATION AND AUTHENTICATION

Control: The information system uniquely identifies and authenticates [*Assignment: organization-defined list of specific and/or types of devices*] before establishing a connection.

Supplemental Guidance: The devices requiring unique identification and authentication may be defined by type, by specific device, or by a combination of type and device as deemed appropriate by the organization. The information system typically uses either shared known information (e.g., Media Access Control [MAC] or Transmission Control Protocol/Internet Protocol [TCP/IP] addresses) for identification or an organizational authentication solution (e.g., IEEE 802.1x and Extensible Authentication Protocol [EAP], Radius server with EAP-Transport Layer Security [TLS] authentication, Kerberos) to identify and authenticate devices on local and/or wide area networks. The required strength of the device authentication mechanism is determined by the security categorization of the information system.

References: None.

IA-4 IDENTIFIER MANAGEMENT

Control: The organization manages information system identifiers for users and devices by:

a. Receiving authorization from a designated organizational official to assign a user or device identifier;

b. Selecting an identifier that uniquely identifies an individual or device;

c. Assigning the user identifier to the intended party or the device identifier to the intended device;

d. Preventing reuse of user or device identifiers for [*Assignment: organization-defined time period*]; and

e. Disabling the user identifier after [*Assignment: organization-defined time period of inactivity*].

Supplemental Guidance: Common device identifiers include media access control (MAC) or Internet protocol (IP) addresses, or device-unique token identifiers. Management of user identifiers is not applicable to shared information system accounts (e.g., guest and anonymous accounts). It is commonly the case that a user identifier is the name of an information system account associated with an individual. In such instances, identifier management is largely addressed by the account management activities of AC-2. IA-4 also covers user identifiers not necessarily associated with an information system account (e.g., the identifier used in a physical security control database accessed by a badge reader system for access to the information system). Related control: AC-2, IA-2.

References: FIPS Publication 201; NIST Special Publications 800-73, 800-76, 800-78.

IA-5 AUTHENTICATOR MANAGEMENT

Control: The organization manages information system authenticators for users and devices by:

a. Verifying, as part of the initial authenticator distribution, the identity of the individual and/or device receiving the authenticator;

b. Establishing initial authenticator content for authenticators defined by the organization;

c. Ensuring that authenticators have sufficient strength of mechanism for their intended use;

d. Establishing and implementing administrative procedures for initial authenticator distribution, for lost/compromised or damaged authenticators, and for revoking authenticators;

e. Changing default content of authenticators upon information system installation;

f. Establishing minimum and maximum lifetime restrictions and reuse conditions for authenticators (if appropriate);

g. Changing/refreshing authenticators [*Assignment: organization-defined time period by authenticator type*];

h. Protecting authenticator content from unauthorized disclosure and modification; and

i. Requiring users to take, and having devices implement, specific measures to safeguard authenticators.

Supplemental Guidance: User authenticators include, for example, passwords, tokens, biometrics, PKI certificates, and key cards. Initial authenticator content is the actual content (e.g., the initial password) as opposed to requirements about authenticator content (e.g., minimum password length). Many information system components are shipped with factory default authentication credentials to allow for initial installation and configuration. Default authentication credentials are often well known, easily discoverable, present a significant security risk, and therefore, are changed upon installation. The requirement to protect user authenticators may be implemented via control PL-4 or PS-6 for authenticators in the possession of users and by controls AC-3, AC-6, and SC-28 for authenticators stored within the information system (e.g., passwords stored in a hashed or encrypted format, files containing encrypted or hashed passwords accessible only with super user privileges). The information system supports user authenticator management by organization-defined settings and restrictions for various authenticator characteristics including, for example, minimum password length, password composition, validation time window for time synchronous one time tokens, and number of allowed rejections during verification stage of biometric authentication. Measures to safeguard user authenticators include, for example, maintaining possession of individual authenticators, not loaning or sharing authenticators with others, and reporting lost or compromised authenticators immediately. Authenticator management includes issuing and revoking, when no longer needed, authenticators for temporary access such as

that required for remote maintenance. Device authenticators include, for example, certificates and passwords. Related controls: AC-2, IA-2, PL-4, PS-6.

Control Enhancements:

(1) The information system, for password-based authentication:

(a) Enforces minimum password complexity of [*Assignment: organization-defined requirements for case sensitivity, number of characters, mix of upper-case letters, lower-case letters, numbers, and special characters, including minimum requirements for each type*];

(b) Enforces at least a [*Assignment: organization-defined number of changed characters*] when new passwords are created;

(c) Encrypts passwords in storage and in transmission;

(d) Enforces password minimum and maximum lifetime restrictions of [Assignment: organization-defined numbers for lifetime minimum, lifetime maximum]; and

(e) Prohibits password reuse for [Assignment: organization-defined number] generations.

Enhancement Supplemental Guidance: This control enhancement is intended primarily for environments where passwords are used as a single factor to authenticate users, or in a similar manner along with one or more additional authenticators. The enhancement generally does *not* apply to situations where passwords are used to unlock hardware authenticators. The implementation of such password mechanisms may not meet all of the requirements in the enhancement.

(2) The information system, for PKI-based authentication:

(a) Validates certificates by constructing a certification path with status information to an accepted trust anchor;

(b) Enforces authorized access to the corresponding private key; and

(c) Maps the authenticated identity to the user account.

Enhancement Supplemental Guidance: Status information for certification paths includes, for example, certificate revocation lists or online certificate status protocol responses.

(3) The organization requires that the registration process to receive [*Assignment: organization-defined types of and/or specific authenticators*] be carried out in person before a designated registration authority with authorization by a designated organizational official (e.g., a supervisor).

References: OMB Memorandum 04-04; FIPS Publication 201; NIST Special Publications 800-73, 800-63, 800-76, 800-78.

IA-6 AUTHENTICATOR FEEDBACK

Control: The information system obscures feedback of authentication information during the authentication process to protect the information from possible exploitation/use by unauthorized individuals.

Supplemental Guidance: The feedback from the information system does not provide information that would allow an unauthorized user to compromise the authentication mechanism. Displaying asterisks when a user types in a password, is an example of obscuring feedback of authentication information.

References: None.

IA-7 CRYPTOGRAPHIC MODULE AUTHENTICATION

Control: The information system uses mechanisms for authentication to a cryptographic module that meet the requirements of applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance for such authentication.

Supplemental Guidance: None.

References: FIPS Publication 140-2; Web: CSRC.NIST.GOV/CRYPTVAL.

IA-8 IDENTIFICATION AND AUTHENTICATION (NON-ORGANIZATIONAL USERS)

Control: The information system uniquely identifies and authenticates non-organizational users (or processes acting on behalf of non-organizational users).

Supplemental Guidance: Non-organizational users include all information system users other than organizational users explicitly covered by IA-2. Users are uniquely identified and authenticated for all accesses other than those accesses explicitly identified and documented by the organization in accordance with AC-14. In accordance with the E-Authentication E-Government initiative, authentication of non-organizational users accessing federal information systems may be required to protect federal, proprietary, or privacy-related information (with exceptions noted for national security systems). Accordingly, a risk assessment is used in determining the authentication needs of the organization. Scalability, practicality, and security are simultaneously considered in balancing the need to ensure ease of use for access to federal information and information systems with the need to protect and adequately mitigate risk to organizational operations, organizational assets, individuals, other organizations, and the Nation. Identification and authentication requirements for information system access by organizational users are described in IA-2. Related controls: AC-14, AC-17, AC-18, MA-4.

References: OMB Memorandum 04-04; Web: WWW.CIO.GOV/EAUTHENTICATION; NIST Special Publication 800-63.

FAMILY: INCIDENT RESPONSE **CLASS:** OPERATIONAL

IR-1 INCIDENT RESPONSE POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented incident response policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the incident response policy and associated incident response controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the incident response family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The incident response policy can be included as part of the general information security policy for the organization. Incident response procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the incident response policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-61, 800-83, 800-100.

IR-2 INCIDENT RESPONSE TRAINING

Control: The organization:

a. Trains personnel in their incident response roles and responsibilities with respect to the information system; and

b. Provides refresher training [*Assignment: organization-defined frequency*].

Supplemental Guidance: Incident response training includes user training in the identification and reporting of suspicious activities, both from external and internal sources. Related control: AT-3.

Control Enhancements:

(1) The organization incorporates simulated events into incident response training to facilitate effective response by personnel in crisis situations.

(2) The organization employs automated mechanisms to provide a more thorough and realistic training environment.

References: NIST Special Publications 800-16, 800-50.

IR-3 INCIDENT RESPONSE TESTING AND EXERCISES

Control: The organization tests and/or exercises the incident response capability for the information system [*Assignment: organization-defined frequency*] using [*Assignment: organization-defined tests and/or exercises*] to determine the incident response effectiveness and documents the results.

Supplemental Guidance: None.

Control Enhancements:

(1) The organization employs automated mechanisms to more thoroughly and effectively test/exercise the incident response capability.

Enhancement Supplemental Guidance: Automated mechanisms can provide the ability to more thoroughly and effectively test or exercise the incident response capability by providing more complete coverage of incident response issues, selecting more realistic test/exercise scenarios

and environments, and more effectively stressing the response capability. Related control: AT-2.

References: NIST Special Publications 800-84, 800-115.

IR-4 INCIDENT HANDLING

Control: The organization:

a. Implements an incident handling capability for security incidents that includes preparation, detection and analysis, containment, eradication, and recovery;

b. Coordinates incident handling activities with contingency planning activities; and

c. Incorporates lessons learned from ongoing incident handling activities into incident response procedures, training, and testing/exercises, and implements the resulting changes accordingly.

Supplemental Guidance: Incident-related information can be obtained from a variety of sources including, but not limited to, audit monitoring, network monitoring, physical access monitoring, and user/administrator reports. Related controls: AU-6, CP-2, IR-2, IR-3, PE-6, SC-5, SC-7, SI-3, SI-4, SI-7.

Control Enhancements:

(1) The organization employs automated mechanisms to support the incident handling process.

Enhancement Supplemental Guidance: An online incident management system is an example of an automated mechanism.

References: NIST Special Publication 800-61.

IR-5 INCIDENT MONITORING

Control: The organization tracks and documents information system security incidents.

Supplemental Guidance: Documenting information system security incidents includes, for example, maintaining records about each incident, the status of the incident, and other pertinent information necessary for forensics, evaluating incident details, trends, and handling. Incident information can be obtained from a variety of sources including, for example, incident reports, incident response teams, audit monitoring, network monitoring, physical access monitoring, and user/administrator reports.

Control Enhancements:

(1) The organization employs automated mechanisms to assist in the tracking of security incidents and in the collection and analysis of incident information.

Enhancement Supplemental Guidance: Automated mechanisms for tracking security incidents and collecting/analyzing incident information include, for example, the Einstein network monitoring device and monitoring online Computer Incident Response Centers (CIRCs) or other electronic databases of incidents. Related controls: AU-6, AU-7, SI-4.

References: NIST Special Publication 800-61.

IR-6 INCIDENT REPORTING

Control: The organization:

a. Requires personnel to report suspected security incidents to the organizational incident response capability within [*Assignment: organization-defined time-period*]; and

b. Reports security incident information to designated authorities.

Supplemental Guidance: The intent of this control is to address both specific incident reporting requirements within an organization and the formal incident reporting requirements for federal agencies and their subordinate organizations. The types of security incidents reported, the content and timeliness of the reports, and the list of designated reporting authorities are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Current federal policy requires that all federal agencies (unless specifically exempted from such requirements) report security incidents to the United States Computer Emergency Readiness Team (US-CERT) within specified time frames designated in the US-CERT Concept of Operations for Federal Cyber Security Incident Handling. Related controls: IR-4, IR-5.

Control Enhancements:

(1) The organization employs automated mechanisms to assist in the reporting of security incidents.

References: NIST Special Publication 800-61: Web: WWW.US-CERT.GOV.

IR-7 INCIDENT RESPONSE ASSISTANCE

Control: The organization provides an incident response support resource, integral to the organizational incident response capability, that offers advice and assistance to users of the information system for the handling and reporting of security incidents.

Supplemental Guidance: Possible implementations of incident response support resources in an organization include a help desk or an assistance group and access to forensics services, when required. Related controls: IR-4, IR-6.

Control Enhancements:

(1) The organization employs automated mechanisms to increase the availability of incident response-related information and support.

Enhancement Supplemental Guidance: Automated mechanisms can provide a push and/or pull capability for users to obtain incident response assistance. For example, individuals might have access to a website to query the assistance capability, or conversely, the assistance capability may have the ability to proactively send information to users (general distribution or targeted) as part of increasing understanding of current response capabilities and support.

References: None.

IR-8 INCIDENT RESPONSE PLAN

Control: The organization:

a. Develops an incident response plan that:

- Provides the organization with a roadmap for implementing its incident response capability;
- Describes the structure and organization of the incident response capability;
- Provides a high-level approach for how the incident response capability fits into the overall organization;
- Meets the unique requirements of the organization, which relate to mission, size, structure, and functions;
- Defines reportable incidents;
- Provides metrics for measuring the incident response capability within the organization.
- Defines the resources and management support needed to effectively maintain and mature an incident response capability; and
- Is reviewed and approved by designated officials within the organization;

b. Distributes copies of the incident response plan to [*Assignment: organization-defined list of incident response personnel (identified by name and/or by role) and organizational elements*];

c. Reviews the incident response plan [*Assignment: organization-defined frequency*];

d. Revises the incident response plan to address system/organizational changes or problems encountered during plan implementation, execution, or testing; and

e. Communicates incident response plan changes to [*Assignment: organization-defined list of incident response personnel (identified by name and/or by role) and organizational elements*].

Supplemental Guidance: It is important that organizations have a formal, focused, and coordinated approach to responding to incidents. The organization's mission, strategies, and goals for incident response help determine the structure of its incident response capability.

References: NIST Special Publication 800-61.

FAMILY: MAINTENANCE **CLASS:** OPERATIONAL

MA-1 SYSTEM MAINTENANCE POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented information system maintenance policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the information system maintenance policy and associated system maintenance controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the system maintenance family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The information system maintenance policy can be included as part of the general information security policy for the organization. System maintenance procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the system maintenance policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-100.

MA-2 CONTROLLED MAINTENANCE

Control: The organization:

a. Schedules, performs, documents, and reviews records of maintenance and repairs on information system components in accordance with manufacturer or vendor specifications and/or organizational requirements;

b. Controls all maintenance activities, whether performed on site or remotely and whether the equipment is serviced on site or removed to another location;

c. Requires that a designated official explicitly approve the removal of the information system or system components from organizational facilities for off-site maintenance or repairs;

d. Sanitizes equipment to remove all information from associated media prior to removal from organizational facilities for off-site maintenance or repairs; and

e. Checks all potentially impacted security controls to verify that the controls are still functioning properly following maintenance or repair actions.

Supplemental Guidance: The control is intended to address the information security aspects of the organization's information system maintenance program. Related controls: MP-6, SI-2.

Control Enhancements:

(1) The organization maintains maintenance records for the information system that include:

(a) Date and time of maintenance;

(b) Name of the individual performing the maintenance;

(c) Name of escort, if necessary;

(d) A description of the maintenance performed; and

(e) A list of equipment removed or replaced (including identification numbers, if applicable).

(2) The organization employs automated mechanisms to schedule, conduct, and document maintenance and repairs as required, producing up-to date, accurate, complete, and available records of all maintenance and repair actions, needed, in process, and completed.

References: None.

MA-3 MAINTENANCE TOOLS

Control: The organization approves, controls, monitors the use of, and maintains on an ongoing basis, information system maintenance tools.

Supplemental Guidance: The intent of this control is to address the security-related issues arising from the hardware and software brought into the information system specifically for diagnostic and repair actions (e.g., a hardware or software packet sniffer that is introduced for the purpose of a particular maintenance activity). Hardware and/or software components that may support information system maintenance, yet are a part of the system (e.g., the software implementing "ping," "ls," "ipconfig," or the hardware and software implementing the monitoring port of an Ethernet switch) are not covered by this control. Related control: MP-6.

Control Enhancements:

(1) The organization inspects all maintenance tools carried into a facility by maintenance personnel for obvious improper modifications.

Enhancement Supplemental Guidance: Maintenance tools include, for example, diagnostic and test equipment used to conduct maintenance on the information system.

(2) The organization checks all media containing diagnostic and test programs for malicious code before the media are used in the information system.

(3) The organization prevents the unauthorized removal of maintenance equipment by one of the following: (i) verifying that there is no organizational information contained on the equipment; (ii) sanitizing or destroying the equipment; (iii) retaining the equipment within the facility; or (iv) obtaining an exemption from a designated organization official explicitly authorizing removal of the equipment from the facility.

References: NIST Special Publication 800-88.

MA-4 NON-LOCAL MAINTENANCE

Control: The organization:

a. Authorizes, monitors, and controls non-local maintenance and diagnostic activities;

b. Allows the use of non-local maintenance and diagnostic tools only as consistent with organizational policy and documented in the security plan for the information system;

c. Employs strong identification and authentication techniques in the establishment of non-local maintenance and diagnostic sessions;

d. Maintains records for non-local maintenance and diagnostic activities; and

e. Terminates all sessions and network connections when non-local maintenance is completed.

Supplemental Guidance: Non-local maintenance and diagnostic activities are those activities conducted by individuals communicating through a network; either an external network (e.g., the Internet) or an internal network. Local maintenance and diagnostic activities are those activities carried out by individuals physically present at the information system or information system component and not communicating across a network connection. Identification and authentication techniques used in the establishment of non-local maintenance and diagnostic sessions are consistent with the network access requirements in IA-2. Strong authenticators include, for example, PKI where certificates are stored on a token protected by a password, passphrase, or biometric. Enforcing requirements in MA-4 is accomplished in part, by other controls. Related controls: AC-2, AC-3, AC-6, AC-17, AU-2, AU-3, IA-2, IA-8, MA-5, MP-6, SC-7.

Control Enhancements:

(1) The organization audits non-local maintenance and diagnostic sessions and designated organizational personnel review the maintenance records of the sessions.

(2) The organization documents, in the security plan for the information system, the installation and use of non-local maintenance and diagnostic connections.

(3) The organization:

(a) Requires that non-local maintenance and diagnostic services be performed from an information system that implements a level of security at least as high as that implemented on the system being serviced; or

(b) Removes the component to be serviced from the information system and prior to non-local maintenance or diagnostic services, sanitizes the component (with regard to organizational information) before removal from organizational facilities, and after the service is performed, inspects and sanitizes the component (with regard to potentially malicious software and surreptitious implants) before reconnecting the component to the information system.

References: FIPS Publications 140-2, 197, 201; NIST Special Publications 800-63, 800-88; CNSS Policy 15.

MA-5 MAINTENANCE PERSONNEL

Control: The organization:

a. Establishes a process for maintenance personnel authorization and maintains a current list of authorized maintenance organizations or personnel; and

b. Ensures that personnel performing maintenance on the information system have required access authorizations or designates organizational personnel with required access authorizations and technical competence deemed necessary to supervise information system maintenance when maintenance personnel do not possess the required access authorizations.

Supplemental Guidance: Individuals not previously identified in the information system, such as vendor personnel and consultants, may legitimately require privileged access to the system, for example, when required to conduct maintenance or diagnostic activities with little or no notice. Based on a prior assessment of risk, the organization may issue temporary credentials to these individuals. Temporary credentials may be for one-time use or for a very limited time period. Related controls: IA-8, MA-5.

References: None.

MA-6 TIMELY MAINTENANCE

Control: The organization obtains maintenance support and/or spare parts for [*Assignment: organization-defined list of security-critical information system components and/or key information technology components*] within [*Assignment: organization-defined time period*] of failure.

Supplemental Guidance: The organization specifies those information system components that, when not operational, result in increased risk to organizations, individuals, or the Nation because the security functionality intended by that component is not being provided. Security-critical components include, for example, firewalls, guards, gateways, intrusion detection systems, audit repositories, authentication servers, and intrusion prevention systems. Related control: CP-2.

References: None.

FAMILY: MEDIA PROTECTION **CLASS:** OPERATIONAL

MP-1 MEDIA PROTECTION POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented media protection policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the media protection policy and associated media protection controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the media protection family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The media protection policy can be included as part of the general information security policy for the organization. Media protection procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the media protection policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-100.

MP-2 MEDIA ACCESS

Control: The organization restricts access to [*Assignment: organization-defined types of digital and non-digital media*] to [*Assignment: organization-defined list of authorized individuals*] using [*Assignment: organization-defined security measures*].

Supplemental Guidance: Information system media includes both digital media (e.g., diskettes, magnetic tapes, external/removable hard drives, flash/thumb drives, compact disks, digital video disks) and non-digital media (e.g., paper, microfilm). This control also applies to mobile computing and communications devices with information storage capability (e.g., notebook/laptop computers, personal digital assistants, cellular telephones, digital cameras, and audio recording devices). An organizational assessment of risk guides the selection of media and associated information contained on that media requiring restricted access. Organizations document in policy and procedures, the media requiring restricted access, individuals authorized to access the media, and the specific measures taken to restrict access. Fewer protection measures are needed for media containing information determined by the organization to be in the public domain, to be publicly releasable, or to have limited or no adverse impact if accessed by other than authorized personnel. In these situations, it is assumed that the physical access controls where the media resides provide adequate protection. Related controls: MP-4, PE-3.

Control Enhancements:

(1) The organization employs automated mechanisms to restrict access to media storage areas and to audit access attempts and access granted.

Enhancement Supplemental Guidance: This control enhancement is primarily applicable to media storage areas within an organization where a significant volume of media is stored and is not applicable to every location where some media is stored (e.g., in individual offices).

References: FIPS Publication 199; NIST Special Publication 800-111.

MP-3 MEDIA MARKING

Control: The organization:

a. Marks, in accordance with organizational policies and procedures, removable information system media and information system output indicating the distribution limitations, handling caveats, and applicable security markings (if any) of the information; and

b. Exempts [*Assignment: organization-defined list of removable media types*] from marking as long as the exempted items remain within [*Assignment: organization-defined controlled areas*].

Supplemental Guidance: The term marking is used when referring to the application or use of human-readable security attributes. The term labeling is used when referring to the application or use of security attributes with regard to internal data structures within the information system (see AC-16, Security Attributes). Removable information system media includes both digital media (e.g., diskettes, magnetic tapes, external/removable hard drives, flash/thumb drives, compact disks, digital video disks) and non-digital media (e.g., paper, microfilm). An organizational assessment of risk guides the selection of media requiring marking. Marking is generally not required for media containing information determined by the organization to be in the public domain or to be publicly releasable. Some organizations, however, may require markings for public information indicating that the information is publicly releasable. Organizations may extend the scope of this control to include information system output devices containing organizational information, including, for example, monitors and printers. Marking of removable media and information system output is consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance.

References: FIPS Publication 199.

MP-4 MEDIA STORAGE

Control: The organization:

a. Physically controls and securely stores [*Assignment: organization-defined types of digital and non-digital media*] within [*Assignment: organization-defined controlled areas*] using [*Assignment: organization-defined security measures*];

b. Protects information system media until the media are destroyed or sanitized using approved equipment, techniques, and procedures.

Supplemental Guidance: Information system media includes both digital media (e.g., diskettes, magnetic tapes, external/removable hard drives, flash/thumb drives, compact disks, digital video disks) and non-digital media (e.g., paper, microfilm). This control also applies to mobile computing and communications devices with information storage capability (e.g., notebook/laptop computers, personal digital assistants, cellular telephones, digital cameras, and audio recording devices). Telephone systems are also considered information systems and may have the capability to store information on internal media (e.g., on voicemail systems). Since telephone systems do not have, in most cases, the identification, authentication, and access control mechanisms typically employed in other information systems, organizational personnel use extreme caution in the types of information stored on telephone voicemail systems. A controlled area is any area or space for which the organization has confidence that the physical and procedural protections are sufficient to meet the requirements established for protecting the information and/or information system.

An organizational assessment of risk guides the selection of media and associated information contained on that media requiring physical protection. Fewer protection measures are needed for media containing information determined by the organization to be in the public domain, to be publicly releasable, or to have limited or no adverse impact on the organization or individuals if accessed by other than authorized personnel. In these situations, it is assumed that the physical access controls to the facility where the media resides provide adequate protection.

As part of a defense-in-depth strategy, the organization considers routinely encrypting information at rest on selected secondary storage devices. The employment of cryptography is at the discretion of the information owner/steward. The selection of the cryptographic mechanisms used is based upon maintaining the confidentiality and integrity of the information. The strength of mechanisms is commensurate with the classification and sensitivity of the information. Related controls: AC-3, AC-19, CP-6, CP-9, MP-2, PE-3.

References: FIPS Publication 199; NIST Special Publications 800-56, 800-57, 800-111.

MP-5 MEDIA TRANSPORT

Control: The organization:

a. Protects and controls [*Assignment: organization-defined types of digital and non-digital media*] during transport outside of controlled areas using [*Assignment: organization-defined security measures*];

b. Maintains accountability for information system media during transport outside of controlled areas; and

c. Restricts the activities associated with transport of such media to authorized personnel.

Supplemental Guidance: Information system media includes both digital media (e.g., diskettes, magnetic tapes, removable hard drives, flash/thumb drives, compact disks, digital video disks) and non-digital media (e.g., paper, microfilm). This control also applies to mobile computing and communications devices with information storage capability (e.g., notebook/laptop computers, personal digital assistants, cellular telephones, digital cameras, and audio recording devices) that are transported outside of controlled areas. Telephone systems are also considered information systems and may have the capability to store information on internal media (e.g., on voicemail systems). Since telephone systems do not have, in most cases, the identification, authentication, and access control mechanisms typically employed in other information systems, organizational personnel use caution in the types of information stored on telephone voicemail systems that are transported outside of controlled areas. A controlled area is any area or space for which the organization has confidence that the physical and procedural protections provided are sufficient to meet the requirements established for protecting the information and/or information system.

Physical and technical security measures for the protection of digital and non-digital media are commensurate with the classification or sensitivity of the information residing on the media, and consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Locked containers and cryptography are examples of security measures available to protect digital and non-digital media during transport. Cryptographic mechanisms can provide confidentiality and/or integrity protections depending upon the mechanisms used. An organizational assessment of risk guides: (i) the selection of media and associated information contained on that media requiring protection during transport; and (ii) the selection and use of storage containers for transporting non-digital media. Authorized transport and courier personnel may include individuals from outside the organization (e.g., U.S. Postal Service or a commercial transport or delivery service). Related controls: AC-19, CP-9.

Control Enhancements:

(2) The organization documents activities associated with the transport of information system media.

Enhancement Supplemental Guidance: Organizations establish documentation requirements for activities associated with the transport of information system media in accordance with the organizational assessment of risk to include the flexibility to define different record-keeping methods for different types of media transport as part of an overall system of transport-related records.

(3) The organization employs an identified custodian throughout the transport of information system media.

Enhancement Supplemental Guidance: Custodial responsibilities can be transferred from one individual to another as long as an unambiguous custodian is identified at all times.

(4) The organization employs cryptographic mechanisms to protect the confidentiality and integrity of information stored on digital media during transport outside of controlled areas.

Enhancement Supplemental Guidance: This control enhancement also applies to mobile devices. Mobile devices include portable storage media (e.g., USB memory sticks, external hard disk drives) and portable computing and communications devices with storage capability (e.g., notebook/laptop computers, personal digital assistants, cellular telephones). Related control: MP-4. Related controls: MP-2; SC-13.

References: FIPS Publication 199; NIST Special Publication 800-60.

MP-6 MEDIA SANITIZATION

Control: The organization:

a. sanitizes information system media, both digital and non-digital, prior to disposal, release out of organizational control, or release for reuse; and

b. Employs sanitization mechanisms with strength and integrity commensurate with the classification or sensitivity of the information.

Supplemental Guidance: This control applies to all media subject to disposal or reuse, whether or not considered removable. Sanitization is the process used to remove information from information system media such that there is reasonable assurance that the information cannot be retrieved or reconstructed. Sanitization techniques, including clearing, purging, and destroying media information, prevent the disclosure of organizational information to unauthorized individuals when such media is reused or released for disposal. The organization uses its discretion on the employment of sanitization techniques and procedures for media containing information deemed to be in the public domain or publicly releasable, or deemed to have no adverse impact on the organization or individuals if released for reuse or disposal.

Control Enhancements:

(1) The organization tracks, documents, and verifies media sanitization and disposal actions.

(2) The organization tests sanitization equipment and procedures to verify correct performance [*Assignment: organization-defined frequency*].

(3) The organization sanitizes portable, removable storage devices prior to connecting such devices to the information system under the following circumstances: [*Assignment: organization-defined list of circumstances requiring sanitization of portable, removable storage devices*].

Enhancement Supplemental Guidance: Portable, removable storage devices (e.g., thumb drives, flash drives, external storage devices) can be the source of malicious code insertions into organizational information systems. Many of these devices are obtained from unknown sources and may contain various types of malicious code that can be readily transferred to the information system through USB ports or other entry portals. While scanning such devices is always recommended, sanitization provides additional assurance that the device is free of all malicious code to include code capable of initiating zero-day attacks. Organizations consider sanitization of portable, removable storage devices, for example, when such devices are first purchased from the manufacturer or vendor prior to initial use or when the organization loses a positive chain of custody for the device. An organizational assessment of risk guides the specific circumstances for employing the sanitization process. Related control: SI-3.

References: FIPS Publication 199; NIST Special Publications 800-60, 800-88; Web: WWW.NSA.GOV/IA/GUIDANCE/MEDIA_DESTRUCTION_GUIDANCE/INDEX.SHTML.

FAMILY: PHYSICAL AND ENVIRONMENTAL PROTECTION **CLASS:** OPERATIONAL

PE-1 PHYSICAL AND ENVIRONMENTAL PROTECTION POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented physical and environmental protection policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the physical and environmental protection policy and associated physical and environmental protection controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the physical and environmental protection family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The physical and environmental protection policy can be included as part of the general information security policy for the organization. Physical and environmental protection procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the physical and environmental protection policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-100.

PE-2 PHYSICAL ACCESS AUTHORIZATIONS

Control: The organization:

a. Develops and keeps current a list of personnel with authorized access to the facility where the information system resides (except for those areas within the facility officially designated as publicly accessible);

b. Issues authorization credentials;

c. Reviews and approves the access list and authorization credentials [*Assignment: organization-defined frequency*], removing from the access list personnel no longer requiring access.

Supplemental Guidance: Authorization credentials include, for example, badges, identification cards, and smart cards. Related control: PE-3, PE-4.

References: None.

PE-3 PHYSICAL ACCESS CONTROL

Control: The organization:

a. Enforces physical access authorizations for all physical access points (including designated entry/exit points) to the facility where the information system resides (excluding those areas within the facility officially designated as publicly accessible);

b. Verifies individual access authorizations before granting access to the facility;

c. Controls entry to the facility containing the information system using physical access devices and/or guards;

d. Controls access to areas officially designated as publicly accessible in accordance with the organization's assessment of risk;

e. Secures keys, combinations, and other physical access devices;

f. Inventories physical access devices [*Assignment: organization-defined frequency*]; and

g. Changes combinations and keys [*Assignment: organization-defined frequency*] and when keys are lost, combinations are compromised, or individuals are transferred or terminated.

Supplemental Guidance: The organization determines the types of guards needed, for example, professional physical security staff or other personnel such as administrative staff or information system users, as deemed appropriate. Physical access devices include, for example, keys, locks, combinations, and card readers. Workstations and associated peripherals connected to (and part of) an organizational information system may be located in areas designated as publicly accessible with access to such devices being safeguarded. Related controls: MP-2, MP-4, PE-2.

Control Enhancements:

(1) The organization enforces physical access authorizations to the information system independent of the physical access controls for the facility.

Enhancement Supplemental Guidance: This control enhancement applies to server rooms, media storage areas, communications centers, or any other areas within an organizational facility containing large concentrations of information system components. The intent is to provide additional physical security for those areas where the organization may be more vulnerable due to the concentration of information system components. Security requirements for facilities containing organizational information systems that process, store, or transmit Sensitive Compartmented Information (SCI) are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. See also PS-3, security requirements for personnel access to SCI.

References: FIPS Publication 201; NIST Special Publications 800-73, 800-76, 800-78; ICD 704; DCID 6/9.

PE-4 ACCESS CONTROL FOR TRANSMISSION MEDIUM

Control: The organization controls physical access to information system distribution and transmission lines within organizational facilities.

Supplemental Guidance: Physical protections applied to information system distribution and transmission lines help prevent accidental damage, disruption, and physical tampering. Additionally, physical protections are necessary to help prevent eavesdropping or in transit modification of unencrypted transmissions. Protective measures to control physical access to information system distribution and transmission lines include: (i) locked wiring closets; (ii) disconnected or locked spare jacks; and/or (iii) protection of cabling by conduit or cable trays. Related control: PE-2.

References: NSTISSI No. 7003.

PE-5 ACCESS CONTROL FOR OUTPUT DEVICES

Control: The organization controls physical access to information system output devices to prevent unauthorized individuals from obtaining the output.

Supplemental Guidance: Monitors, printers, and audio devices are examples of information system output devices.

References: None.

PE-6 MONITORING PHYSICAL ACCESS

Control: The organization:

a. Monitors physical access to the information system to detect and respond to physical security incidents;

b. Reviews physical access logs [*Assignment: organization-defined frequency*]; and

c. Coordinates results of reviews and investigations with the organization's incident response capability.

Supplemental Guidance: Investigation of and response to detected physical security incidents, including apparent security violations or suspicious physical access activities, are part of the organization's incident response capability.

Control Enhancements:

(1) The organization monitors real-time physical intrusion alarms and surveillance equipment.

(2) The organization employs automated mechanisms to recognize potential intrusions and initiate designated response actions.

References: None.

PE-7 VISITOR CONTROL

Control: The organization controls physical access to the information system by authenticating visitors before authorizing access to the facility where the information system resides other than areas designated as publicly accessible.

Supplemental Guidance: Individuals (to include organizational employees, contract personnel, and others) with permanent authorization credentials for the facility are not considered visitors.

Control Enhancements:

(1) The organization escorts visitors and monitors visitor activity, when required.

References: None.

PE-8 ACCESS RECORDS

Control: The organization:

a. Maintains visitor access records to the facility where the information system resides (except for those areas within the facility officially designated as publicly accessible); and

b. Reviews visitor access records [*Assignment: organization-defined frequency*].

Supplemental Guidance: Visitor access records include, for example, name/organization of the person visiting, signature of the visitor, form(s) of identification, date of access, time of entry and departure, purpose of visit, and name/organization of person visited.

Control Enhancements:

(1) The organization employs automated mechanisms to facilitate the maintenance and review of access records.

(2) The organization maintains a record of all physical access, both visitor and authorized individuals.

References: None.

PE-9 POWER EQUIPMENT AND POWER CABLING

Control: The organization protects power equipment and power cabling for the information system from damage and destruction.

Supplemental Guidance: This control, to include any enhancements specified, may be satisfied by similar requirements fulfilled by another organizational entity other than the information security program. Organizations avoid duplicating actions already covered.

References: None.

PE-10 EMERGENCY SHUTOFF

Control: The organization:

a. Provides the capability of shutting off power to the information system or individual system components in emergency situations;

b. Places emergency shutoff switches or devices in [*Assignment: organization-defined location by information system or system component*] to facilitate safe and easy access for personnel; and

c. Protects emergency power shutoff capability from unauthorized activation.

Supplemental Guidance: This control applies to facilities containing concentrations of information system resources, for example, data centers, server rooms, and mainframe computer rooms.

References: None.

PE-11 EMERGENCY POWER

Control: The organization provides a short-term uninterruptible power supply to facilitate an orderly shutdown of the information system in the event of a primary power source loss.

Supplemental Guidance: This control, to include any enhancements specified, may be satisfied by similar requirements fulfilled by another organizational entity other than the information security program. Organizations avoid duplicating actions already covered.

Control Enhancements:

(1) The organization provides a long-term alternate power supply for the information system that is capable of maintaining minimally required operational capability in the event of an extended loss of the primary power source.

References: None.

PE-12 EMERGENCY LIGHTING

Control: The organization employs and maintains automatic emergency lighting for the information system that activates in the event of a power outage or disruption and that covers emergency exits and evacuation routes within the facility.

Supplemental Guidance: This control, to include any enhancements specified, may be satisfied by similar requirements fulfilled by another organizational entity other than the information security program. Organizations avoid duplicating actions already covered.

References: None.

PE-13 FIRE PROTECTION

Control: The organization employs and maintains fire suppression and detection devices/systems for the information system that are supported by an independent energy source.

Supplemental Guidance: Fire suppression and detection devices/systems include, for example, sprinkler systems, handheld fire extinguishers, fixed fire hoses, and smoke detectors. This control, to include any enhancements specified, may be satisfied by similar requirements fulfilled by

another organizational entity other than the information security program. Organizations avoid duplicating actions already covered.

Control Enhancements:

(1) The organization employs fire detection devices/systems for the information system that activate automatically and notify the organization and emergency responders in the event of a fire.

(2) The organization employs fire suppression devices/systems for the information system that provide automatic notification of any activation to the organization and emergency responders.

(3) The organization employs an automatic fire suppression capability for the information system when the facility is not staffed on a continuous basis.

References: None.

PE-14 TEMPERATURE AND HUMIDITY CONTROLS

Control: The organization:

a. Maintains temperature and humidity levels within the facility where the information system resides at [*Assignment: organization-defined acceptable levels*]; and

b. Monitors temperature and humidity levels [*Assignment: organization-defined frequency*].

Supplemental Guidance: This control, to include any enhancements specified, may be satisfied by similar requirements fulfilled by another organizational entity other than the information security program. Organizations avoid duplicating actions already covered.

References: None.

PE-15 WATER DAMAGE PROTECTION

Control: The organization protects the information system from damage resulting from water leakage by providing master shutoff valves that are accessible, working properly, and known to key personnel.

Supplemental Guidance: This control, to include any enhancements specified, may be satisfied by similar requirements fulfilled by another organizational entity other than the information security program. Organizations avoid duplicating actions already covered.

Control Enhancements:

(1) The organization employs mechanisms that, without the need for manual intervention, protect the information system from water damage in the event of a water leak.

References: None.

PE-16 DELIVERY AND REMOVAL

Control: The organization authorizes, monitors, and controls [*Assignment: organization-defined types of information system components*] entering and exiting the facility and maintains records of those items.

Supplemental Guidance: Effectively enforcing authorizations for entry and exit of information system components may require restricting access to delivery areas and possibly isolating the areas from the information system and media libraries.

References: None.

PE-17 ALTERNATE WORK SITE

Control: The organization:

a. Employs [*Assignment: organization-defined management, operational, and technical information system security controls*] at alternate work sites;

b. Assesses as feasible, the effectiveness of security controls at alternate work sites; and

c. Provides a means for employees to communicate with information security personnel in case of security incidents or problems.

Supplemental Guidance: Alternate work sites may include, for example, government facilities or private residences of employees. The organization may define different sets of security controls for specific alternate work sites or types of sites.

References: NIST Special Publication 800-46.

PE-18 LOCATION OF INFORMATION SYSTEM COMPONENTS

Control: The organization positions information system components within the facility to minimize potential damage from physical and environmental hazards and to minimize the opportunity for unauthorized access.

Supplemental Guidance: Physical and environmental hazards include, for example, flooding, fire, tornados, earthquakes, hurricanes, acts of terrorism, vandalism, electromagnetic pulse, electrical interference, and electromagnetic radiation. Whenever possible, the organization also considers the location or site of the facility with regard to physical and environmental hazards. In addition, the organization considers the location of physical entry points where unauthorized individuals, while not being granted access, might nonetheless be in close proximity to the information system and therefore, increase the potential for unauthorized access to organizational communications (e.g., through the use of wireless sniffers or microphones). This control, to include any enhancements specified, may be satisfied by similar requirements fulfilled by another organizational entity other than the information security program. Organizations avoid duplicating actions already covered.

Control Enhancements:

(1) The organization plans the location or site of the facility where the information system resides with regard to physical and environmental hazards and for existing facilities, considers the physical and environmental hazards in its risk mitigation strategy.

References: None.

FAMILY: PLANNING **CLASS:** MANAGEMENT

PL-1 SECURITY PLANNING POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented security planning policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the security planning policy and associated security planning controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the security planning family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The security planning policy addresses the overall policy requirements for confidentiality, integrity, and availability and can be included as part of the general information security policy for the organization. Security planning procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the security planning policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-18, 800-100.

PL-2 SYSTEM SECURITY PLAN

Control: The organization:

a. Develops a security plan for the information system that:

- Is consistent with the organization's enterprise architecture;
- Explicitly defines the authorization boundary for the system;
- Describes the operational context of the information system in terms of missions and business processes;
- Provides the security categorizaton of the information system including supporting rationale;
- Describes the operational environment for the information system;
- Describes relationships with or connections to other information systems;
- Provides an overview of the security requirements for the system;
- Describes the security controls in place or planned for meeting those requirements including a rationale for the tailoring and supplementation decisions; and
- Is reviewed and approved by the authorizing official or designated representative prior to plan implementation;

b. Reviews the security plan for the information system [*Assignment: organization-defined frequency*]; and

c. Updates the plan to address changes to the information system/environment of operation or problems identified during plan implementation or security control assessments.

Supplemental Guidance: The security plan contains sufficient information (including specification of parameters for assignment and selection statements in security controls either explicitly or by

reference) to enable an implementation that is unambiguously compliant with the intent of the plan and a subsequent determination of risk to organizational operations and assets, individuals, other organizations, and the Nation if the plan is implemented as intended. Related controls: PM-1, PM-7, PM-8, PM-9, PM-11.

References: NIST Special Publication 800-18.

PL-4 RULES OF BEHAVIOR

Control: The organization:

a. Establishes and makes readily available to all information system users, the rules that describe their responsibilities and expected behavior with regard to information and information system usage; and

b. Receives signed acknowledgment from users indicating that they have read, understand, and agree to abide by the rules of behavior, before authorizing access to information and the information system.

Supplemental Guidance: The organization considers different sets of rules based on user roles and responsibilities, for example, differentiating between the rules that apply to privileged users and rules that apply to general users. Electronic signatures are acceptable for use in acknowledging rules of behavior. Related control: PS-6.

References: NIST Publication 800-18.

PL-5 PRIVACY IMPACT ASSESSMENT

Control: The organization conducts a privacy impact assessment on the information system in accordance with OMB policy.

Supplemental Guidance: None.

References: OMB Memorandum 03-22.

PL-6 SECURITY-RELATED ACTIVITY PLANNING

Control: The organization plans and coordinates security-related activities affecting the information system before conducting such activities in order to reduce the impact on organizational operations (i.e., mission, functions, image, and reputation), organizational assets, and individuals.

Supplemental Guidance: Security-related activities include, for example, security assessments, audits, system hardware and software maintenance, and contingency plan testing/exercises. Organizational advance planning and coordination includes both emergency and nonemergency (i.e., planned or nonurgent unplanned) situations.

References: None.

FAMILY: PERSONNEL SECURITY **CLASS:** OPERATIONAL

PS-1 PERSONNEL SECURITY POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented personnel security policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the personnel security policy and associated personnel security controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the personnel security family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The personnel security policy can be included as part of the general information security policy for the organization. Personnel security procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the personnel security policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-100.

PS-2 POSITION CATEGORIZATION

Control: The organization:

a. Assigns a risk designation to all positions;

b. Establishes screening criteria for individuals filling those positions; and

c. Reviews and revises position risk designations [*Assignment: organization-defined frequency*].

Supplemental Guidance: Position risk designations are consistent with Office of Personnel Management policy and guidance. The screening criteria include explicit information security role appointment requirements (e.g., training, security clearance).

References: 5 CFR 731.106(a).

PS-3 PERSONNEL SCREENING

Control: The organization:

a. Screens individuals prior to authorizing access to the information system; and

b. Rescreens individuals according to [*Assignment: organization-defined list of conditions requiring rescreening and, where re-screening is so indicated, the frequency of such rescreening*].

Supplemental Guidance: Screening and rescreening are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, guidance, and the criteria established for the risk designation of the assigned position. The organization may define different rescreening conditions and frequencies for personnel accessing the information system based on the type of information processed, stored, or transmitted by the system.

References: 5 CFR 731.106; FIPS Publications 199, 201; NIST Special Publications 800-73, 800-76, 800-78; ICD 704.

PS-4 PERSONNEL TERMINATION

Control: The organization, upon termination of individual employment:

a. Terminates information system access;

b. Conducts exit interviews;

c. Retrieves all security-related organizational information system-related property; and

d. Retains access to organizational information and information systems formerly controlled by terminated individual.

Supplemental Guidance: Information system-related property includes, for example, hardware authentication tokens, system administration technical manuals, keys, identification cards, and building passes. Exit interviews ensure that individuals understand any security constraints imposed by being former employees and that proper accountability is achieved for all information system-related property. Exit interviews may not be possible for some employees (e.g., in the case of job abandonment, some illnesses, and nonavailability of supervisors). Exit interviews are important for individuals with security clearances. Timely execution of this control is particularly essential for employees or contractors terminated for cause.

References: None.

PS-5 PERSONNEL TRANSFER

Control: The organization reviews logical and physical access authorizations to information systems/facilities when personnel are reassigned or transferred to other positions within the organization and initiates [*Assignment: organization-defined transfer or reassignment actions*] within [*Assignment: organization-defined time period following the formal transfer action*].

Supplemental Guidance: This control applies when the reassignment or transfer of an employee is permanent or of such an extended duration as to make the actions warranted. In addition the organization defines the actions appropriate for the type of reassignment or transfer; whether permanent or temporary. Actions that may be required when personnel are transferred or reassigned to other positions within the organization include, for example: (i) returning old and issuing new keys, identification cards, and building passes; (ii) closing previous information system accounts and establishing new accounts; (iii) changing information system access authorizations; and (iv) providing for access to official records to which the employee had access at the previous work location and in the previous information system accounts.

References: None.

PS-6 ACCESS AGREEMENTS

Control: The organization:

a. Ensures that individuals requiring access to organizational information and information systems sign appropriate access agreements prior to being granted access; and

b. Reviews/updates the access agreements [*Assignment: organization-defined frequency*].

Supplemental Guidance: Access agreements include, for example, nondisclosure agreements, acceptable use agreements, rules of behavior, and conflict-of-interest agreements. Signed access agreements include an acknowledgement that individuals have read, understand, and agree to abide by the constraints associated with the information system to which access is authorized. Electronic signatures are acceptable for use in acknowledging access agreements unless specifically prohibited by organizational policy. Related control: PL-4.

References: None.

PS-7 THIRD-PARTY PERSONNEL SECURITY

Control: The organization:

a. Establishes personnel security requirements including security roles and responsibilities for third-party providers;

b. Documents personnel security requirements; and

c. Monitors provider compliance.

Supplemental Guidance: Third-party providers include, for example, service bureaus, contractors, and other organizations providing information system development, information technology services, outsourced applications, and network and security management. The organization explicitly includes personnel security requirements in acquisition-related documents.

References: NIST Special Publication 800-35.

PS-8 PERSONNEL SANCTIONS

Control: The organization employs a formal sanctions process for personnel failing to comply with established information security policies and procedures.

Supplemental Guidance: The sanctions process is consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. The process is described in access agreements and can be included as part of the general personnel policies and procedures for the organization. Related controls: PL-4, PS-6.

References: None.

FAMILY: RISK ASSESSMENT **CLASS:** MANAGEMENT

RA-1 RISK ASSESSMENT POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented risk assessment policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the risk assessment policy and associated risk assessment controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the risk assessment family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The risk assessment policy can be included as part of the general information security policy for the organization. Risk assessment procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the risk assessment policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-30,800-100.

RA-2 SECURITY CATEGORIZATION

Control: The organization:

a. Categorizes information and the information system in accordance with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance;

b. Documents the security categorization results (including supporting rationale) in the security plan for the information system; and

c. Ensures the security categorization decision is reviewed and approved by the authorizing official or authorizing official designated representative.

Supplemental Guidance: A clearly defined authorization boundary is a prerequisite for an effective security categorization. Security categorization describes the potential adverse impacts to organizational operations, organizational assets, and individuals should the information and information system be comprised through a loss of confidentiality, integrity, or availability. The organization conducts the security categorization process as an organization-wide activity with the involvement of the chief information officer, senior information security officer, information system owner, mission owners, and information owners/stewards. The organization also considers potential adverse impacts to other organizations and, in accordance with the USA PATRIOT Act of 2001 and Homeland Security Presidential Directives, potential national-level adverse impacts in categorizing the information system. The security categorization process facilitates the creation of an *inventory* of information assets, and in conjunction with CM-8, a mapping to the information system components where the information is processed, stored, and transmitted. Related controls: CM-8, MP-4, SC-7.

References: FIPS Publication 199; NIST Special Publications 800-30, 800-39, 800-60.

RA-3 RISK ASSESSMENT

Control: The organization:

a. Conducts an assessment of risk, including the likelihood and magnitude of harm, from the unauthorized access, use, disclosure, disruption, modification, or destruction of the information system and the information it processes, stores, or transmits;

b. Documents risk assessment results in [*Selection: security plan; risk assessment report;* [*Assignment: organization-defined document*]];

c. Reviews risk assessment results [*Assignment: organization-defined frequency*]; and

d. Updates the risk assessment [*Assignment: organization-defined frequency*] or whenever there are significant changes to the information system or environment of operation (including the identification of new threats and vulnerabilities), or other conditions that may impact the security state of the system.

Supplemental Guidance: A clearly defined authorization boundary is a prerequisite for an effective risk assessment. Risk assessments take into account vulnerabilities, threat sources, and security controls planned or in place to determine the level of residual risk posed to organizational operations and assets, individuals, other organizations, and the Nation based on the operation of the information system. Risk assessments also take into account risk posed to organizational operations, organizational assets, or individuals from external parties (e.g., service providers, contractors operating information systems on behalf of the organization, individuals accessing organizational information systems, outsourcing entities). In accordance with OMB policy and related E-authentication initiatives, authentication of public users accessing federal information systems may also be required to protect nonpublic or privacy-related information. As such, organizational assessments of risk also address public access to federal information systems. The General Services Administration provides tools supporting that portion of the risk assessment dealing with public access to federal information systems.

Risk assessments (either formal or informal) can be conducted by organizations at various steps in the Risk Management Framework including: information system categorization; security control selection; security control implementation; security control assessment; information system authorization; and security control monitoring. RA-3 is a noteworthy security control in that the control must be partially *implemented* prior to the implementation of other controls in order to complete the first two steps in the Risk Management Framework. Risk assessments can play an important role in the security control selection process during the application of tailoring guidance for security control baselines and when considering supplementing the tailored baselines with additional security controls or control enhancements.

References: NIST Special Publication 800-30.

RA-5 VULNERABILITY SCANNING

Control: The organization:

a. Scans for vulnerabilities in the information system and hosted applications [*Assignment: organization-defined frequency and/or randomly in accordance with organization-defined process*] and when new vulnerabilities potentially affecting the system/applications are identified and reported;

b. Employs vulnerability scanning tools and techniques that promote interoperability among tools and automate parts of the vulnerability management process by using standards for:

- Enumerating platforms, software flaws, and improper configurations;
- Formatting and making transparent, checklists and test procedures; and
- Measuring vulnerability impact;

c. Analyzes vulnerability scan reports and results from security control assessments;

d. Remediates legitimate vulnerabilities [*Assignment: organization-defined response times*] in accordance with an organizational assessment of risk; and

e. Shares information obtained from the vulnerability scanning process and security control assessments with designated personnel throughout the organization to help eliminate similar vulnerabilities in other information systems (i.e., systemic weaknesses or deficiencies).

Supplemental Guidance: The security categorization of the information system guides the frequency and comprehensiveness of the vulnerability scans. Vulnerability analysis for custom software and applications may require additional, more specialized techniques and approaches (e.g., web-based application scanners, source code reviews, source code analyzers). Vulnerability scanning includes scanning for specific functions, ports, protocols, and services that should not be accessible to users or devices and for improperly configured or incorrectly operating information flow mechanisms. The organization considers using tools that express vulnerabilities in the Common Vulnerabilities and Exposures (CVE) naming convention and that use the Open Vulnerability Assessment Language (OVAL) to test for the presence of vulnerabilities. The Common Weakness Enumeration (CWE) and the National Vulnerability Database (NVD) are also excellent sources for vulnerability information. In addition, security control assessments such as red team exercises are another source of potential vulnerabilities for which to scan. Related controls: CA-2, CM-6, RA-3, SI-2.

Control Enhancements:

(1) The organization employs vulnerability scanning tools that include the capability to readily update the list of information system vulnerabilities scanned.

(2) The organization updates the list of information system vulnerabilities scanned [*Assignment: organization-defined frequency*] or when new vulnerabilities are identified and reported.

(3) The organization employs vulnerability scanning procedures that can demonstrate the breadth and depth of coverage (i.e., information system components scanned and vulnerabilities checked).

(4) The organization attempts to discern what information about the information system is discoverable by adversaries.

(5) The organization includes privileged access authorization to [*Assignment: organization-identified information system components*] for selected vulnerability scanning activities to facilitate more thorough scanning.

(7) The organization employs automated mechanisms [*Assignment: organization-defined frequency*] to detect the presence of unauthorized software on organizational information systems and notify designated organizational officials.

References: NIST Special Publications 800-40, 800-70, 800-115; Web: CWE.MITRE.ORG; NVD.NIST.GOV.

FAMILY: SYSTEM AND SERVICES ACQUISITION **CLASS:** MANAGEMENT

SA-1 SYSTEM AND SERVICES ACQUISITION POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented system and services acquisition policy that includes information security considerations and that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the system and services acquisition policy and associated system and services acquisition controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the system and services acquisition family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The system and services acquisition policy can be included as part of the general information security policy for the organization. System and services acquisition procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the system and services acquisition policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-100.

SA-2 ALLOCATION OF RESOURCES

Control: The organization:

a. Includes a determination of information security requirements for the information system in mission/business process planning;

b. Determines, documents, and allocates the resources required to protect the information system as part of its capital planning and investment control process; and

c. Establishes a discrete line item for information security in organizational programming and budgeting documentation.

Supplemental Guidance: Related controls: PM-3, PM-11.

References: NIST Special Publication 800-65.

SA-3 LIFE CYCLE SUPPORT

Control: The organization:

a. Manages the information system using a system development life cycle methodology that includes information security considerations;

b. Defines and documents information system security roles and responsibilities throughout the system development life cycle; and

c. Identifies individuals having information system security roles and responsibilities.

Supplemental Guidance: Related control: PM-7.

References: NIST Special Publication 800-64.

SA-4 ACQUISITIONS

Control: The organization includes the following requirements and/or specifications, explicitly or by reference, in information system acquisition contracts based on an assessment of risk and in accordance with applicable federal laws, Executive Orders, directives, policies, regulations, and standards:

a. Security functional requirements/specifications;

b. Security-related documentation requirements; and

c. Developmental and evaluation-related assurance requirements.

Supplemental Guidance: The acquisition documents for information systems, information system components, and information system services include, either explicitly or by reference, security requirements that describe: (i) required security capabilities (i.e., security needs and, as necessary, specific security controls and other specific FISMA requirements); (ii) required design and development processes; (iii) required test and evaluation procedures; and (iv) required documentation. The requirements in the acquisition documents permit updating security controls as new threats/vulnerabilities are identified and as new technologies are implemented. Acquisition documents also include requirements for appropriate information system documentation. The documentation addresses user and system administrator guidance and information regarding the implementation of the security controls in the information system. The level of detail required in the documentation is based on the security categorization for the information system. In addition, the required documentation includes security configuration settings and security implementation guidance. FISMA reporting instructions provide guidance on configuration requirements for federal information systems.

Control Enhancements:

(1) The organization requires in acquisition documents that vendors/contractors provide information describing the functional properties of the security controls to be employed within the information system, information system components, or information system services in sufficient detail to permit analysis and testing of the controls.

(2) The organization requires in acquisition documents that vendors/contractors provide information describing the design and implementation details of the security controls to be employed within the information system, information system components, or information system services (including functional interfaces among control components) in sufficient detail to permit analysis and testing of the controls.

(4) The organization ensures that each information system component acquired is explicitly assigned to an information system, and that the owner of the system acknowledges this assignment.

References: ISO/IEC 15408; FIPS 140-2; NIST Special Publications 800-23, 800-35, 800-36, 800-64, 800-70; Web: WWW.NIAP-CCEVS.ORG.

SA-5 INFORMATION SYSTEM DOCUMENTATION

Control: The organization:

a. Obtains, protects as required, and makes available to authorized personnel, administrator documentation for the information system that describes:

- Secure configuration, installation, and operation of the information system;
- Effective use and maintenance of security features/functions; and
- Known vulnerabilities regarding configuration and use of administrative (i.e., privileged) functions; and

b. Obtains, protects as required, and makes available to authorized personnel, user documentation for the information system that describes:

- User-accessible security features/functions and how to effectively use those security features/functions;

- Methods for user interaction with the information system, which enables individuals to use the system in a more secure manner; and
- User responsibilities in maintaining the security of the information and information system; and

c. Documents attempts to obtain information system documentation when such documentation is either unavailable or nonexistent.

Supplemental Guidance: The inability of the organization to obtain necessary information system documentation may occur, for example, due to the age of the system and/or lack of support from the vendor/contractor. In those situations, organizations may need to recreate selected information system documentation if such documentation is essential to the effective implementation and/or operation of security controls.

Control Enhancements:

(1) The organization obtains, protects as required, and makes available to authorized personnel, vendor/manufacturer documentation that describes the functional properties of the security controls employed within the information system with sufficient detail to permit analysis and testing.

(2) The organization obtains, protects as required, and makes available to authorized personnel, vendor/manufacturer documentation that describes the security-relevant external interfaces to the information system with sufficient detail to permit analysis and testing.

(3) The organization obtains, protects as required, and makes available to authorized personnel, vendor/manufacturer documentation that describes the high-level design of the information system in terms of subsystems and implementation details of the security controls employed within the system with sufficient detail to permit analysis and testing.

Enhancement Supplemental Guidance: An information system can be partitioned into multiple subsystems.

References: None.

SA-6 SOFTWARE USAGE RESTRICTIONS

Control: The organization:

a. Uses software and associated documentation in accordance with contract agreements and copyright laws;

b. Employs tracking systems for software and associated documentation protected by quantity licenses to control copying and distribution; and

c. Controls and documents the use of peer-to-peer file sharing technology to ensure that this capability is not used for the unauthorized distribution, display, performance, or reproduction of copyrighted work.

Supplemental Guidance: Tracking systems can include, for example, simple spreadsheets or fully automated, specialized applications depending on the needs of the organization.

References: None.

SA-7 USER-INSTALLED SOFTWARE

Control: The organization enforces explicit rules governing the installation of software by users.

Supplemental Guidance: If provided the necessary privileges, users have the ability to install software. The organization identifies what types of software installations are permitted (e.g., updates and security patches to existing software) and what types of installations are prohibited (e.g., software whose pedigree with regard to being potentially malicious is unknown or suspect). Related control: CM-2.

References: None.

SA-8 SECURITY ENGINEERING PRINCIPLES

Control: The organization applies information system security engineering principles in the specification, design, development, implementation, and modification of the information system.

Supplemental Guidance: The application of security engineering principles is primarily targeted at new development information systems or systems undergoing major upgrades and is integrated into the system development life cycle. For legacy information systems, the organization applies security engineering principles to system upgrades and modifications to the extent feasible, given the current state of the hardware, software, and firmware within the system. Examples of security engineering principles include, for example: (i) developing layered protections; (ii) establishing sound security policy, architecture, and controls as the foundation for design; (iii) incorporating security into the system development life cycle; (iv) delineating physical and logical security boundaries; (v) ensuring system developers and integrators are trained on how to develop secure software; (vi) tailoring security controls to meet organizational and operational needs; and (vii) reducing risk to acceptable levels, thus enabling informed risk management decisions.

References: NIST Special Publication 800-27.

SA-9 EXTERNAL INFORMATION SYSTEM SERVICES

Control: The organization:

a. Requires that providers of external information system services comply with organizational information security requirements and employ appropriate security controls in accordance with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance;

b. Defines and documents government oversight and user roles and responsibilities with regard to external information system services; and

c. Monitors security control compliance by external service providers.

Supplemental Guidance: An external information system service is a service that is implemented outside of the authorization boundary of the organizational information system (i.e., a service that is used by, but not a part of, the organizational information system). Relationships with external service providers are established in a variety of ways, for example, through joint ventures, business partnerships, outsourcing arrangements (i.e., contracts, interagency agreements, lines of business arrangements), licensing agreements, and/or supply chain exchanges. The responsibility for adequately mitigating risks arising from the use of external information system services remains with the authorizing official. Authorizing officials require that an appropriate chain of trust be established with external service providers when dealing with the many issues associated with information security. For services external to the organization, a chain of trust requires that the organization establish and retain a level of confidence that each participating provider in the potentially complex consumer-provider relationship provides adequate protection for the services rendered to the organization. The extent and nature of this chain of trust varies based on the relationship between the organization and the external provider. Where a sufficient level of trust cannot be established in the external services and/or service providers, the organization employs compensating security controls or accepts the greater degree of risk. The external information system services documentation includes government, service provider, and end user security roles and responsibilities, and any service-level agreements. Service-level agreements define the expectations of performance for each required security control, describe measurable outcomes, and identify remedies and response requirements for any identified instance of noncompliance.

References: NIST Special Publication 800-35.

SA-10 DEVELOPER CONFIGURATION MANAGEMENT

Control: The organization requires that information system developers/integrators:

a. Perform configuration management during information system design, development, implementation, and operation;

b. Manage and control changes to the information system;

c. Implement only organization-approved changes;

d. Document approved changes to the information system; and

e. Track security flaws and flaw resolution.

Supplemental Guidance: Related controls: CM-3, CM-4, CM-9.

References: None.

SA-11 DEVELOPER SECURITY TESTING

Control: The organization requires that information system developers/integrators, in consultation with associated security personnel (including security engineers):

a. Create and implement a security test and evaluation plan;

b. Implement a verifiable flaw remediation process to correct weaknesses and deficiencies identified during the security testing and evaluation process; and

c. Document the results of the security testing/evaluation and flaw remediation processes.

Supplemental Guidance: Developmental security test results are used to the greatest extent feasible after verification of the results and recognizing that these results are impacted whenever there have been security-relevant modifications to the information system subsequent to developer testing. Test results may be used in support of the security authorization process for the delivered information system. Related control: CA-2, SI-2.

References: None.

SA-12 SUPPLY CHAIN PROTECTION

Control: The organization protects against supply chain threats by employing: [*Assignment: organization-defined list of measures to protect against supply chain threats*] as part of a comprehensive, defense-in-breadth information security strategy.

Supplemental Guidance: A defense-in-breadth approach helps to protect information systems (including the information technology products that compose those systems) throughout the system development life cycle (i.e., during design and development, manufacturing, packaging, assembly, distribution, system integration, operations, maintenance, and retirement). This is accomplished by the identification, management, and elimination of vulnerabilities at each phase of the life cycle and the use of complementary, mutually reinforcing strategies to mitigate risk.

References: None.

SA-13 TRUSTWORTHINESS

Control: The organization requires that the information system meets [*Assignment: organization-defined level of trustworthiness*].

Supplemental Guidance: The intent of this control is to ensure that organizations recognize the importance of trustworthiness and making explicit trustworthiness decisions when designing, developing, and implementing organizational information systems. Trustworthiness is a characteristic or property of an information system that expresses the degree to which the system

can be expected to preserve the confidentiality, integrity, and availability of the information being processed, stored, or transmitted by the system. Trustworthy information systems are systems that are capable of being trusted to operate within defined levels of *risk* despite the environmental disruptions, human errors, and purposeful attacks that are expected to occur in the specified environments of operation. Two factors affecting the trustworthiness of an information system include: (i) *security functionality* (i.e., the security features or functions employed within the system); and (ii) *security assurance* (i.e., the grounds for confidence that the security functionality is effective in its application).

Appropriate security functionality for the information system can be obtained by using the Risk Management Framework (Steps 1, 2, and 3) to select and implement the necessary management, operational, and technical security controls necessary to mitigate risk to organizational operations and assets, individuals, other organizations, and the Nation. Appropriate security assurance can be obtained by: (i) the actions taken by developers and implementers of security controls with regard to the design, development, implementation, and operation of those controls; and (ii) the actions taken by assessors to determine the extent to which the controls are implemented correctly, operating as intended, and producing the desired outcome with respect to meeting the security requirements for the information system.

Developers and implementers can increase the assurance in security controls by employing well-defined security policy models, structured, disciplined, and rigorous hardware and software development techniques, and sound system/security engineering principles. Assurance is also based on the assessment of evidence produced during the initiation, acquisition/development, implementation, and operations/maintenance phases of the system development life cycle. For example, developmental evidence may include the techniques and methods used to design and develop security functionality. Operational evidence may include flaw reporting and remediation, the results of security incident reporting, and the results of the ongoing monitoring of security controls. Independent assessments by qualified assessors may include analyses of the evidence as well as testing, inspections, and audits. Minimum assurance requirements are described in Appendix E.

Explicit trustworthiness decisions highlight situations where achieving the information system resilience and security capability necessary to withstand cyber attacks from adversaries with certain threat capabilities may require adjusting the risk management strategy, the design of mission/business processes with regard to automation, the selection and implementation rigor of management and operational protections, or the selection of information technology components with higher levels of trustworthiness. Trustworthiness may be defined on a component-by-component, subsystem-by-subsystem, or function-by-function basis. It is noted, however, that typically functions, subsystems, and components are highly interrelated, making separation by trustworthiness perhaps problematic and at a minimum, something that likely requires careful attention in order to achieve practically useful results. Related controls: RA-2, SA-4, SA-8, SC-3.

References: FIPS Publications 199, 200; NIST Special Publications 800-53, 800-53A, 800-60, 800-64.

FAMILY: SYSTEM AND COMMUNICATIONS PROTECTION **CLASS:** TECHNICAL

SC-1 SYSTEM AND COMMUNICATIONS PROTECTION POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented system and communications protection policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the system and communications protection policy and associated system and communications protection controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the system and communications protection family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The system and communications protection policy can be included as part of the general information security policy for the organization. System and communications protection procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the system and communications protection policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-100.

SC-2 APPLICATION PARTITIONING

Control: The information system separates user functionality (including user interface services) from information system management functionality.

Supplemental Guidance: Information system management functionality includes, for example, functions necessary to administer databases, network components, workstations, or servers, and typically requires privileged user access. The separation of user functionality from information system management functionality is either physical or logical and is accomplished by using different computers, different central processing units, different instances of the operating system, different network addresses, combinations of these methods, or other methods as appropriate. An example of this type of separation is observed in web administrative interfaces that use separate authentication methods for users of any other information system resources. This may include isolating the administrative interface on a different domain and with additional access controls.

References: None.

SC-3 SECURITY FUNCTION ISOLATION

Control: The information system isolates security functions from nonsecurity functions.

Supplemental Guidance: The information system isolates security functions from nonsecurity functions by means of an isolation boundary (implemented via partitions and domains) that controls access to and protects the integrity of, the hardware, software, and firmware that perform those security functions. The information system maintains a separate execution domain (e.g., address space) for each executing process. Related control: SA-13.

References: None.

SC-4 INFORMATION IN SHARED RESOURCES

Control: The information system prevents unauthorized and unintended information transfer via shared system resources.

Supplemental Guidance: The purpose of this control is to prevent information, including encrypted representations of information, produced by the actions of a prior user/role (or the actions of a process acting on behalf of a prior user/role) from being available to any current user/role (or current process) that obtains access to a shared system resource (e.g., registers, main memory, secondary storage) after that resource has been released back to the information system. Control of information in shared resources is also referred to as object reuse. This control does not address: (i) information remanence which refers to residual representation of data that has been in some way nominally erased or removed; (ii) covert channels where shared resources are manipulated to achieve a violation of information flow restrictions; or (iii) components in the information system for which there is only a single user/role.

References: None.

SC-5 DENIAL OF SERVICE PROTECTION

Control: The information system protects against or limits the effects of the following types of denial of service attacks: [*Assignment: organization-defined list of types of denial of service attacks or reference to source for current list*].

Supplemental Guidance: A variety of technologies exist to limit, or in some cases, eliminate the effects of denial of service attacks. For example, boundary protection devices can filter certain types of packets to protect devices on an organization's internal network from being directly affected by denial of service attacks. Employing increased capacity and bandwidth combined with service redundancy may reduce the susceptibility to some denial of service attacks. Related control: SC-7.

References: None.

SC-7 BOUNDARY PROTECTION

Control: The information system:

a. Monitors and controls communications at the external boundary of the system and at key internal boundaries within the system; and

b. Connects to external networks or information systems only through managed interfaces consisting of boundary protection devices arranged in accordance with an organizational security architecture.

Supplemental Guidance: Restricting external web traffic only to organizational web servers within managed interfaces and prohibiting external traffic that appears to be spoofing an internal address as the source are examples of restricting and prohibiting communications. Managed interfaces employing boundary protection devices include, for example, proxies, gateways, routers, firewalls, guards, or encrypted tunnels arranged in an effective security architecture (e.g., routers protecting firewalls and application gateways residing on a protected subnetwork commonly referred to as a demilitarized zone or DMZ).

The organization considers the intrinsically shared nature of commercial telecommunications services in the implementation of security controls associated with the use of such services. Commercial telecommunications services are commonly based on network components and consolidated management systems shared by all attached commercial customers, and may include third-party provided access lines and other service elements. Consequently, such interconnecting transmission services may represent sources of increased risk despite contract security provisions. Therefore, when this situation occurs, the organization either implements appropriate

compensating security controls or explicitly accepts the additional risk. Related controls: AC-4, IR-4, SC-5.

Control Enhancements:

(1) The organization physically allocates publicly accessible information system components to separate subnetworks with separate physical network interfaces.

Enhancement Supplemental Guidance: Publicly accessible information system components include, for example, public web servers.

(2) The information system prevents public access into the organization's internal networks except as appropriately mediated by managed interfaces employing boundary protection devices.

(3) The organization limits the number of access points to the information system to allow for more comprehensive monitoring of inbound and outbound communications and network traffic.

Enhancement Supplemental Guidance: The Trusted Internet Connection (TIC) initiative is an example of limiting the number of managed network access points.

(4) The organization:

(a) Implements a managed interface for each external telecommunication service;

(b) Establishes a traffic flow policy for each managed interface;

(c) Employs security controls as needed to protect the confidentiality and integrity of the information being transmitted;

(d) Documents each exception to the traffic flow policy with a supporting mission/business need and duration of that need;

(e) Reviews exceptions to the traffic flow policy [*Assignment: organization-defined frequency*]; and

(f) Removes traffic flow policy exceptions that are no longer supported by an explicit mission/business need.

(5) The information system at managed interfaces, denies network traffic by default and allows network traffic by exception (i.e., deny all, permit by exception).

(6) The organization prevents the unauthorized release of information outside of the information system boundary or any unauthorized communication through the information system boundary when there is an operational failure of the boundary protection mechanisms.

(7) The information system prevents remote devices that have established a non-remote connection with the system from communicating outside of that communications path with resources in external networks.

Enhancement Supplemental Guidance: This control enhancement is implemented within the remote device (e.g., notebook/laptop computer) via configuration settings that are not configurable by the user of that device. An example of a non-remote communications path from a remote device is a virtual private network. When a non-remote connection is established using a virtual private network, the configuration settings prevent *split-tunneling*. Split tunneling might otherwise be used by remote users to communicate with the information system as an extension of that system and to communicate with local resources such as a printer or file server. Since the remote device, when connected by a non-remote connection, becomes an extension of the information system, allowing dual communications paths such as split-tunneling would be, in effect, allowing unauthorized external connections into the system.

(8) The information system routes [*Assignment: organization-defined internal communications traffic*] to [*Assignment: organization-defined external networks*] through authenticated proxy servers within the managed interfaces of boundary protection devices.

Enhancement Supplemental Guidance: External networks are networks outside the control of the organization. Proxy servers support logging individual Transmission Control Protocol (TCP) sessions and blocking specific Uniform Resource Locators (URLs), domain names, and Internet Protocol (IP) addresses. Proxy servers are also configurable with organization-defined lists of authorized and unauthorized websites.

References: FIPS Publication 199; NIST Special Publications 800-41, 800-77.

SC-8 TRANSMISSION INTEGRITY

Control: The information system protects the integrity of transmitted information.

Supplemental Guidance: This control applies to communications across internal and external networks. If the organization is relying on a commercial service provider for transmission services as a commodity item rather than a fully dedicated service, it may be more difficult to obtain the necessary assurances regarding the implementation of needed security controls for transmission integrity. When it is infeasible or impractical to obtain the necessary security controls and assurances of control effectiveness through appropriate contracting vehicles, the organization either implements appropriate compensating security controls or explicitly accepts the additional risk. Related controls: AC-17, PE-4.

Control Enhancements:

(1) The organization employs cryptographic mechanisms to recognize changes to information during transmission unless otherwise protected by alternative physical measures.

Enhancement Supplemental Guidance: Alternative physical protection measures include, for example, protected distribution systems. Related control: SC-13.

References: FIPS Publications 140-2, 197; NIST Special Publications 800-52, 800-77, 800-81, 800-113; NSTISSI No. 7003.

SC-9 TRANSMISSION CONFIDENTIALITY

Control: The information system protects the confidentiality of transmitted information.

Supplemental Guidance: This control applies to communications across internal and external networks. If the organization is relying on a commercial service provider for transmission services as a commodity item rather than a fully dedicated service, it may be more difficult to obtain the necessary assurances regarding the implementation of needed security controls for transmission confidentiality. When it is infeasible or impractical to obtain the necessary security controls and assurances of control effectiveness through appropriate contracting vehicles, the organization either implements appropriate compensating security controls or explicitly accepts the additional risk. Related controls: AC-17, PE-4.

Control Enhancements:

(1) The organization employs cryptographic mechanisms to prevent unauthorized disclosure of information during transmission unless otherwise protected by [*Assignment: organization-defined alternative physical measures*].

Enhancement Supplemental Guidance: Alternative physical protection measures include, for example, protected distribution systems. Related control: SC-13.

References: FIPS Publications 140-2, 197; NIST Special Publications 800-52, 800-77, 800-113; CNSS Policy 15; NSTISSI No. 7003.

SC-10 NETWORK DISCONNECT

Control: The information system terminates the network connection associated with a communications session at the end of the session or after [*Assignment: organization-defined time period*] of inactivity.

Supplemental Guidance: This control applies to both internal and external networks. Terminating network connections associated with communications sessions include, for example, de-allocating associated TCP/IP address/port pairs at the operating-system level, or de-allocating networking assignments at the application level if multiple application sessions are using a single, operating

system-level network connection. The time period of inactivity may, as the organization deems necessary, be a set of time periods by type of network access or for specific accesses.

References: None.

SC-12 CRYPTOGRAPHIC KEY ESTABLISHMENT AND MANAGEMENT

Control: The organization establishes and manages cryptographic keys for required cryptography employed within the information system.

Supplemental Guidance: Cryptographic key management and establishment can be performed using manual procedures or automated mechanisms with supporting manual procedures. In addition to being required for the effective operation of a cryptographic mechanism, effective cryptographic key management provides protections to maintain the availability of the information in the event of the loss of cryptographic keys by users.

Control Enhancements:

(1) The organization maintains availability of information in the event of the loss of cryptographic keys by users.

References: NIST Special Publications 800-56, 800-57.

SC-13 USE OF CRYPTOGRAPHY

Control: The information system implements required cryptographic protections using cryptographic modules that comply with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance.

Supplemental Guidance: None.

References: FIPS Publication 140-2; Web: CSRC.NIST.GOV/CRYPTVAL, WWW.CNSS.GOV.

SC-14 PUBLIC ACCESS PROTECTIONS

Control: The information system protects the integrity and availability of publicly available information and applications.

Supplemental Guidance: The purpose of this control is to ensure that organizations explicitly address the protection needs for public information and applications with such protection likely being implemented as part of other security controls.

References: None.

SC-15 COLLABORATIVE COMPUTING DEVICES

Control: The information system:

a. Prohibits remote activation of collaborative computing devices with the following exceptions: [*Assignment: organization-defined exceptions where remote activation is to be allowed*]; and

b. Provides an explicit indication of use to users physically present at the devices.

Supplemental Guidance: Collaborative computing devices include, for example, networked white boards, cameras, and microphones. Explicit indication of use includes, for example, signals to users when collaborative computing devices are activated.

References: None.

SC-17 PUBLIC KEY INFRASTRUCTURE CERTIFICATES

Control: The organization issues public key certificates under an [*Assignment: organization-defined certificate policy*] or obtains public key certificates under an appropriate certificate policy from an approved service provider.

Supplemental Guidance: For user certificates, each organization attains certificates from an approved, shared service provider, as required by OMB policy. For federal agencies operating a legacy public key infrastructure cross-certified with the Federal Bridge Certification Authority at medium assurance or higher, this Certification Authority will suffice. This control focuses on certificates with a visibility external to the information system and does not include certificates related to internal system operations, for example, application-specific time services.

References: OMB Memorandum 05-24; NIST Special Publications 800-32, 800-63.

SC-18 MOBILE CODE

Control: The organization:

a. Defines acceptable and unacceptable mobile code and mobile code technologies;

b. Establishes usage restrictions and implementation guidance for acceptable mobile code and mobile code technologies; and

c. Authorizes, monitors, and controls the use of mobile code within the information system.

Supplemental Guidance: Decisions regarding the employment of mobile code within organizational information systems are based on the potential for the code to cause damage to the system if used maliciously. Mobile code technologies include, for example, Java, JavaScript, ActiveX, PDF, Postscript, Shockwave movies, Flash animations, and VBScript. Usage restrictions and implementation guidance apply to both the selection and use of mobile code installed on organizational servers and mobile code downloaded and executed on individual workstations. Policy and procedures related to mobile code, address preventing the development, acquisition, or introduction of unacceptable mobile code within the information system.

References: NIST Special Publication 800-28; DOD Instruction 8552.01.

SC-19 VOICE OVER INTERNET PROTOCOL

Control: The organization:

a. Establishes usage restrictions and implementation guidance for Voice over Internet Protocol (VoIP) technologies based on the potential to cause damage to the information system if used maliciously; and

b. Authorizes, monitors, and controls the use of VoIP within the information system.

Supplemental Guidance: None.

References: NIST Special Publication 800-58.

SC-20 SECURE NAME / ADDRESS RESOLUTION SERVICE (AUTHORITATIVE SOURCE)

Control: The information system provides additional data origin and integrity artifacts along with the authoritative data the system returns in response to name/address resolution queries.

Supplemental Guidance: This control enables remote clients to obtain origin authentication and integrity verification assurances for the host/service name to network address resolution information obtained through the service. A domain name system (DNS) server is an example of an information system that provides name/address resolution service. Digital signatures and

cryptographic keys are examples of additional artifacts. DNS resource records are examples of authoritative data. Information systems that use technologies other than the DNS to map between host/service names and network addresses provide other means to assure the authenticity and integrity of response data. The DNS security controls are consistent with, and referenced from, OMB Memorandum 08-23.

Control Enhancements:

(1) The information system, when operating as part of a distributed, hierarchical namespace, provides the means to indicate the security status of child subspaces and (if the child supports secure resolution services) enable verification of a chain of trust among parent and child domains.

Enhancement Supplemental Guidance: An example means to indicate the security status of child subspaces is through the use of delegation signer (DS) resource records in the DNS.

References: OMB Memorandum 08-23; NIST Special Publication 800-81.

SC-21 SECURE NAME / ADDRESS RESOLUTION SERVICE (RECURSIVE OR CACHING RESOLVER)

Control: The information system performs data origin authentication and data integrity verification on the name/address resolution responses the system receives from authoritative sources when requested by client systems.

Supplemental Guidance: A recursive resolving or caching domain name system (DNS) server is an example of an information system that provides name/address resolution service for local clients. Authoritative DNS servers are examples of authoritative sources. Information systems that use technologies other than the DNS to map between host/service names and network addresses provide other means to enable clients to verify the authenticity and integrity of response data.

References: NIST Special Publication 800-81.

SC-22 ARCHITECTURE AND PROVISIONING FOR NAME / ADDRESS RESOLUTION SERVICE

Control: The information systems that collectively provide name/address resolution service for an organization are fault-tolerant and implement internal/external role separation.

Supplemental Guidance: A domain name system (DNS) server is an example of an information system that provides name/address resolution service. To eliminate single points of failure and to enhance redundancy, there are typically at least two authoritative domain name system (DNS) servers, one configured as primary and the other as secondary. Additionally, the two servers are commonly located in two different network subnets and geographically separated (i.e., not located in the same physical facility). With regard to role separation, DNS servers with an internal role, only process name/address resolution requests from within the organization (i.e., internal clients). DNS servers with an external role only process name/address resolution information requests from clients external to the organization (i.e., on the external networks including the Internet). The set of clients that can access an authoritative DNS server in a particular role is specified by the organization (e.g., by address ranges, explicit lists).

References: NIST Special Publication 800-81.

SC-23 SESSION AUTHENTICITY

Control: The information system provides mechanisms to protect the authenticity of communications sessions.

Supplemental Guidance: This control focuses on communications protection at the session, versus packet, level. The intent of this control is to establish grounds for confidence at each end of a communications session in the ongoing identity of the other party and in the validity of the information being transmitted. For example, this control addresses man-in-the-middle attacks including session hijacking or insertion of false information into a session. This control is only

implemented where deemed necessary by the organization (e.g., sessions in service-oriented architectures providing web-based services).

References: NIST Special Publications 800-52, 800-77, 800-95.

SC-24 FAIL IN KNOWN STATE

Control: The information system fails to a [*Assignment: organization-defined known-state*] for [*Assignment: organization-defined types of failures*] preserving [*Assignment: organization-defined system state information*] in failure.

Supplemental Guidance: Failure in a known state can address safety or security in accordance with the mission/business needs of the organization. Failure in a known secure state helps prevent a loss of confidentiality, integrity, or availability in the event of a failure of the information system or a component of the system. Failure in a known safe state helps prevent systems from failing to a state that may cause injury to individuals or destruction to property. Preserving information system state information facilitates system restart and return to the operational mode of the organization with less disruption of mission/business processes.

References: None.

SC-28 PROTECTION OF INFORMATION AT REST

Control: The information system protects the confidentiality and integrity of information at rest.

Supplemental Guidance: This control is intended to address the confidentiality and integrity of information at rest in nonmobile devices and covers user information and system information. Information at rest refers to the state of information when it is located on a secondary storage device (e.g., disk drive, tape drive) within an organizational information system. Configurations and/or rule sets for firewalls, gateways, intrusion detection/prevention systems, and filtering routers and authenticator content are examples of system information likely requiring protection. Organizations may choose to employ different mechanisms to achieve confidentiality and integrity protections, as appropriate.

References: NIST Special Publications 800-56, 800-57, 800-111.

SC-32 INFORMATION SYSTEM PARTITIONING

Control: The organization partitions the information system into components residing in separate physical domains (or environments) as deemed necessary.

Supplemental Guidance: Information system partitioning is a part of a defense-in-depth protection strategy. An organizational assessment of risk guides the partitioning of information system components into separate physical domains (or environments). The security categorization also guides the selection of appropriate candidates for domain partitioning. Managed interfaces restrict or prohibit network access and information flow among partitioned information system components. Related controls: AC-4, SC-7.

References: FIPS Publication 199.

FAMILY: SYSTEM AND INFORMATION INTEGRITY **CLASS:** OPERATIONAL

SI-1 SYSTEM AND INFORMATION INTEGRITY POLICY AND PROCEDURES

Control: The organization develops, disseminates, and reviews/updates [*Assignment: organization-defined frequency*]:

a. A formal, documented system and information integrity policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

b. Formal, documented procedures to facilitate the implementation of the system and information integrity policy and associated system and information integrity controls.

Supplemental Guidance: This control is intended to produce the policy and procedures that are required for the effective implementation of selected security controls and control enhancements in the system and information integrity family. The policy and procedures are consistent with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and guidance. Existing organizational policies and procedures may make the need for additional specific policies and procedures unnecessary. The system and information integrity policy can be included as part of the general information security policy for the organization. System and information integrity procedures can be developed for the security program in general and for a particular information system, when required. The organizational risk management strategy is a key factor in the development of the system and information integrity policy. Related control: PM-9.

References: NIST Special Publications 800-12, 800-100.

SI-2 FLAW REMEDIATION

Control: The organization:

a. Identifies, reports, and corrects information system flaws;

b. Tests software updates related to flaw remediation for effectiveness and potential side effects on organizational information systems before installation; and

c. Incorporates flaw remediation into the organizational configuration management process.

Supplemental Guidance: The organization identifies information systems containing software affected by recently announced software flaws (and potential vulnerabilities resulting from those flaws) and reports this information to designated organizational officials with information security responsibilities (e.g., senior information security officers, information system security managers, information systems security officers). The organization (including any contractor to the organization) promptly installs security-relevant software updates (e.g., patches, service packs, and hot fixes). Flaws discovered during security assessments, continuous monitoring, incident response activities, or information system error handling, are also addressed expeditiously. Organizations are encouraged to use resources such as the Common Weakness Enumeration (CWE) or Common Vulnerabilities and Exposures (CVE) databases in remediating flaws discovered in organizational information systems. By requiring that flaw remediation be incorporated into the organizational configuration management process, it is the intent of this control that required/anticipated remediation actions are tracked and verified. An example of expected flaw remediation that would be so verified is whether the procedures contained in US-CERT guidance and Information Assurance Vulnerability Alerts have been accomplished. Related controls: CA-2, CA-7, CM-3, MA-2, IR-4, RA-5, SA-11, SI-11.

Control Enhancements:

(1) The organization centrally manages the flaw remediation process and installs software updates automatically.

Enhancement Supplemental Guidance: Due to information system integrity and availability concerns, organizations give careful consideration to the methodology used to carry out automatic updates.

(2) The organization employs automated mechanisms [*Assignment: organization-defined frequency*] to determine the state of information system components with regard to flaw remediation.

References: NIST Special Publication 800-40.

SI-3 MALICIOUS CODE PROTECTION

Control: The organization:

a. Employs malicious code protection mechanisms at information system entry and exit points and at workstations, servers, or mobile computing devices on the network to detect and eradicate malicious code:

   - Transported by electronic mail, electronic mail attachments, web accesses, removable media, or other common means; or
   - Inserted through the exploitation of information system vulnerabilities;

b. Updates malicious code protection mechanisms (including signature definitions) whenever new releases are available in accordance with organizational configuration management policy and procedures;

c. Configures malicious code protection mechanisms to:

   - Perform periodic scans of the information system [*Assignment: organization-defined frequency*] and real-time scans of files from external sources as the files are downloaded, opened, or executed in accordance with organizational security policy; and
   - [*Selection (one or more): block malicious code; quarantine malicious code; send alert to administrator;* [*Assignment: organization-defined action*]] in response to malicious code detection; and

d. Addresses the receipt of false positives during malicious code detection and eradication and the resulting potential impact on the availability of the information system.

Supplemental Guidance: Information system entry and exit points include, for example, firewalls, electronic mail servers, web servers, proxy servers, and remote-access servers. Malicious code includes, for example, viruses, worms, Trojan horses, and spyware. Malicious code can also be encoded in various formats (e.g., UUENCODE, Unicode) or contained within a compressed file. Removable media includes, for example, USB devices, diskettes, or compact disks. A variety of technologies and methods exist to limit or eliminate the effects of malicious code attacks. Pervasive configuration management and strong software integrity controls may be effective in preventing execution of unauthorized code. In addition to commercial off-the-shelf software, malicious code may also be present in custom-built software. This could include, for example, logic bombs, back doors, and other types of cyber attacks that could affect organizational missions and business functions. Traditional malicious code protection mechanisms are not built to detect such code. In these situations, organizations must rely instead on other risk mitigation measures to include, for example, secure coding practices, trusted procurement processes, configuration management and control, and monitoring practices to help ensure that software does not perform functions other than those intended. Related controls: SA-4, SA-8, SA-12, SA-13, SI-4, SI-7.

Control Enhancements:

(1) The organization centrally manages malicious code protection mechanisms.

(2) The information system automatically updates malicious code protection mechanisms (including signature definitions).

(3) The information system prevents non-privileged users from circumventing malicious code protection capabilities.

References: NIST Special Publication 800-83.

SI-4 INFORMATION SYSTEM MONITORING

Control: The organization:

a. Monitors events on the information system in accordance with [*Assignment: organization-defined monitoring objectives*] and detects information system attacks;

b. Identifies unauthorized use of the information system;

c. Deploys monitoring devices: (i) strategically within the information system to collect organization-determined essential information; and (ii) at ad hoc locations within the system to track specific types of transactions of interest to the organization;

d. Heightens the level of information system monitoring activity whenever there is an indication of increased risk to organizational operations and assets, individuals, other organizations, or the Nation based on law enforcement information, intelligence information, or other credible sources of information; and

e. Obtains legal opinion with regard to information system monitoring activities in accordance with applicable federal laws, Executive Orders, directives, policies, or regulations.

Supplemental Guidance: Information system monitoring includes external and internal monitoring. External monitoring includes the observation of events occurring at the system boundary (i.e., part of perimeter defense and boundary protection). Internal monitoring includes the observation of events occurring within the system (e.g., within internal organizational networks and system components). Information system monitoring capability is achieved through a variety of tools and techniques (e.g., intrusion detection systems, intrusion prevention systems, malicious code protection software, audit record monitoring software, network monitoring software). Strategic locations for monitoring devices include, for example, at selected perimeter locations and near server farms supporting critical applications, with such devices typically being employed at the managed interfaces associated with controls SC-7 and AC-17. The Einstein network monitoring device from the Department of Homeland Security is an example of a system monitoring device. The granularity of the information collected is determined by the organization based on its monitoring objectives and the capability of the information system to support such activities. An example of a specific type of transaction of interest to the organization with regard to monitoring is Hyper Text Transfer Protocol (HTTP) traffic that bypasses organizational HTTP proxies, when use of such proxies is required. Related controls: AC-4, AC-8, AC-17, AU-2, AU-6, SI-3, SI-7.

Control Enhancements:

(2) The organization employs automated tools to support near real-time analysis of events.

(4) The information system monitors inbound and outbound communications for unusual or unauthorized activities or conditions.

Enhancement Supplemental Guidance: Unusual/unauthorized activities or conditions include, for example, internal traffic that indicates the presence of malicious code within an information system or propagating among system components, the unauthorized export of information, or signaling to an external information system. Evidence of malicious code is used to identify potentially compromised information systems or information system components.

(5) The information system provides near real-time alerts when the following indications of compromise or potential compromise occur: [*Assignment: organization-defined list of compromise indicators*].

Enhancement Supplemental Guidance: Alerts may be generated, depending on the organization-defined list of indicators, from a variety of sources, for example, audit records or input from malicious code protection mechanisms, intrusion detection or prevention mechanisms, or boundary protection devices such as firewalls, gateways, and routers.

(6) The information system prevents non-privileged users from circumventing intrusion detection and prevention capabilities.

References: NIST Special Publications 800-61, 800-83, 800-92, 800-94.

SI-5 SECURITY ALERTS, ADVISORIES, AND DIRECTIVES

Control: The organization:

a. Receives information system security alerts, advisories, and directives from designated external organizations on an ongoing basis;

b. Generates internal security alerts, advisories, and directives as deemed necessary;

c. Disseminates security alerts, advisories, and directives to [*Assignment: organization-defined list of personnel (identified by name and/or by role)*]; and

d. Implements security directives in accordance with established time frames, or notifies the issuing organization of the degree of noncompliance.

Supplemental Guidance: Security alerts and advisories are generated by the United States Computer Emergency Readiness Team (US-CERT) to maintain situational awareness across the federal government. Security directives are issued by OMB or other designated organizations with the responsibility and authority to issue such directives. Compliance to security directives is *essential* due to the critical nature of many of these directives and the potential immediate adverse affects on organizational operations and assets, individuals, other organizations, and the Nation should the directives not be implemented in a timely manner.

Control Enhancements:

(1) The organization employs automated mechanisms to make security alert and advisory information available throughout the organization as needed.

References: NIST Special Publication 800-40.

SI-6 SECURITY FUNCTIONALITY VERIFICATION

Control: The information system verifies the correct operation of security functions [*Selection (one or more):* [*Assignment: organization-defined system transitional states*]*; upon command by user with appropriate privilege; periodically every* [*Assignment: organization-defined time-period*]] and [*Selection (one or more): notifies system administrator; shuts the system down; restarts the system;* [*Assignment: organization-defined alternative action(s)*]] when anomalies are discovered.

Supplemental Guidance: The need to verify security functionality applies to all security functions. For those security functions that are not able to execute automated self-tests, the organization either implements compensating security controls or explicitly accepts the risk of not performing the verification as required. Information system transitional states include, for example, startup, restart, shutdown, and abort.

References: None.

SI-7 SOFTWARE AND INFORMATION INTEGRITY

Control: The information system detects unauthorized changes to software and information.

Supplemental Guidance: The organization employs integrity verification applications on the information system to look for evidence of information tampering, errors, and omissions. The organization employs good software engineering practices with regard to commercial off-the-shelf integrity mechanisms (e.g., parity checks, cyclical redundancy checks, cryptographic hashes) and uses tools to automatically monitor the integrity of the information system and the applications it hosts.

Control Enhancements:

(1) The organization reassesses the integrity of software and information by performing [*Assignment: organization-defined frequency*] integrity scans of the information system.

(2) The organization employs automated tools that provide notification to designated individuals upon discovering discrepancies during integrity verification.

References: None.

SI-8 SPAM PROTECTION

Control: The organization:

a. Employs spam protection mechanisms at information system entry and exit points and at workstations, servers, or mobile computing devices on the network to detect and take action on unsolicited messages transported by electronic mail, electronic mail attachments, web accesses, or other common means; and

b. Updates spam protection mechanisms (including signature definitions) when new releases are available in accordance with organizational configuration management policy and procedures.

Supplemental Guidance: Information system entry and exit points include, for example, firewalls, electronic mail servers, web servers, proxy servers, and remote-access servers. Related controls: SC-5, SI-3.

Control Enhancements:

(1) The organization centrally manages spam protection mechanisms.

References: NIST Special Publication 800-45.

SI-9 INFORMATION INPUT RESTRICTIONS

Control: The organization restricts the capability to input information to the information system to authorized personnel.

Supplemental Guidance: Restrictions on organizational personnel authorized to input information to the information system may extend beyond the typical access controls employed by the system and include limitations based on specific operational/project responsibilities. Related controls: AC-5, AC-6.

References: None.

SI-10 INFORMATION INPUT VALIDATION

Control: The information system checks the validity of information inputs.

Supplemental Guidance: Rules for checking the valid syntax and semantics of information system inputs (e.g., character set, length, numerical range, acceptable values) are in place to verify that inputs match specified definitions for format and content. Inputs passed to interpreters are prescreened to prevent the content from being unintentionally interpreted as commands.

References: None.

SI-11 ERROR HANDLING

Control: The information system:

a. Identifies potentially security-relevant error conditions;

b. Generates error messages that provide information necessary for corrective actions without revealing [*Assignment: organization-defined sensitive or potentially harmful information*] in error logs and administrative messages that could be exploited by adversaries; and

c. Reveals error messages only to authorized personnel.

Supplemental Guidance: The structure and content of error messages are carefully considered by the organization. The extent to which the information system is able to identify and handle error conditions is guided by organizational policy and operational requirements. Sensitive information includes, for example, account numbers, social security numbers, and credit card numbers.

References: None.

SI-12 INFORMATION OUTPUT HANDLING AND RETENTION

Control: The organization handles and retains both information within and output from the information system in accordance with applicable federal laws, Executive Orders, directives, policies, regulations, standards, and operational requirements.

Supplemental Guidance: The output handling and retention requirements cover the full life cycle of the information, in some cases extending beyond the disposal of the information system. The National Archives and Records Administration provides guidance on records retention. Related controls: MP-2, MP-4.

References: None.

PART TWO

MINIMUM ASSURANCE REQUIREMENTS

HIGH-IMPACT INFORMATION SYSTEMS

The minimum assurance requirements for security controls described in the security control catalog are listed below. The assurance requirements are directed at the activities and actions that security control developers and implementers[2] define and apply to increase the level of confidence that the controls are implemented correctly, operating as intended, and producing the desired outcome with respect to meeting the security requirements for the information system. The assurance requirements are applied on a control-by-control basis. Using a format similar to security controls, assurance requirements are followed by supplemental guidance that provides additional detail and explanation of how the requirements are to be applied. Bolded text indicates requirements that appear for the first time at a particular impact level.

Assurance Requirement: The security control is in effect and meets explicitly identified functional requirements in the control statement. The control developer/implementer provides a description of the functional properties **and design/implementation** of the control with sufficient detail to permit analysis and testing of the control (**including functional interfaces among control components)**. The control developer/implementer includes as an integral part of the control, assigned responsibilities and specific actions supporting increased confidence that when the control is implemented, it will **continuously and consistently (i.e., across the information system)** meet its required function or purpose **and support improvement in the effectiveness of the control**. These actions include, for example, requiring the development of records with structure and content suitable to facilitate making this determination.

Supplemental Guidance: For security controls in high-impact information systems, the focus is expanded to require, within the control, the capabilities that are needed to support ongoing consistent operation of the control and continuous improvement in the control's effectiveness. The developer/implementer is expected to expend significant effort on the design, development, implementation, and component/integration testing of the controls and to produce associated design and implementation documentation to support these activities. This documentation is also needed by assessors to analyze and test the internal components of the control as part of the overall assessment of the control.

Note: This level of assurance is not intended to protect a high-impact information system against high-end threat agents (i.e., threat agents that are highly skilled, highly motivated, and well-resourced). When such protection is required, the section below applies.

Assurance Requirement: The security control is in effect and meets explicitly identified functional requirements in the control statement. The control developer/implementer provides a description of the functional properties and design/implementation of the control with sufficient detail to permit analysis and testing of the control. The control developer/implementer includes as an integral part of the control, actions supporting increased confidence that when the control is implemented, it will continuously and consistently (i.e., across the information system) meet its required function or purpose and support improvement in the effectiveness of the control. These actions include requiring the development of records with structure and content suitable to facilitate making this determination. **The control is developed in a manner that supports a high degree of confidence that the control is complete, consistent, and correct.**

[2] In this context, a developer/implementer is an individual or group of individuals responsible for the development or implementation of security controls. This may include in addition to organizational personnel, for example, hardware and software vendors providing the controls and contractors implementing the controls.

Supplemental Guidance: The additional high assurance requirements are intended to supplement the minimum assurance requirements for high-impact information systems, when appropriate, in order to protect against threats from highly skilled, highly motivated, and well-resourced threat agents. This level of protection is necessary for those information systems where the organization is not willing to accept the risks associated with the type of threat agents cited above.