Near Real Time Risk Management

Transforming the Certification and Accreditation Process

Information Security and Privacy Advisory Board

June 6, 2008

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Information Technology Laboratory

The Threat Situation

Continuing serious cyber attacks on federal information systems, large and small; targeting key federal operations and assets…

- Attacks are organized, disciplined, aggressive, and well resourced; many are extremely sophisticated.
- Adversaries are nation states, terrorist groups, criminals, hackers, and individuals or groups with intentions of compromising federal information systems.
- Significant exfiltration of critical and sensitive information and implantation of malicious software.

What is at Risk?

- Federal information systems supporting Defense, Civil, and Intelligence agencies within the federal government.
- Private sector information systems supporting U.S. industry and businesses (intellectual capital).
- Information systems supporting critical infrastructures within the United States (public and private sector) including:
  - Energy (electrical, nuclear, gas and oil, dams)
  - Transportation (air, road, rail, port, waterways)
  - Public Health Systems / Emergency Services
  - Information and Telecommunications
  - Defense Industry
  - Banking and Finance
  - Postal and Shipping
  - Agriculture / Food / Water / Chemical

Risk-Based Protection Strategy

- Enterprise missions and business processes drive security requirements and associated safeguards and countermeasures for organizational information systems.
- Highly flexible implementation; recognizing diversity in missions/business processes and operational environments.
- Senior leaders take ownership of their security plans including the safeguards/countermeasures for the information systems.
- Senior leaders are both responsible and accountable for their information security decisions; understanding, acknowledging, and explicitly accepting resulting mission/business risk.

Certification and Accreditation

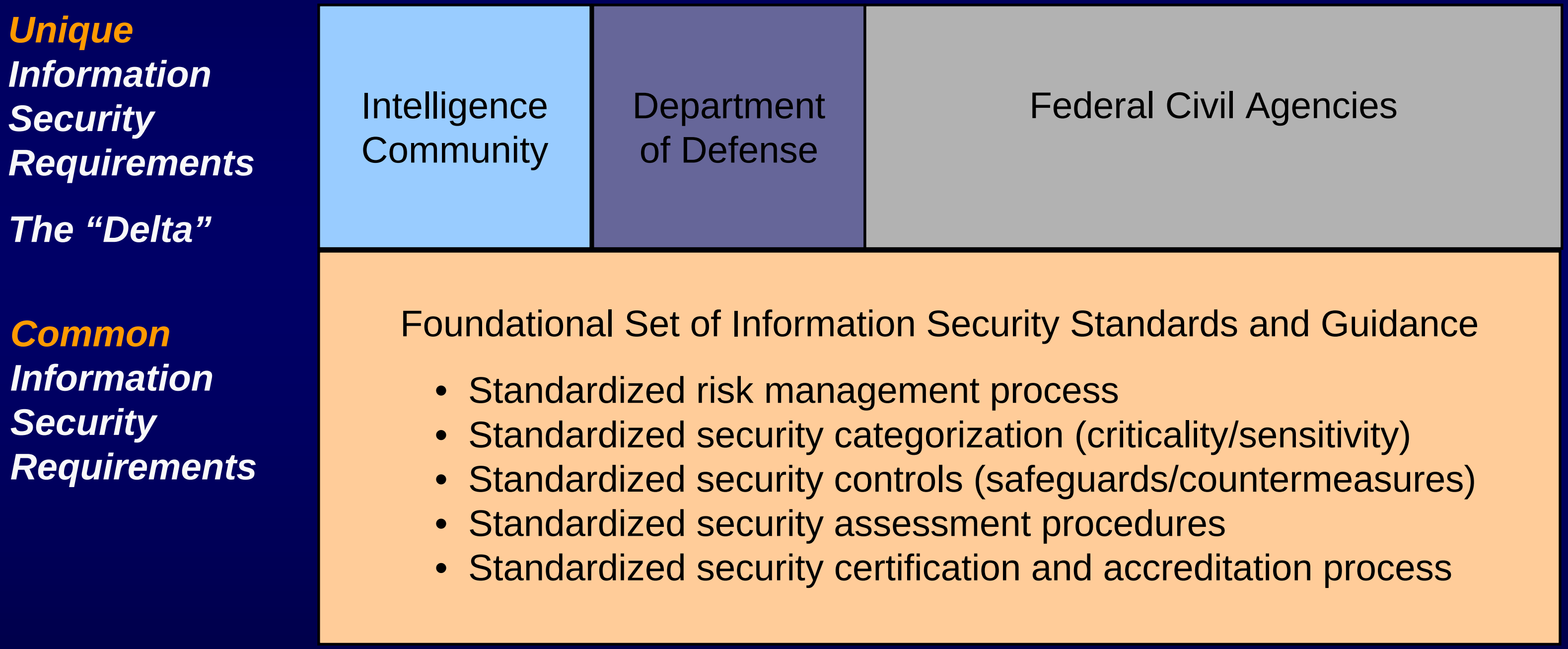
The last line of defense for ensuring that —

- Adequate safeguards and countermeasures are employed within information systems and supporting infrastructures.
- Information system safeguards and countermeasures are effective in their application.
- Risk to organizational operations, organizational assets, individuals, other organizations, and the Nation is explicitly understood and accepted by leaders at all levels.

A Unified Framework

For Information Security

The Generalized Model



***Unique* Information Security Requirements**

The "Delta"

Intelligence Community

Department of Defense

Federal Civil Agencies

***Common* Information Security Requirements**

Foundational Set of Information Security Standards and Guidance

- Standardized risk management process
- Standardized security categorization (criticality/sensitivity)
- Standardized security controls (safeguards/countermeasures)
- Standardized security assessment procedures
- Standardized security certification and accreditation process

National security and non national security information systems

Transforming the C&A Process

- Describe the C&A process in terms of the Risk Management Framework and change the focus of the process from a static *event*—

  … to a more dynamic, near real time, information system monitoring process carried out with automated support tools as part of an enterprise risk management process.

- Extend the Risk Management Framework from individual information systems to the enterprise—

  … to provide a corporate-wide perspective on managing risk from information systems and the complex missions and business functions supported by those systems.

Transforming the C&A Process

- Incorporate a *trust model* into risk management activities—

  … to address partnerships, information sharing, new computing paradigms, and methods of operation (e.g., common security controls, joint authorizations, external service providers, shared services, outsourcing, service-oriented architectures, software-as-a-service).

- Integrate the Risk Management Framework into the organization’s Enterprise Architecture and System Development Life Cycle—

  … to ensure information security requirements are tightly coupled into the system design and development processes and to take maximum advantage of ongoing life cycle activities including reuse of assessment results and documentation (i.e., artifacts and evidence).

Transformation #1

Reflecting the C&A Process within the Risk Management Framework

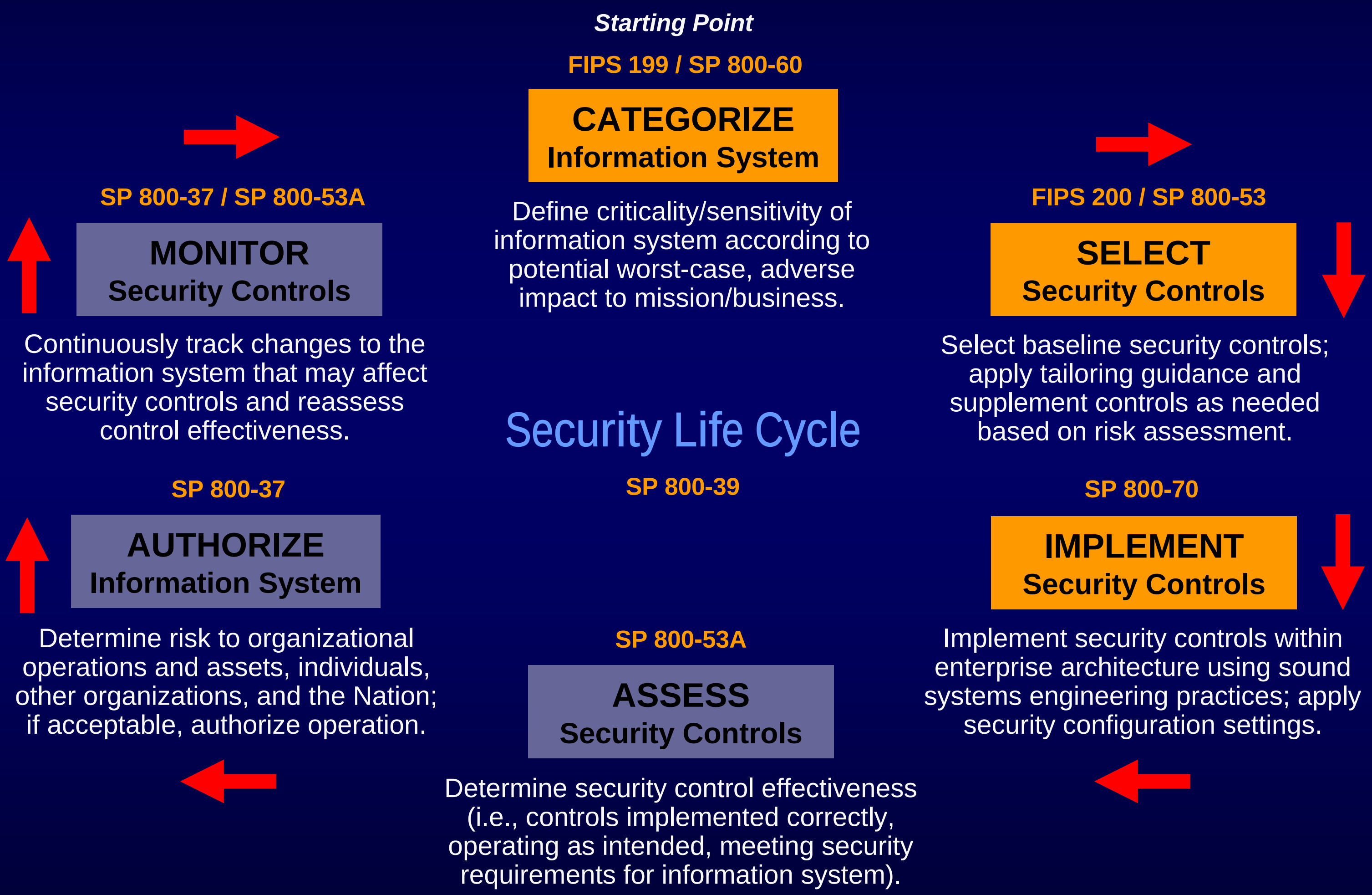
Current C&A Process

- Initiation Phase
- Certification Phase
- Accreditation Phase
- Continuous Monitoring Phase

Expressed within the context of the
Risk Management Framework as follows…

Initiation Phase

Risk Management Framework Steps 1 through 3



Starting Point

FIPS 199 / SP 800-60

CATEGORIZE
Information System

Define criticality/sensitivity of information system according to potential worst-case, adverse impact to mission/business.

FIPS 200 / SP 800-53

SELECT
Security Controls

Select baseline security controls; apply tailoring guidance and supplement controls as needed based on risk assessment.

SP 800-70

IMPLEMENT
Security Controls

Implement security controls within enterprise architecture using sound systems engineering practices; apply security configuration settings.

SP 800-53A

ASSESS
Security Controls

Determine security control effectiveness (i.e., controls implemented correctly, operating as intended, meeting security requirements for information system).

SP 800-37

AUTHORIZE
Information System

Determine risk to organizational operations and assets, individuals, other organizations, and the Nation; if acceptable, authorize operation.

SP 800-37 / SP 800-53A

MONITOR
Security Controls

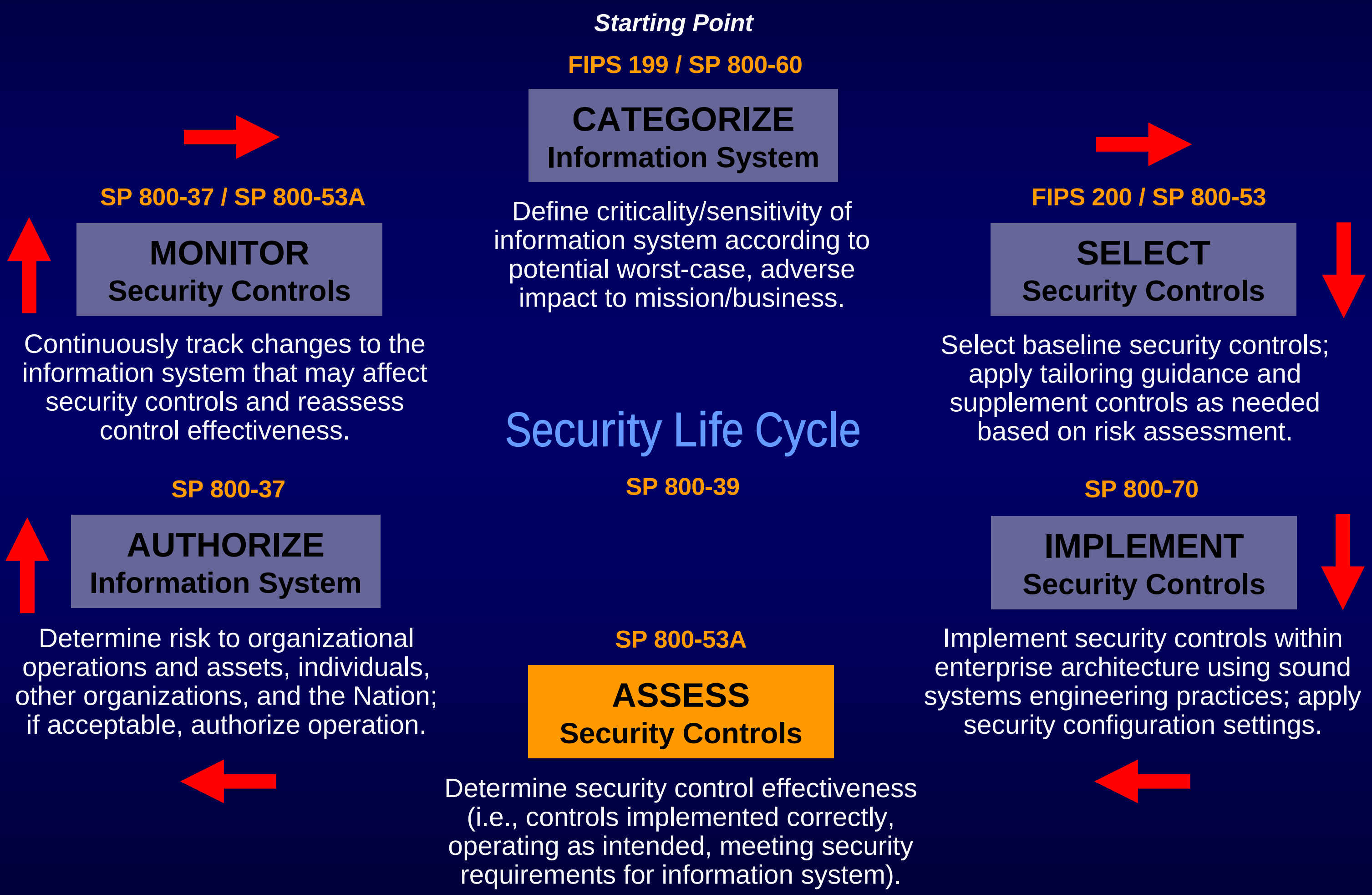
Continuously track changes to the information system that may affect security controls and reassess control effectiveness.

Security Life Cycle

SP 800-39

Certification Phase

Risk Management Framework Step 4



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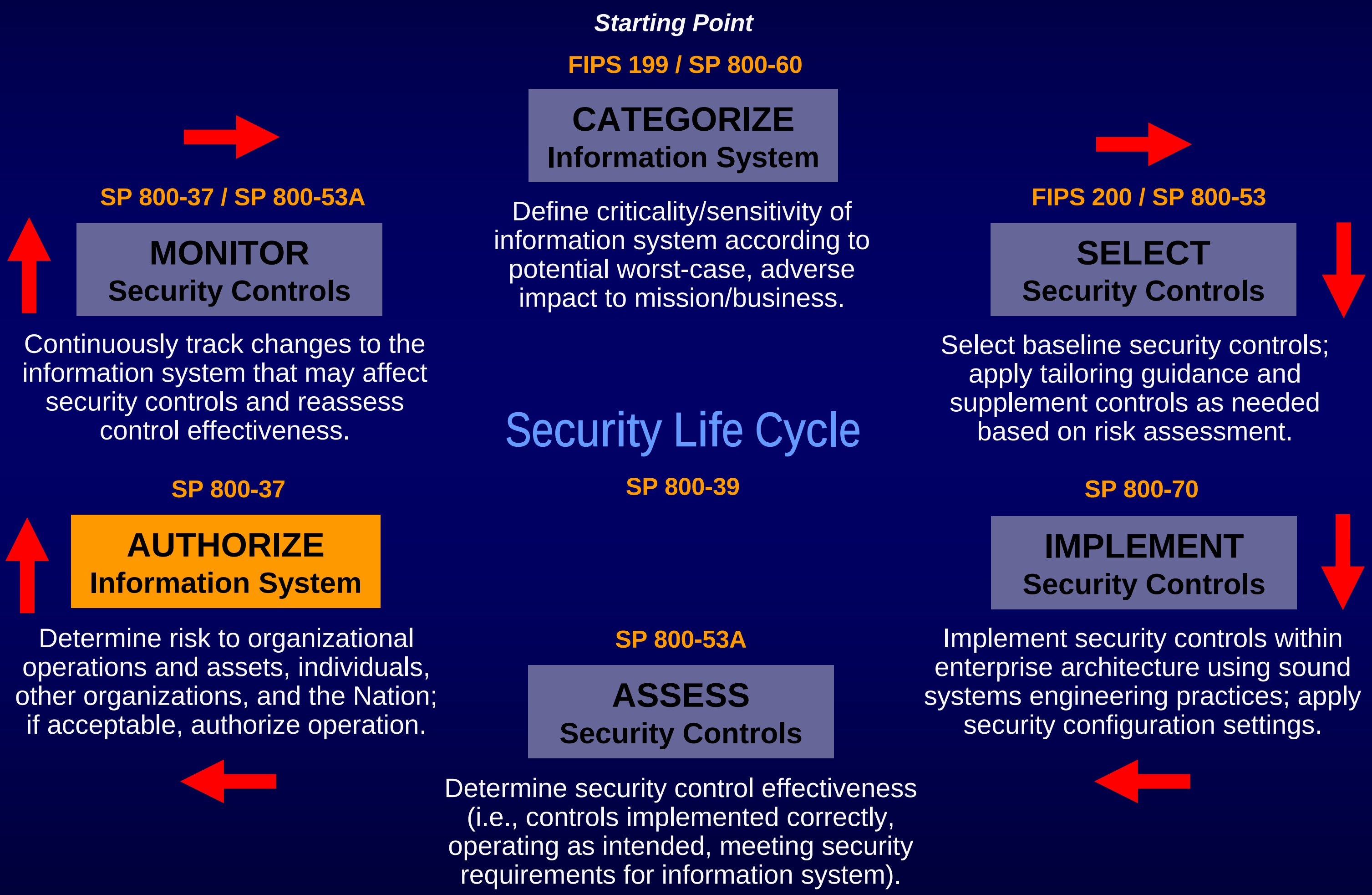
Security Life Cycle

SP 800-39

Accreditation Phase

Risk Management Framework Step 5



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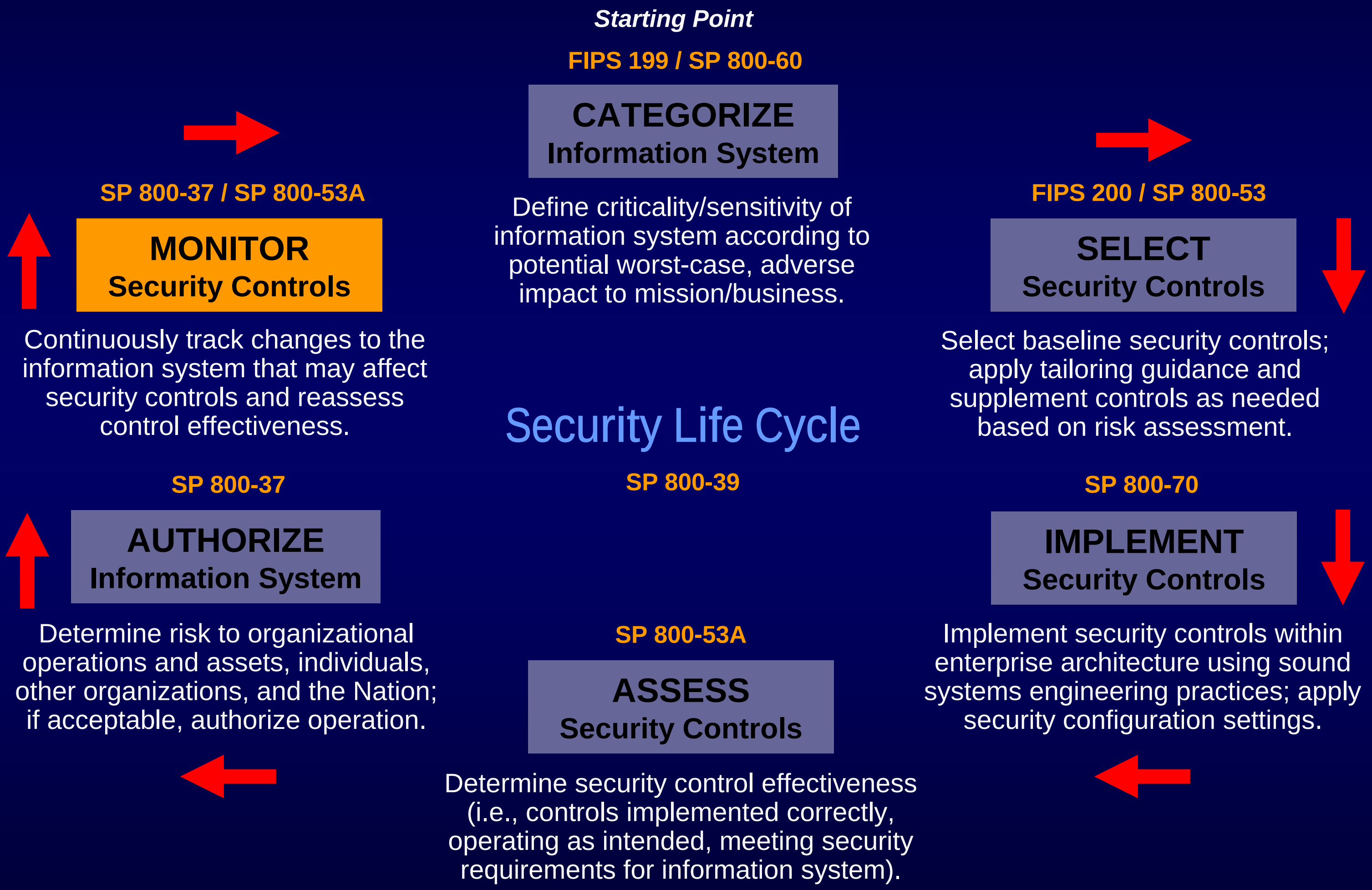
Security Life Cycle

SP 800-39

Continuous Monitoring Phase

Risk Management Framework Step 6



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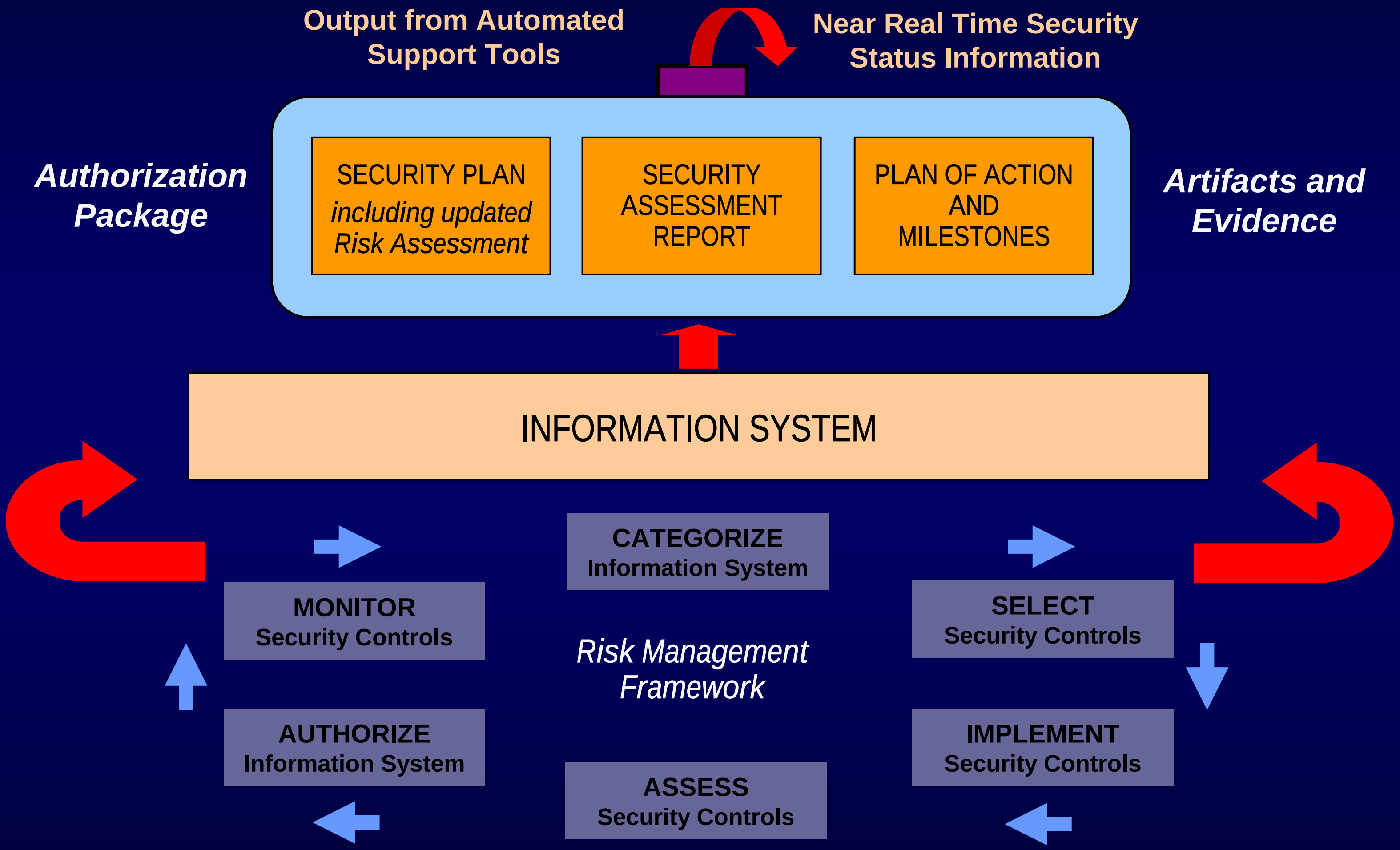
SP 800-39

Transformation #2

Extending the Risk Management Framework to the Enterprise

Applying the Risk Management Framework to Information Systems



Output from Automated Support Tools

Near Real Time Security Status Information

Authorization Package

SECURITY PLAN *including updated Risk Assessment*

SECURITY ASSESSMENT REPORT

PLAN OF ACTION AND MILESTONES

Artifacts and Evidence

INFORMATION SYSTEM

CATEGORIZE **Information System**

SELECT **Security Controls**

IMPLEMENT **Security Controls**

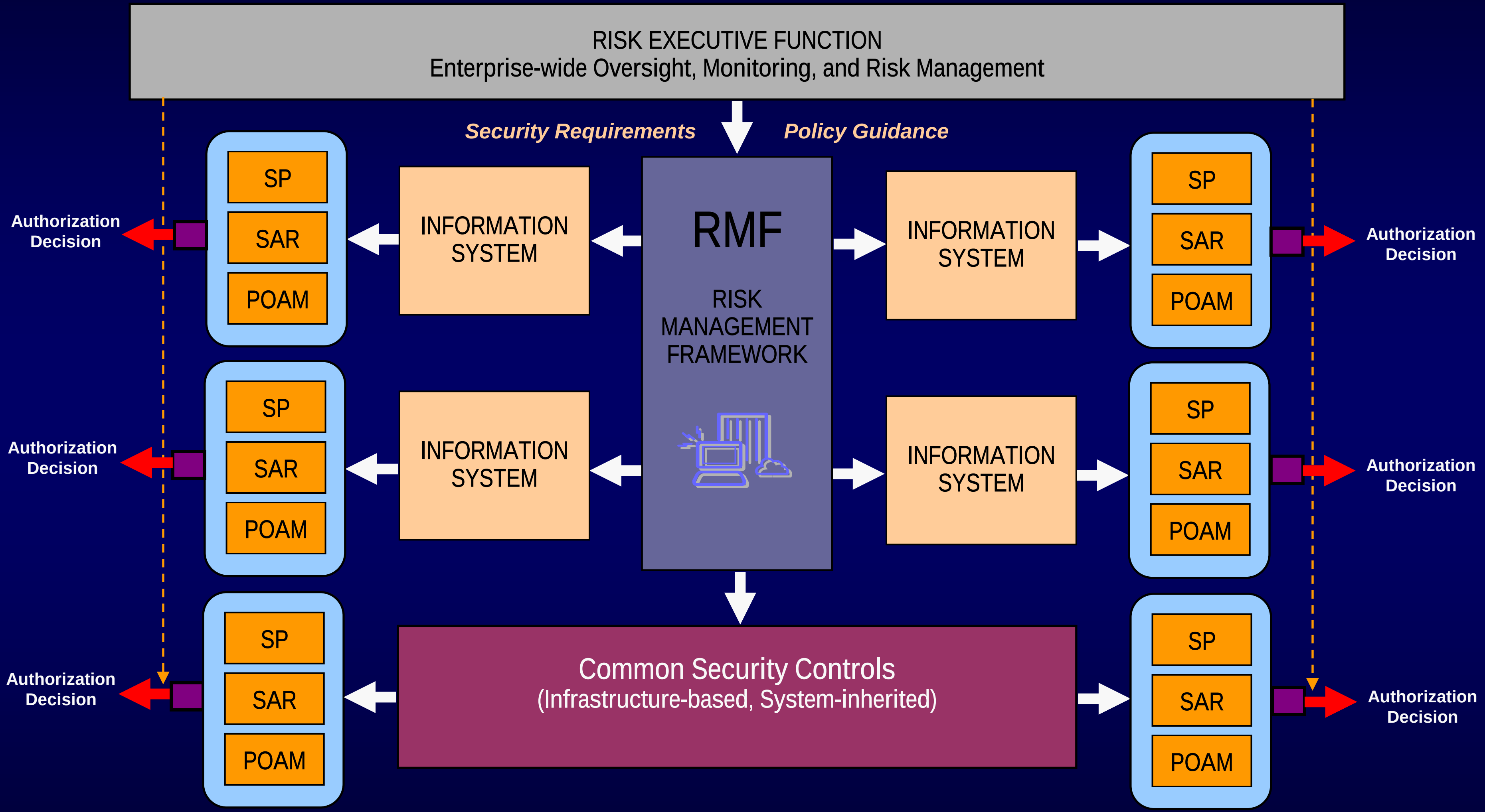
ASSESS **Security Controls**

AUTHORIZE **Information System**

MONITOR **Security Controls**

Risk Management Framework

Extending the Risk Management Framework to Organizations



RISK EXECUTIVE FUNCTION
Enterprise-wide Oversight, Monitoring, and Risk Management

Security Requirements

Policy Guidance

RMF

RISK MANAGEMENT FRAMEWORK

INFORMATION SYSTEM

INFORMATION SYSTEM

INFORMATION SYSTEM

INFORMATION SYSTEM

Common Security Controls
(Infrastructure-based, System-inherited)

SP

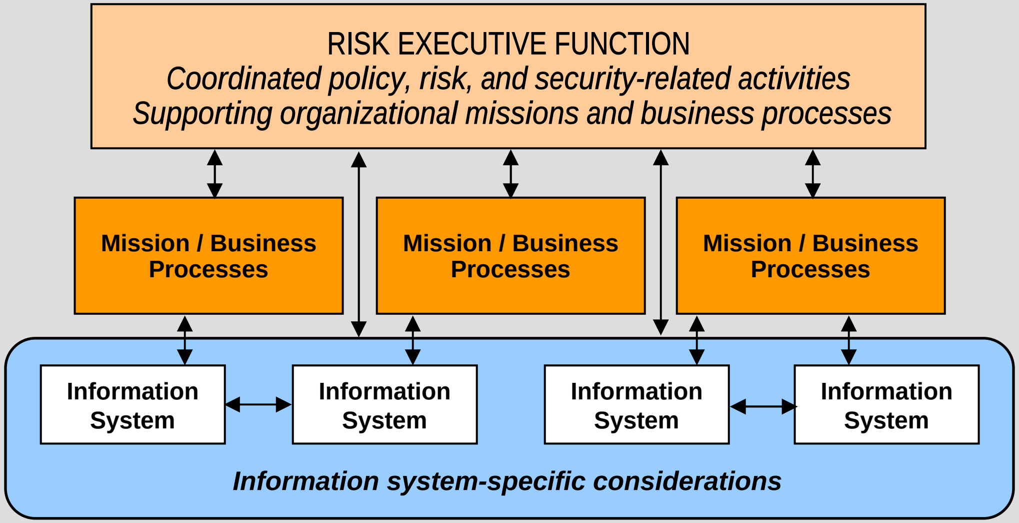
SAR

POAM

Authorization Decision

Risk Executive Function

Managing Risk at the Organizational Level



RISK EXECUTIVE FUNCTION
Coordinated policy, risk, and security-related activities
Supporting organizational missions and business processes

Mission / Business Processes

Mission / Business Processes

Mission / Business Processes

Information System

Information System

Information System

Information System

Information system-specific considerations

- Establish organizational information security priorities.
- Allocate information security resources across the organization.
- Provide oversight of information system security categorizations.
- Identify and assign responsibility for common security controls.
- Provide guidance on security control selection (tailoring and supplementation).
- Define common security control inheritance relationships for information systems.
- Establish and apply mandatory security configuration settings.
- Identify and correct systemic weaknesses and deficiencies in information systems.

Transformation #3

Incorporating Trust Models into Enterprise Risk Management

Trustworthy Information Systems

- Trustworthy information systems are systems that are worthy of being trusted to operate within defined levels of *risk* to organizational operations and assets, individuals, other organizations, or the Nation despite:
  - *environmental disruptions*
  - *human errors*
  - *purposeful attacks*

  that are expected to occur in the specified environments of operation.

Information System Trustworthiness

- 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.
- Trustworthiness defines the *security state* of the information system at a particular point in time and is *measurable*.

Information System Trustworthiness

Two factors affecting the trustworthiness of information systems include:

- *Security functionality* (i.e., the security-related features or functions employed within an information system or the infrastructure supporting the system); and
- *Security assurance* (i.e., the grounds for confidence that the security functionality, when employed within an information system or its supporting infrastructure, is effective in its application).

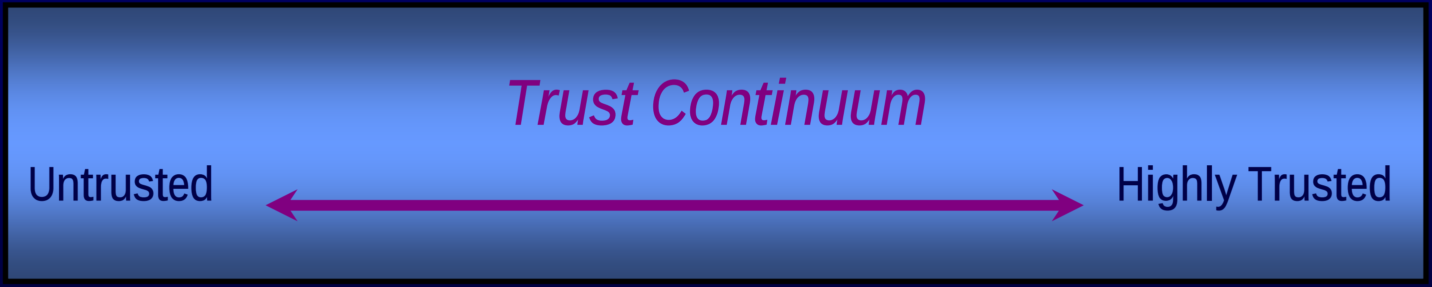
Elements of Trust

Trust among partners can be established by:

- Identifying the goals and objectives for the provision of services/information or information sharing;
- Agreeing upon the risk from the operation and use of information systems associated with the provision of services/information or information sharing;
- Agreeing upon the degree of trustworthiness (i.e., the security functionality and assurance) needed for the information systems processing, storing, or transmitting shared information or providing services/information in order to adequately mitigate the identified risk;
- Determining if the information systems providing services/information or involved in information sharing activities are worthy of being trusted; and
- Providing ongoing monitoring and management oversight to ensure that the trust relationship is maintained.

The Trust Continuum

- Trust relationships among partners can be viewed as a continuum—ranging from a high degree of trust to little or no trust…
- The degree of trust in the information systems supporting the partnership should be factored into risk decisions.

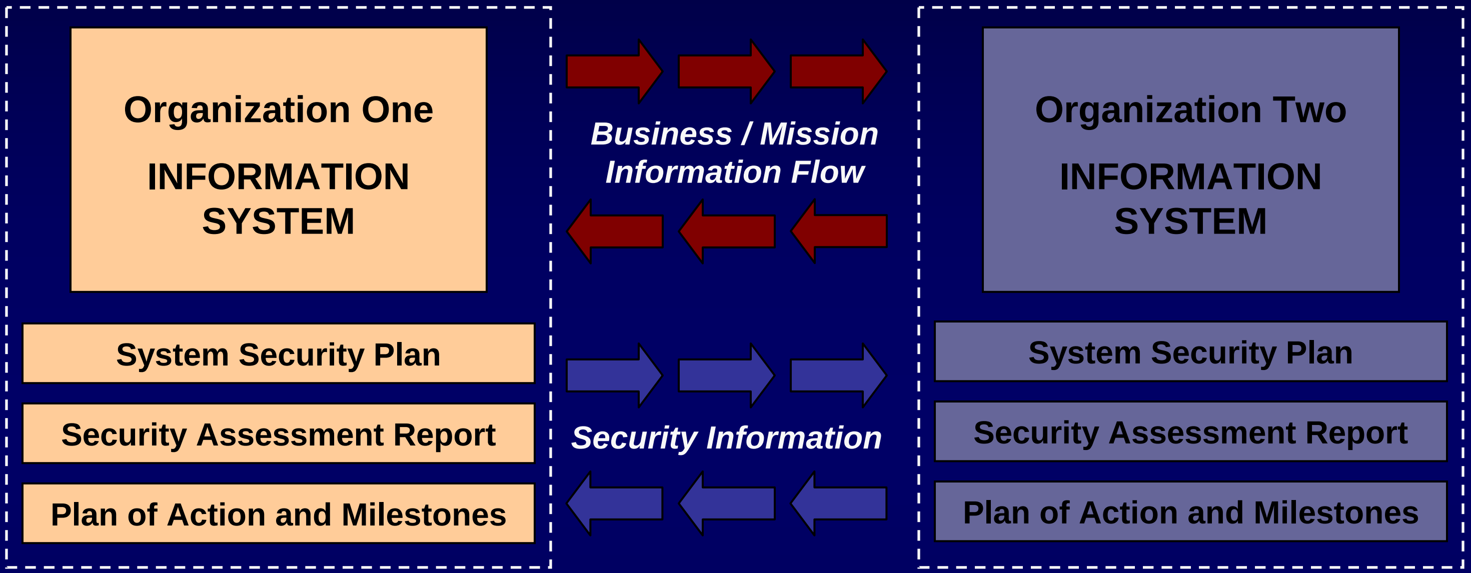


Trust Continuum

Untrusted

Highly Trusted

Trust Relationships



Organization One

INFORMATION SYSTEM

System Security Plan

Security Assessment Report

Plan of Action and Milestones

Business / Mission Information Flow

Security Information

Organization Two

INFORMATION SYSTEM

System Security Plan

Security Assessment Report

Plan of Action and Milestones

Determining risk to the organization's operations and assets, individuals, other organizations, and the Nation; and the acceptability of such risk.

Determining risk to the organization's operations and assets, individuals, other organizations, and the Nation; and the acceptability of such risk.

The objective is to achieve *visibility* into and *understanding* of prospective partner's information security programs…establishing a trust relationship based on the trustworthiness of their information systems.

Transformation #4

Integrating Risk Management into Enterprise Architectures and System Development Life Cycle Processes

Main Streaming Information Security

- Information security requirements must be considered *first order requirements* and are critical to mission and business success.
- An effective organization-wide information security program helps to ensure that security considerations are specifically addressed in the *enterprise architecture* for the organization and are integrated early into the *system development life cycle*.

Enterprise Architecture

- Provides a common language for discussing information security in the context of organizational missions, business processes, and performance goals.
- Defines a collection of interrelated reference models that are focused on lines of business including Performance, Business, Service Component, Data, and Technical.
- Uses a security and privacy profile to describe how to integrate the Risk Management Framework (including the embedded C&A process) into the reference models.

System Development Life Cycle

- The Risk Management Framework (including the embedded C&A process) should be integrated into all phases of the SDLC.
  - Initiation (RMF Steps 1 and 2)
  - Development and Acquisition (RMF Step 2)
  - Implementation (RMF Steps 3 through 5)
  - Operations and Maintenance (RMF Step 6)
  - Disposition (RMF Step 6)
- Reuse system development artifacts and evidence (e.g., design specifications, system documentation, testing and evaluation results) for risk management activities including C&A.

FISMA Phase I Publications

- FIPS Publication 199 (Security Categorization)
- FIPS Publication 200 (Minimum Security Requirements)
- NIST Special Publication 800-18 (Security Planning)
- NIST Special Publication 800-30 (Risk Assessment) *
- NIST Special Publication 800-39 (Risk Management) **
- NIST Special Publication 800-37 (Certification & Accreditation) *
- NIST Special Publication 800-53 (Recommended Security Controls)
- NIST Special Publication 800-53A (Security Control Assessment) **
- NIST Special Publication 800-59 (National Security Systems)
- NIST Special Publication 800-60 (Security Category Mapping) *

* Publications currently under revision.
** Publications currently under development.

Final Phase I Projects

- Publication of NIST Special Publication 800-39
- Completion of NIST Special Publication 800-53A
- Revision of NIST Special Publication 800-37
- Revision of NIST Special Publication 800-30
- Publication of an Authorizing Official’s Handbook
- Publication of Configuration Management Guideline
- Publication of Industrial Control System Security Control Augmentations

FISMA Phase II

FISMA Phase II

- Mission: Develop and implement a standards-based organizational credentialing program for public and private sector entities to demonstrate core competencies for offering security services to federal agencies.
- Timeline: 2007-2010
- Status: Initial work started in late 2007.

FISMA Phase II

Demonstrating competence to provide information security services including—

- Assessments of Information Systems

  (Operational environments)

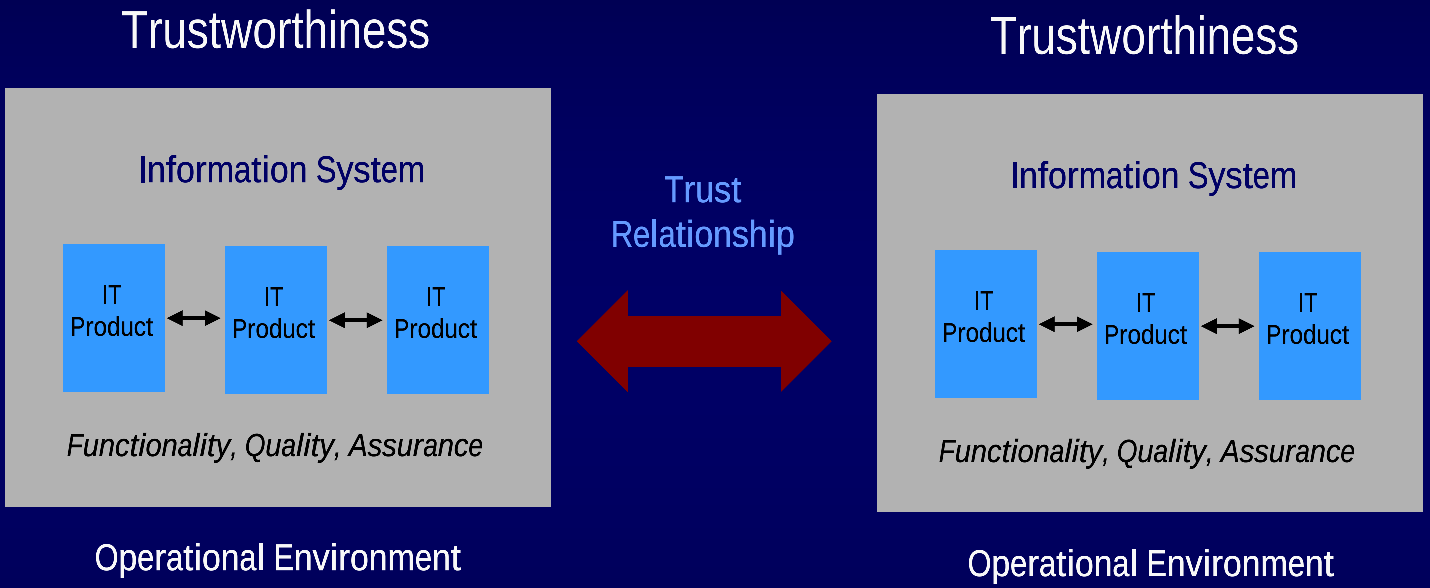
  - *Security controls and assurances*
  - *Configuration settings*

- Assessments of Information Technology Products/Services

  (Laboratory environments)

  - *Security functionality (features) and assurances*
  - *Configuration settings*

FISMA Phase II



Producing evidence that supports the grounds for confidence in the design, development, implementation, and operation of information systems.

FISMA Phase II Project Initiatives

- Organizational Credentialing Initiative
- Product and Service Supplier Assurance Initiatives
- Support Tools, Techniques, Reference Materials, Practices & Validation Program Initiatives
- Training Initiative
- ISO Harmonization Initiative

Organizational Credentialing Initiative

- Draft NISTIR 7328, *Security Assessment Provider Requirements and Customer Responsibilities: Building a Security Assessment Credentialing Program for Federal Information Systems* (September 2007).
- Draft Criteria for Product & Service Supplier Claims Statement

Training Initiative

- Information security training initiative underway to provide increased support to organizations using FISMA-related security standards and guidelines.
- Training initiative includes three components—
  - Frequently Asked Questions
  - Publication Summary Guides (Quickstart Guides)
  - Formal Curriculum and Training Courses
- NIST will provide initial training in order to fine-tune the curriculum; then transition to other providers.

ISO 27001 Harmonization Initiative

- Define relationship between the FISMA security standards and guidelines and the ISO 27001 Information Security Management System.
- Provide comprehensive mapping from FISMA standards and guidelines to ISO 27001.
- Develop and publish a “delta document” that states commonalities and differences among the standards.
- Explore possibilities for recognition and acceptance of assessment results to reduce information security costs.

FISMA Phase II

Near Term Tasks and Milestones

- Update Draft NISTIR 7328 based on public comments (August 2008).
- FISMA FAQ's (initial draft August 2008).
- Draft criteria, structure, guidelines, etc. for products and services claiming support of 800-53 security controls (September 2008).
- Initial Risk Management Framework training module --- Categorize Step (September 2008).
- Initial Quick Start Guide --- Categorize Step (August 2008).
- FISMA Phase II workshop (October 2008).

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