FISMA Implementation Project

Protecting the Nation's Critical Information Infrastructure

An Overview

Ron Ross

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Today's Climate

- Highly interactive environment of powerful computing devices and interconnected systems of systems across global networks
- Federal agencies routinely interact with industry, private citizens, state and local governments, and the governments of other nations
- The complexity of today's systems and networks presents great security challenges for both producers and consumers of information technology

The Global Threat

- Information security is not just a paperwork drill…there are dangerous adversaries out there capable of launching serious attacks on our information systems that can result in severe or catastrophic damage to the nation's critical information infrastructure and ultimately threaten our economic and national security…

The Advantage of the Offense

- Sophisticated attack tools now available over the Internet to anyone who wants them
- Powerful, affordable computing platforms to launch sophisticated attacks now available to the masses
- Little skill or sophistication required to initiate extremely harmful attacks

Key Security Challenges

- Adequately protecting enterprise information systems within constrained budgets
- Changing the current culture of:

  "Connect first…ask security questions later"
- Bringing standards to:
  - ✓ Information system security control selection and specification
  - ✓ Methods and procedures employed to assess the correctness and effectiveness of those controls

Legislative and Policy Drivers

- Public Law 107-347 (Title III)
  Federal Information Security Management Act of 2002
- Homeland Security Presidential Directive #7
  Critical Infrastructure Identification, Prioritization, and Protection
- OMB Circular A-130 (Appendix III)
  Security of Federal Automated Information Resources

FISMA Legislation

Overview

"Each federal agency shall develop, document, and implement an agency-wide information security program to provide information security for the information and information systems that support the operations and assets of the agency, including those provided or managed by another agency, contractor, or other source…"

-- Federal Information Security Management Act of 2002

National Policy

Office of Management and Budget Circular A-130, *Management of Federal Information Resources* requires federal agencies to:

- Plan for security
- Ensure that appropriate officials are assigned security responsibility
- Authorize system processing prior to operations and periodically, thereafter

FISMA Tasks for NIST

- Develop standards to be used by federal agencies to categorize information and information systems based on the objectives of providing appropriate levels of information security according to a range of risk levels
- Develop guidelines recommending the types of information and information systems to be included in each category
- Develop minimum information security requirements (management, operational, and technical security controls) for information and information systems in each such category

FISMA Implementation Project

- Phase I: To develop standards and guidelines for:
  - Categorizing federal information and information systems
  - Selecting minimum security controls for federal information systems
  - Assessing the security controls in federal information systems

Phase II: To create a national network of accredited organizations capable of providing cost effective, quality security assessment services based on the NIST standards and guidelines

Categorization Standards

NIST FISMA Requirement #1

- Develop standards to be used by federal agencies to categorize information and information systems based on the objectives of providing appropriate levels of information security according to a range of risk levels
- Publication status:
  - ✓ Federal Information Processing Standards (FIPS) Publication 199, "Standards for Security Categorization of Federal Information and Information Systems"
  - ✓ Final Publication: December 2003
  - ✓ Signed by Secretary of Commerce: February 2004

Mapping Guidelines

NIST FISMA Requirement #2

- Develop guidelines recommending the types of information and information systems to be included in each category described in FIPS Publication 199
- Publication status:
  - ✓ NIST Special Publication 800-60, "Guide for Mapping Types of Information and Information Systems to Security Categories"
  - ✓ Final Publication: June 2004

Minimum Security Requirements

NIST FISMA Requirement #3

- Develop minimum information security requirements (i.e., management, operational, and technical security controls) for information and information systems in each such category—
- Publication status:
  - ✓ Federal Information Processing Standards (FIPS) Publication 200, "Minimum Security Controls for Federal Information Systems"*
  - ✓ Final Publication: December 2005

* NIST Special Publication 800-53, "Recommended Security Controls for Federal Information Systems" (Second public draft projected for August 2004),will provide interim guidance until completion and adoption of FIPS Publication 200.

Certification and Accreditation

Supporting FISMA Requirements

- Conduct periodic testing and evaluation of the effectiveness of information security policies, procedures, and practices (including management, operational, and technical security controls)
- Publication status:
  - ✓ NIST Special Publication 800-37, "Guide for the Security Certification and Accreditation of Federal Information Systems"
  - ✓ Final Publication: May 2004

Security Control Assessment

Supporting FISMA Requirements

- Conduct periodic testing and evaluation of the effectiveness of information security policies, procedures, and practices (including management, operational, and technical security controls)
- Publication status:
  - ✓ NIST Special Publication 800-53A, "Guide for Assessing the Security Controls in Federal Information Systems"
  - ✓ Initial Public Draft: Winter 2004-05

Information Security Programs

Question

How does the family of FISMA-related publications fit into an organization's information security program?

Information Security Programs

Answer

NIST publications in the FISMA-related series provide security standards and guidelines that support an enterprise-wide risk management process and are an integral part of an agency's overall information security program.

Risk Management

Links in the Security Chain: Management, Operational, and Technical Controls

- ✓ Risk assessment
- ✓ Security planning
- ✓ Security policies and procedures
- ✓ Contingency planning
- ✓ Incident response planning
- ✓ Physical security
- ✓ Personnel security
- ✓ Security assessments
- ✓ Security accreditation
- ✓ Access control mechanisms
- ✓ Identification & authentication mechanisms (Biometrics, tokens, passwords)
- ✓ Audit mechanisms
- ✓ Cryptography
- ✓ Firewalls and network security mechanisms
- ✓ Intrusion detection systems
- ✓ Anti-viral software
- ✓ Smart cards

Adversaries attack the weakest link…where is yours?

Managing Risk

- Key activities in managing organization-level risk—risk resulting from the operation of an information system:
  - ✓ **Categorize** the information system
  - ✓ **Select** set of minimum (baseline) security controls
  - ✓ **Refine** the security control set based on risk assessment
  - ✓ **Document** security controls in system security plan
  - ✓ **Implement** the security controls in the information system
  - ✓ **Assess** the security controls
  - ✓ **Determine** agency-level risk and risk acceptability
  - ✓ **Authorize** information system operation
  - ✓ **Monitor** security controls on a continuous basis

Risk Management Framework

FIPS 199 / SP 800-60

Security Categorization

Defines category of information system according to potential impact of loss

SP 800-53 / FIPS 200

Security Control Selection

Selects minimum security controls (i.e., safeguards and countermeasures) planned or in place to protect the information system

SP 800-37

Security Control Monitoring

Continuously tracks changes to the information system that may affect security controls and assesses control effectiveness

SP 800-53 / FIPS 200 / SP 800-30

Security Control Refinement

Uses risk assessment to adjust minimum control set based on local conditions, required threat coverage, and specific agency requirements

SP 800-37

System Authorization

Determines risk to agency operations, agency assets, or individuals and, if acceptable, authorizes information system processing

SP 800-18

Security Control Documentation

In system security plan, provides a an overview of the security requirements for the information system and documents the security controls planned or in place

SP 800-70

Security Control Implementation

Implements security controls in new or legacy information systems; implements security configuration checklists

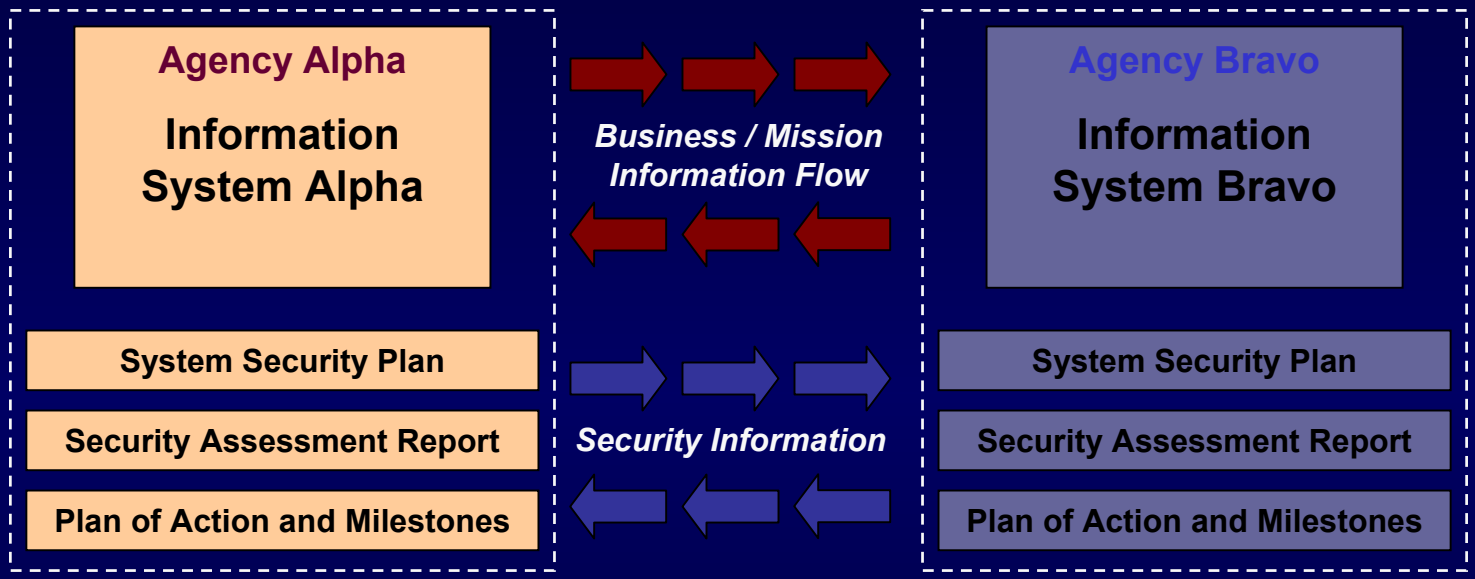
SP 800-53A / SP 800-37

Security Control Assessment

Determines extent to which the security controls are implemented correctly, operating as intended, and producing desired outcome with respect to meeting security requirements

The Desired End State

Security Visibility Among Business/Mission Partners



Determination of risk to Agency Alpha's operations, agency assets, or individuals and acceptability of such risk

Determination of risk to Agency Bravo's operations, agency assets, or individuals and acceptability of such risk

The objective is to have *visibility* into prospective business/mission partners security programs BEFORE critical/sensitive communications begin…establishing levels of security due diligence.

FISMA Implementation Project

Standards and Guidelines

- FIPS Publication 199 (Security Categorization)
- NIST Special Publication 800-37 (C&A)
- NIST Special Publication 800-53 (Recommended Security Controls)
- NIST Special Publication 800-53A (Assessment)
- NIST Special Publication 800-59 (National Security Systems)
- NIST Special Publication 800-60 (Security Category Mapping)
- FIPS Publication 200 (Minimum Security Controls)

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NIST Special Publication 800-53

Recommended Security Controls for Federal Information Systems

A Status Report

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Security Controls

- The management, operational, and technical controls (i.e., safeguards or countermeasures) prescribed for an information system to protect the confidentiality, integrity, and availability of the system and its information.

  -- [FIPS Publication 199]

Key Questions

- What security controls are needed to adequately protect an information system that supports the operations and assets of the organization?
- Have the selected security controls been implemented or is there a realistic plan for their implementation?
- To what extent are the security controls implemented correctly, operating as intended, and producing the desired outcome with respect to meeting security requirements?

Minimum Security Requirements

NIST FISMA Tasking

- Develop minimum information security requirements (i.e., management, operational, and technical security controls) for information and information systems in security categories defined by FIPS 199—
- Publication status:
  - ✓ Federal Information Processing Standards (FIPS) Publication 200, "Minimum Security Controls for Federal Information Systems"*
  - ✓ Final Publication: December 2005

* NIST Special Publication 800-53, "Recommended Security Controls for Federal Information Systems" (Second public draft projected for publication in September 2004), will provide interim guidance until completion and adoption of FIPS Publication 200.

Purpose

The purpose of Special Publication 800-53 is to provide—

- Guidance on how to use a FIPS Publication 199 security categorization to identify minimum security controls for an information system
- Minimum (baseline) security controls for low, moderate, and high impact information systems
- A catalog of security controls for information systems requiring additional threat coverage

Applicability

- Applicable to all Federal information systems other than those systems designated as national security systems as defined in 44 U.S.C., Section 3542
- Broadly developed from a technical perspective so as to be complementary to similar guidelines for national security systems
- Provides guidance to Federal agencies until the publication of FIPS Publication 200, *Minimum Security Controls for Federal Information Systems*

Security Control Assessment

Supporting FISMA Requirements

- Conduct periodic testing and evaluation of the effectiveness of information security policies, procedures, and practices (including management, operational, and technical security controls)
- Publication status:
  - ✓ NIST Special Publication 800-53A, "Guide for Assessing the Security Controls in Federal Information Systems"
  - ✓ Initial Public Draft: Winter 2004-05

Document Structure

- Introduction
  - ***The importance of security controls—relating to key legislative and policy drivers***
- The Fundamentals
  - ***The structure and types of security controls, organization of the security control catalog, methods to instantiate control variables***
- The Process
  - ***The process of selecting minimum security controls using FIPS 199 and how the process relates to the organization's risk management process***
- Appendices
  - ***Minimum security controls, minimum assurance requirements, security control catalog, and other supporting information***

Security Control Structure

- Simplified structure consisting of three sections:
  - Token-level security control statement
  - Supplemental guidance
  - Control enhancements
- Example: Contingency Planning Family

CP-7 ALTERNATE PROCESSING SITES

Control: The organization identifies an alternate processing site and initiates necessary agreements to permit the resumption of information system operations for critical mission/business functions within [*Assignment: organization-defined time period*] when the primary processing capabilities are unavailable.

Supplemental Guidance: Equipment and supplies required to resume operations within the organization-defined time period are either available at the alternate site or contracts are in place to support delivery to the site.

Control Enhancements:

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

(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) Alternate processing site agreements contain priority of service provisions in accordance with the organization's availability requirements.

Security Controls Families

- Access Control
- Awareness and Training
- Audit and Accountability
- Certification, Accreditation, and Security Assessments
- Configuration Management
- Contingency Planning

Security Controls Families

- Identification and Authentication
- Incident Response
- Maintenance
- Media Protection
- Physical and Environmental Protection
- Planning

Security Controls Families

- Personnel Security
- Risk Assessment
- System and Information Integrity
- System Acquisition
- System and Communications Protection

Security Categorization

Potential Impact

Security Objective

FIPS Publication 199	Low	Moderate	High
Confidentiality	The loss of confidentiality could be expected to have a **limited** adverse effect on organizational operations, organizational assets, or individuals.	The loss of confidentiality could be expected to have a **serious** adverse effect on organizational operations, organizational assets, or individuals.	The loss of confidentiality could be expected to have a **severe or catastrophic** adverse effect on organizational operations, organizational assets, or individuals.
Integrity	The loss of integrity could be expected to have a **limited** adverse effect on organizational operations, organizational assets, or individuals.	The loss of integrity could be expected to have a **serious** adverse effect on organizational operations, organizational assets, or individuals.	The loss of integrity could be expected to have a **severe or catastrophic** adverse effect on organizational operations, organizational assets, or individuals.
Availability	The loss of availability could be expected to have a **limited** adverse effect on organizational operations, organizational assets, or individuals.	The loss of availability could be expected to have a **serious** adverse effect on organizational operations, organizational assets, or individuals.	The loss of availability could be expected to have a **severe or catastrophic** adverse effect on organizational operations, organizational assets, or individuals.

Security Categorization

Example: Law Enforcement Witness Protection Information System

FIPS Publication 199	Low	Moderate	High
Confidentiality	The loss of confidentiality could be expected to have a **limited** adverse effect on organizational operations, organizational assets, or individuals.	The loss of confidentiality could be expected to have a **serious** adverse effect on organizational operations, organizational assets, or individuals.	The loss of confidentiality could be expected to have a **severe or catastrophic** adverse effect on organizational operations, organizational assets, or individuals.
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Availability	The loss of availability could be expected to have a **limited** adverse effect on organizational operations, organizational assets, or individuals.	The loss of availability could be expected to have a **serious** adverse effect on organizational operations, organizational assets, or individuals.	The loss of availability could be expected to have a **severe or catastrophic** adverse effect on organizational operations, organizational assets, or individuals.

Guidance for Mapping Types of Information and Information Systems to FIPS Publication 199 Security Categories

SP 800-60

Security Categorization

Example: Law Enforcement Witness Protection Information System

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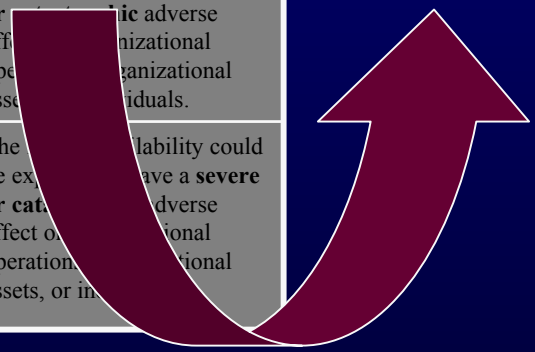
Availability	The loss of availability could be expected to have a **limited** adverse effect on organizational operations, organizational assets, or individuals.	The loss of availability could be expected to have a **serious** adverse effect on organizational operations, organizational assets, or individuals.	The loss of availability could be expected to have a **severe or catastrophic** adverse effect on organizational operations, organizational assets, or individuals.

Guidance for Mapping Types of Information and Information Systems to FIPS Publication 199 Security Categories

SP 800-60

Minimum Security Controls for High Impact Systems



Why High Water Mark

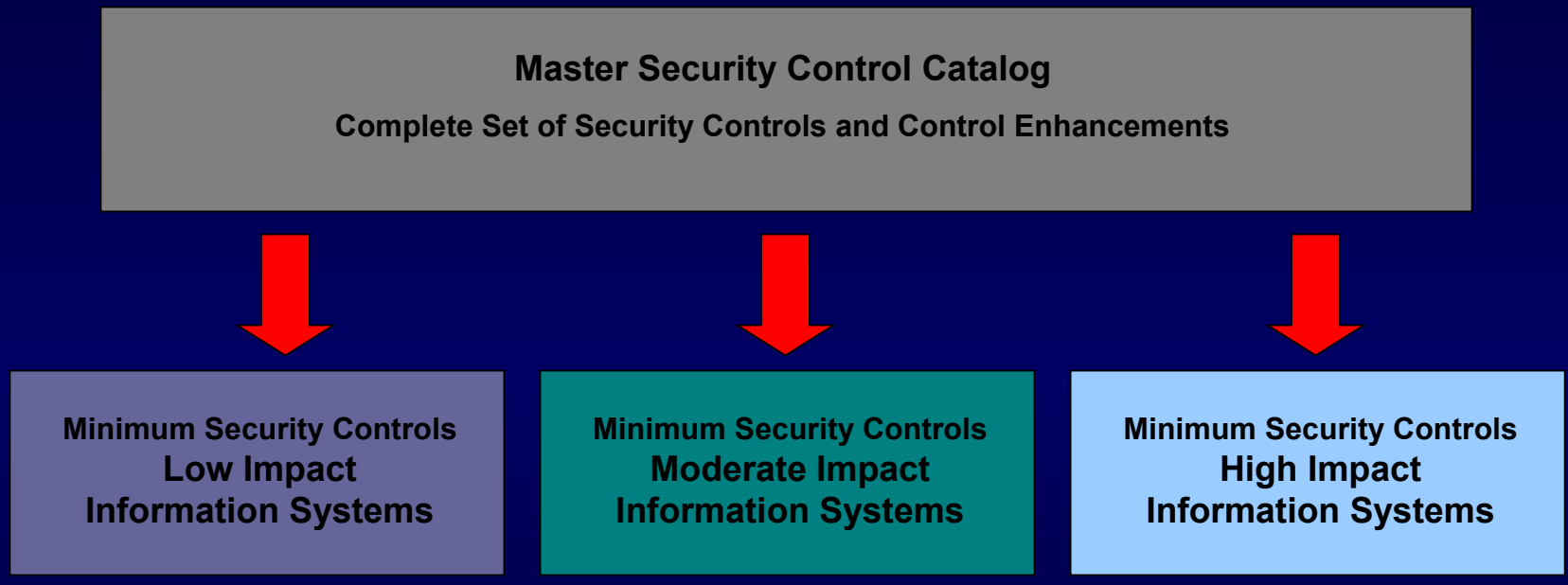
- Strong dependencies among security objectives of confidentiality, integrity, and availability
- In general, the impact values for all security objectives must be commensurate—a lowering of an impact value for *one* security objective might affect *all* other security objectives
  - Example: A lowering of the impact value for confidentiality and the corresponding employment of weaker security controls may result in a breach of security due to an unauthorized disclosure of system password tables—thus, causing a subsequent integrity loss or denial of service…

Minimum Security Controls

- Minimum security controls in each of the designated baselines:
  - Provide a *starting point* for organizations and communities of interest in their security control selection process
  - Are used in the context of the organization's ongoing *risk management process*

Minimum Security Controls Sets

Baselines Provided by Special Publication 800-53



Baseline #1

Selection of a subset of security controls from the master catalog—consisting of ***basic*** level controls

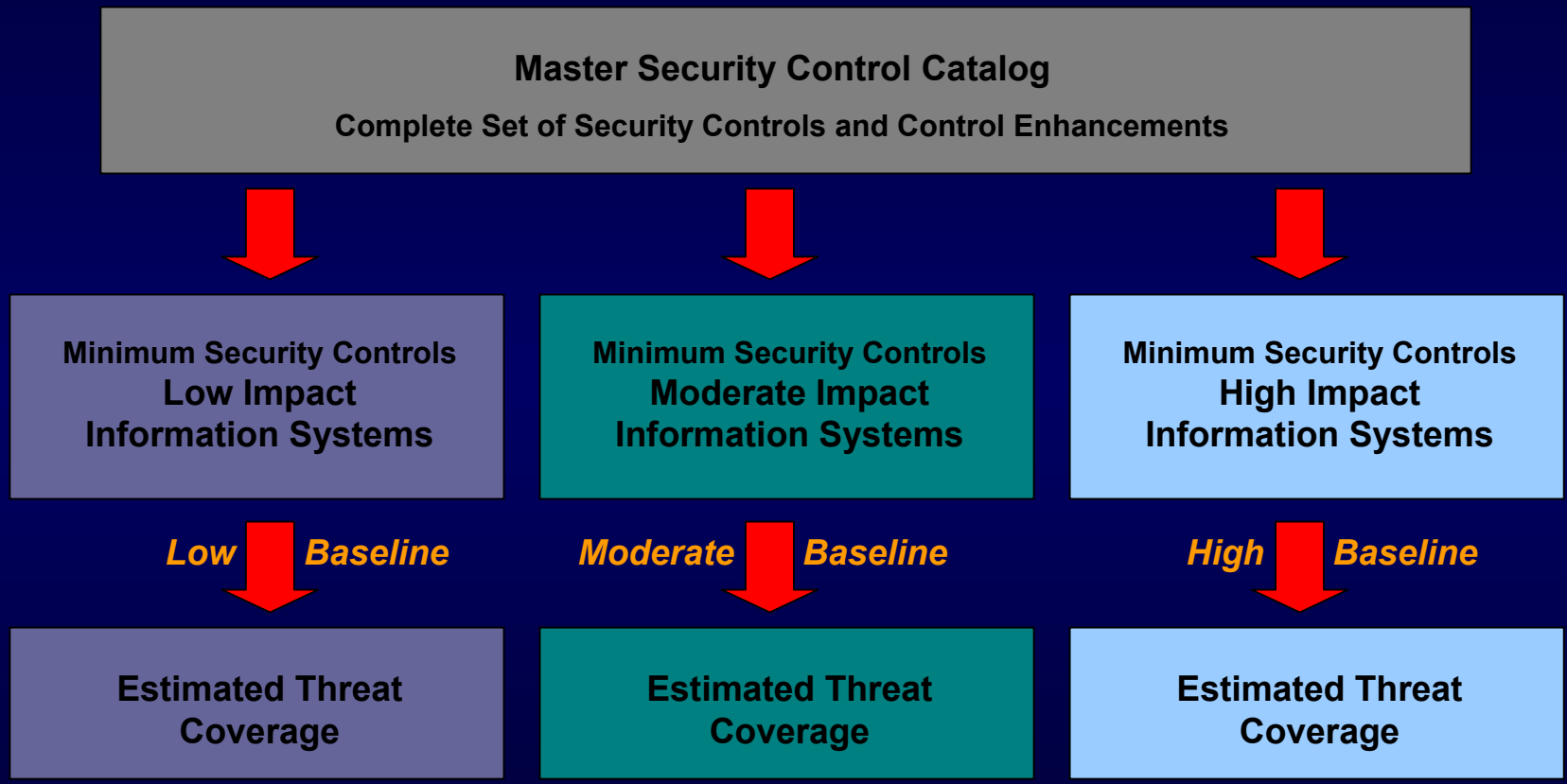
Baseline #2

Selection of a subset of security controls from the master catalog—consisting of ***basic*** level controls, plus additional controls and control ***enhancements***, as needed

Baseline #3

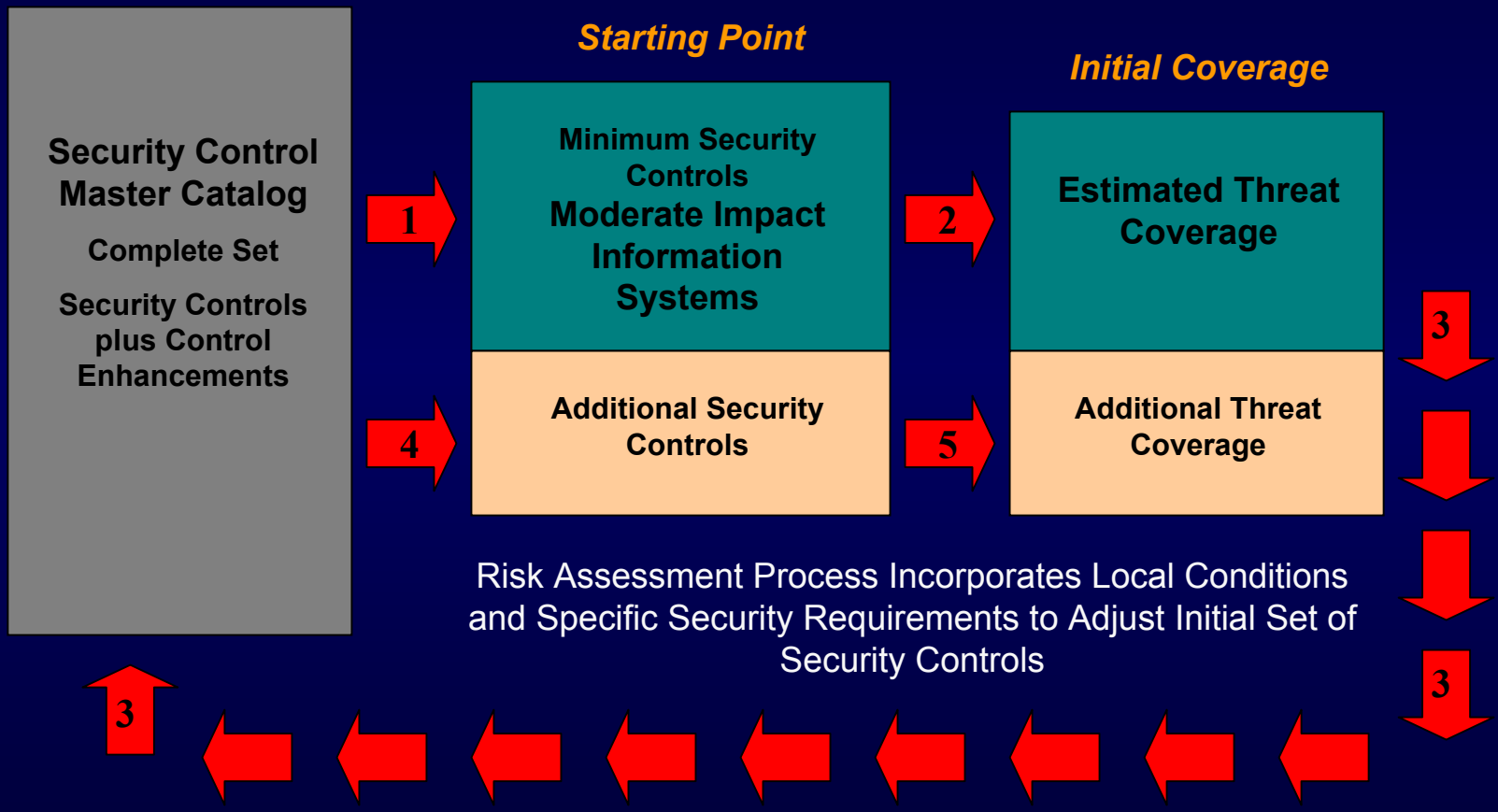
Selection of a subset of security controls from the master catalog—consisting of ***basic*** level controls, plus additional controls and control ***enhancements***, as needed

Estimated Threat Coverage



Security Control Refinement

Organization-level Activity Guided by Risk Assessment



Common Security Controls

- Security controls that can be applied to one or more organizational information systems and have the following properties:
  - The development, implementation, and assessment of the controls can be assigned to responsible officials or organizational elements other than the information system owner
  - The results from the assessment of the controls can be reused in security certifications and accreditations of organizational information systems where those controls have been applied

Common Security Controls

- Common security controls can be applied organization-wide, site-wide, or to common subsystems and assessed accordingly—

  Examples include:

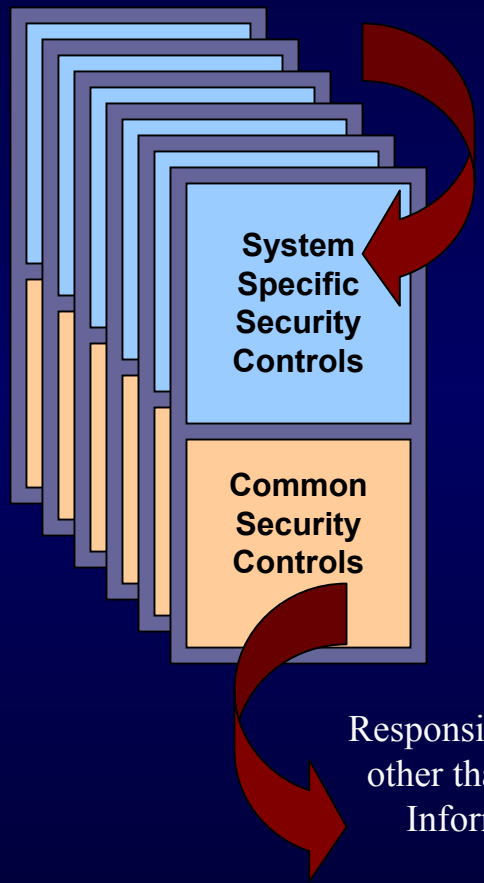
  - Contingency planning
  - Incident response planning
  - Awareness and training
  - Physical and personnel security
  - Common hardware, software, or firmware

Common Security Controls

Responsibility of information system owners

Example: Moderate Impact Organizational Information Systems

- Maximum re-use of assessment evidence during security certification and accreditation of information systems
- Security assessment reports provided to information system owners to confirm the security status of common security controls
- Assessments of common security controls not repeated; only system specific aspects when necessary



- Common security controls developed, implemented, and assessed one time by designated organizational official(s)
- Development and implementation cost amortized across all information systems
- Assessment results shared among all information system owners and authorizing officials where common security controls are applied

Responsibility of designated organizational officials other than information system owners (e.g., Chief Information Officer, facilities manager, etc.)

Special Publication 800-53

Establishes the foundation for—

- More consistent, comparable specifications of security controls for information systems
- More consistent, comparable, and repeatable system assessments of information systems
- More complete and reliable information for authorizing officials to facilitate better risk-based security accreditation decisions

And, ultimately, more secure information systems for organizations…

Projected Publication Schedule

- Special Publication 800-53
  Second Public Draft, September 2004
- Special Publication 800-53
  Final Publication, March 2005
- FIPS Publication 200
  Final Publication, December 2005

Note: Special Publication 800-53 will transition into FIPS 200. Several publication options are under consideration.