The Future of Cyber Security

NIST Special Publication 800-53, Revision 4

Federal Computer Security Program Manager’s Forum

June 5, 2013

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Today’s agenda.

Part 1: Locker room fire up the team.

Part 2: The real story behind 800-53 Rev 4.

Part 3: Your time.

We the People
Article 1

The seeds of information security and privacy in the digital age, were planted in United States Constitution over two centuries ago…

We the People of the United

Article I

Section. 1. All legislative Powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.

Section. 2. [illegible]

Section. 3. The Senate of the United States shall be composed of two Senators [illegible]

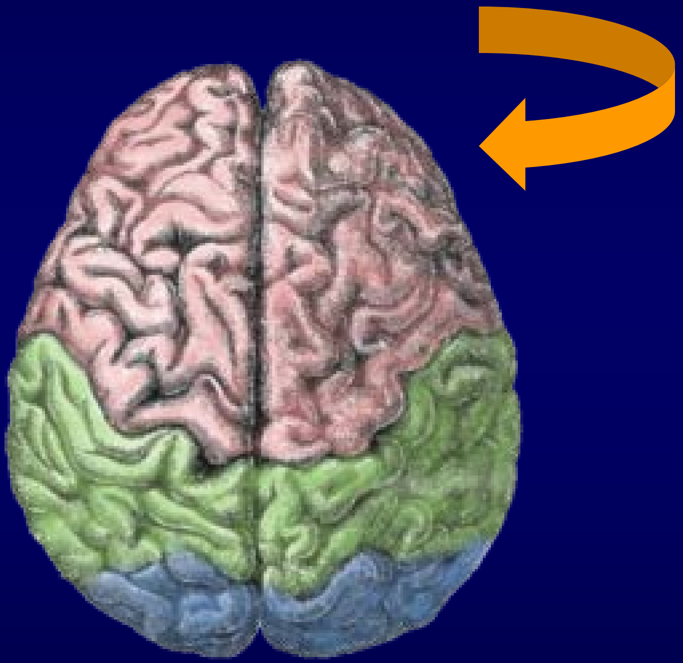
The United States Constitution

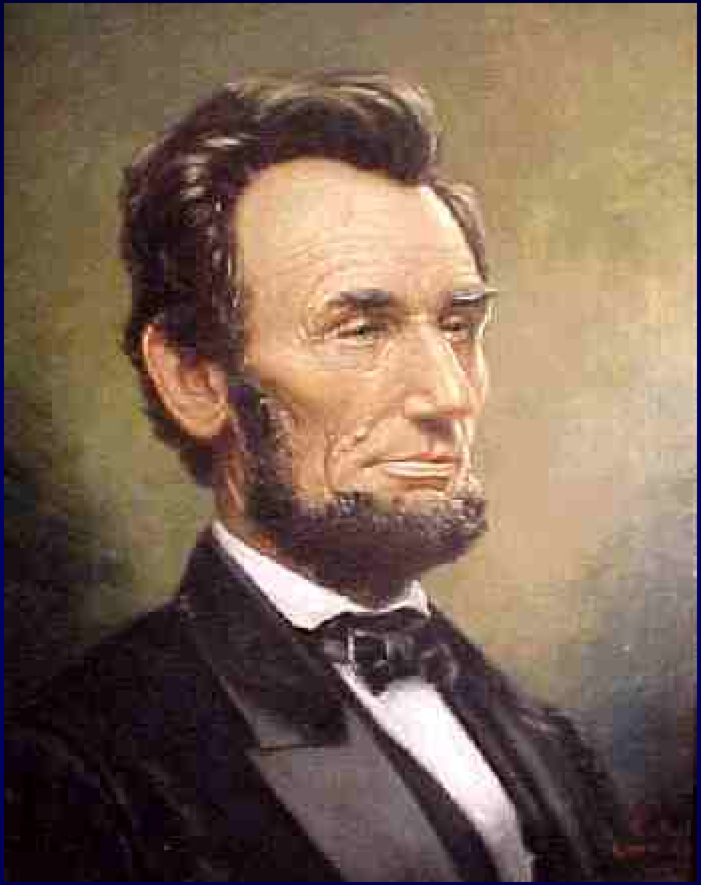
"WE THE PEOPLE of the United States, in Order to form a more perfect Union, establish Justice, ensure domestic Tranquility, *provide for the common defence*, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America…"

The federal cyber security strategy…

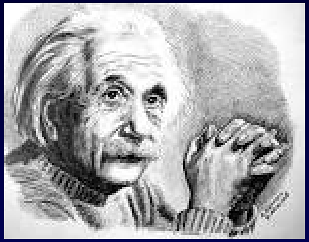
Build It Right, Continuously Monitor

Right brain portion of the presentation.





Time for an honest discussion.



Everything should be made as simple as possible – but not simpler.

-- Albert Einstein

Being satisfied with stopping 85% of cyber attacks is like being happy you have plugged up 85% of the holes in the bottom of your boat…

Not good enough for critical information systems and critical infrastructure.

Good housekeeping is necessary…

But not sufficient.

You can’t count, configure, or patch your way out of this problem space.

Tough decisions ahead.

The glass ceiling.

Cyber hygiene.

The national imperative for building stronger, more resilient information systems…

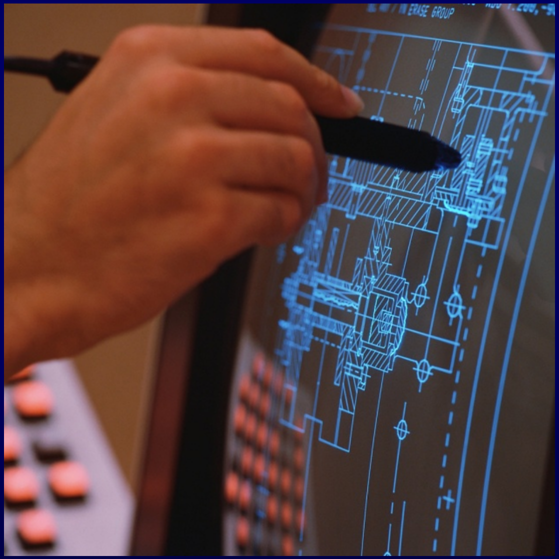
Software assurance.

Systems and security engineering.

Supply chain risk management.

Maybe we don't have a threat problem.

Maybe we have a complexity problem…



That is solved by employing best practices in software assurance, systems and security engineering, and supply chain risk management.

NASCAR.

The threat.

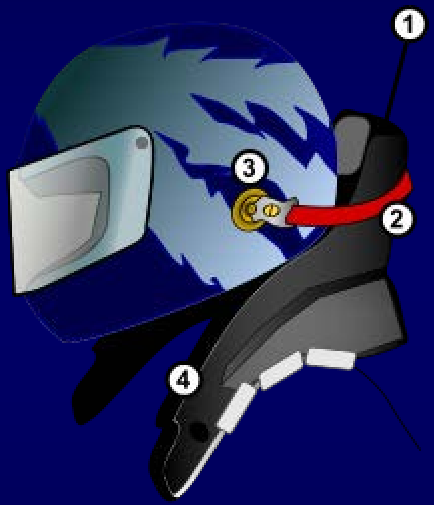
Hitting the wall at 200 miles per hour at Daytona International Speedway.

NASCAR.

The vulnerability.

NASCAR.
The impact.

NASCAR.
The solution.



Head and Neck Safety (HANS) Devices

Strength of Mechanism – Build It Right

Netflix.

Intel.

ADP.

A New Approach for Information Security

- Work directly with executives, mission/business owners and program managers.
- Bring all stakeholders to the table with a vested interest in the success or outcome of the mission or business function.
- Consider information security requirements as mainstream functional requirements.
- Conduct security trade-off analyses with regard to cost, schedule, and performance requirements.
- Implement enforceable metrics for key executives.

Increasing Strength of IT Infrastructure

- Simplify.
  - Reduce and manage *complexity* of IT infrastructure.
  - Use enterprise architecture to streamline the IT infrastructure; *standardize*, *optimize*, *consolidate* IT assets.
- Specialize.
  - Use guidance in SP 800-53, Rev 4 to *customize security plans* to support specific missions/business functions, environments of operation, and technologies.
  - Develop effective *monitoring strategies* linked to specialized security plans.

Increasing Strength of IT Infrastructure

- Integrate.
  - Build information security requirements and controls into mainstream organizational processes including:
    - *Enterprise Architecture*.
    - *Systems Engineering*.
    - *System Development Life Cycle*.
    - *Acquisition*.
  - Eliminate information security programs and practices as stovepipes within organizations.
  - Ensure information security decisions are risk-based and part of routine *cost*, *schedule*, and *performance* tradeoffs.

Think strategic.

Execute tactical…

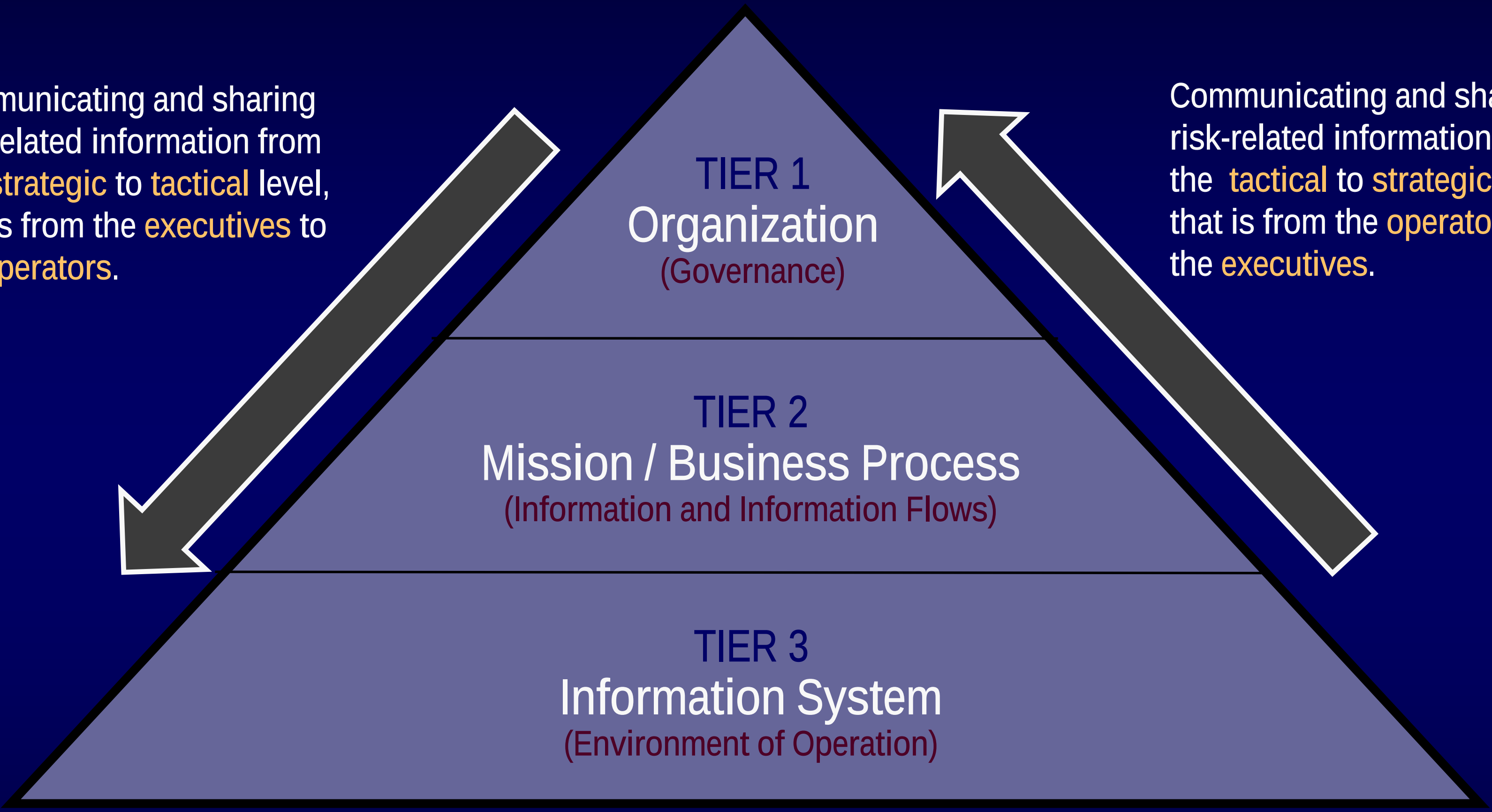
It’s not the *number* of security controls that matters…

It’s having the *right* controls to do the job.

STRATEGIC (EXECUTIVE) RISK FOCUS

Communicating and sharing risk-related information from the strategic to tactical level, that is from the executives to the operators.

Communicating and sharing risk-related information from the tactical to strategic level, that is from the operators to the executives.



TIER 1
Organization
(Governance)

TIER 2
Mission / Business Process
(Information and Information Flows)

TIER 3
Information System
(Environment of Operation)

TACTICAL (OPERATIONAL) RISK FOCUS

Managing risk.

Requires having a good framework…

- ✓ Frame
- ✓ Assess
- ✓ Respond
- ✓ Monitor

Dual Protection Strategies

Sometimes your information systems will be compromised even when you do everything right…

- Boundary Protection

  Primary Consideration: *Penetration resistance.*

  Adversary Location: *Outside defensive perimeter.*

  Objective: *Repel the attack.*

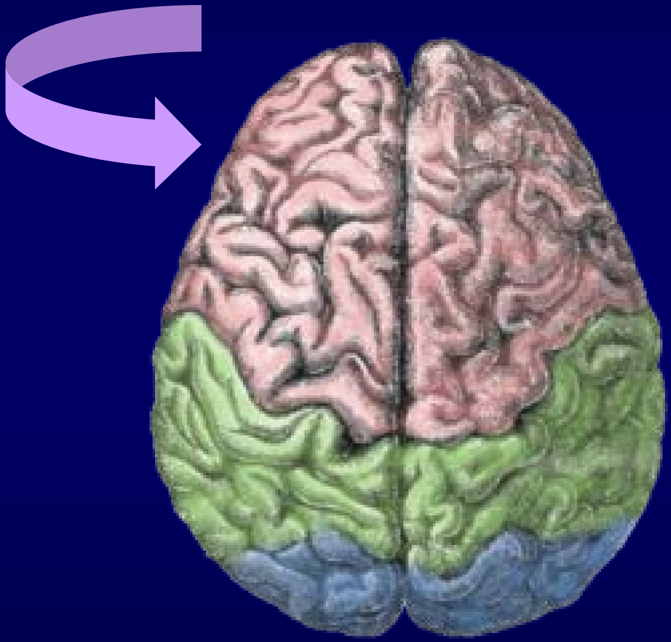
- Agile Defense

  Primary Consideration: *Information system resilience.*

  Adversary Location: *Inside defensive perimeter.*

  Objective: *Operate while under attack, limit damage, survive.*

Left brain portion of the presentation.



Unified Information Security Framework

Your Toolbox

- NIST Special Publication 800-39
  Managing Information Security Risk:
  Organization, Mission, and Information System View
- NIST Special Publication 800-30
  Guide for Conducting Risk Assessments
- NIST Special Publication 800-37
  Applying the Risk Management Framework
  to Federal Information Systems
- NIST Special Publication 800-53
  Security and Privacy Controls for Federal
  Information Systems and Organizations
- NIST Special Publication 800-53A
  Guide for Assessing the Security Controls
  in Federal Information Systems and Organizations

Special Publication 800-53, Revision 4.

Big changes have arrived…

Gap Areas Addressed

- Insider threat
- Application security
- Supply chain risk
- Security assurance and trustworthy systems
- Mobile and cloud computing technologies
- Advanced persistent threat
- Tailoring guidance and overlays
- Privacy

Highlights of SP 800-53 Update

Structural Changes

Security Control Class Designations

Eliminated management, operational, and technical class labels on security control families—

ID	FAMILY	~~CLASS~~
AC	Access Control	Technical
AT	Awareness and Training	Operational
AU	Audit and Accountability	~~Technical~~
CA	Security Assessment and Authorization	~~Management~~
CM	Configuration Management	~~Operational~~
CP	Contingency Planning	~~Operational~~
IA	Identification and Authentication	~~Technical~~
IR	Incident Response	~~Operational~~
MA	Maintenance	~~Operational~~
MP	Media Protection	~~Operational~~
PE	Physical and Environmental Protection	~~Operational~~
PL	Planning	~~Management~~
PS	Personnel Security	~~Operational~~
RA	Risk Assessment	~~Management~~
SA	System and Services Acquisition	~~Management~~
SC	System and Communications Protection	~~Technical~~
SI	System and Information Integrity	~~Operational~~
PM	Program Management	Management

Control Enhancement Naming

AC-9 PREVIOUS LOGON (ACCESS) NOTIFICATION

Control: The information system notifies the user, upon successful interactive logon (access) to the system, of the date and time of the last logon (access).

Supplemental Guidance: This control is intended to cover both traditional logons to information systems and accesses to systems that occur in other types of architectural configurations (e.g., service oriented architectures). Related controls: AC-7, PL-4.

Control Enhancements:

(1) *PREVIOUS LOGON NOTIFICATION | UNSUCCESSFUL LOGONS*
The information system notifies the user, upon successful logon/access, of the number of unsuccessful logon/access attempts since the last successful logon/access.

(2) *PREVIOUS LOGON NOTIFICATION | SUCCESSFUL/UNSUCCESSFUL LOGONS*
The information system notifies the user of the number of [*Selection: successful logons/accesses; unsuccessful logon/access attempts; both*] during [*Assignment: organization-defined time period*].

Tables Added to Appendix D

CNTL NO.	**CONTROL NAME** *Control Enhancement Name*	WITHDRAWN	ASSURANCE	CONTROL BASELINES		
				LOW	MOD	HIGH
PL-1	**Security Planning Policy and Procedures**		**A**	x	x	x
PL-2	**System Security Plan**		**A**	x	x	x
PL-2 (1)	*SYSTEM SECURITY PLAN* | *CONCEPT OF OPERATIONS*	**W**	Incorporated into PL-7.			
PL-2 (2)	*SYSTEM SECURITY PLAN* | *FUNCTIONAL ARCHITECTURE*	**W**	Incorporated into PL-8.			
PL-2 (3)	*SYSTEM SECURITY PLAN* | *PLAN / COORDINATE WITH OTHER ORGANIZATIONAL ENTITIES*		**A**		x	x
PL-3	**System Security Plan Update**	**W**	Incorporated into PL-2.			
PL-4	**Rules of Behavior**		**A**	x	x	x
PL-4 (1)	*RULES OF BEHAVIOR* | *SOCIAL MEDIA AND NETWORKING RESTRICTIONS*		**A**		x	x
PL-5	**Privacy Impact Assessment**	**W**	Incorporated into Appendix J, AR-2.			
PL-6	**Security-Related Activity Planning**	**W**	Incorporated into PL-2.			
PL-7	**Security Concept of Operations**					
PL-8	**Security Architecture**					

Assumptions, Baselines, and Tailoring

Clarification of Term *Baseline*

The use of the term *baseline* is intentional. The security controls and control enhancements listed in the initial baselines are *not* a minimum—but rather a proposed starting point from which controls and controls enhancements may be removed or added based on the tailoring guidance in Section 3.2.

Specialization of security plans is the goal…

Assumptions for 800-53 Rev 4 Baselines

- Assumptions applied when security controls for each baseline were determined.
- Assumptions are a key element in the risk framing step in the NIST SP 800-39 risk management process.
- Assumptions about control selection may be related to:
  - Operational environments;
  - Nature of missions/operations being conducted;
  - Functionality of the information system;
  - Threats facing all three organizational tiers; and
  - Information types processed, stored, or transmitted.

Assumptions Applied to Baselines

- Information systems are located in fixed, physical facilities, complexes, or locations.
- User information in systems is (relatively) persistent.
- Information systems are multi-user (either serially or concurrently) in operation.
- Information systems exist in networked environments.
- Information systems are general purpose in nature.
- Organizations have the necessary structure, resources, and infrastructure to implement the security controls.

Assumptions Not Applied to Baselines

- Insider threats exist within organizations.
- Classified information is processed, stored, or transmitted.
- Advanced persistent threats exist within organizations.
- Information requires specialized protection based on federal legislation, Executive Orders, directives, regulations, or policies.
- Information systems communicate or interconnect with systems in different policy domains.

Expanded Tailoring Guidance

(1 of 2)

- Identifying and designating common controls in initial security control baselines.
- Applying scoping considerations to the remaining baseline security controls.
- Selecting compensating security controls, if needed.
- Assigning specific values to organization-defined security control parameters via explicit assignment and selection statements.

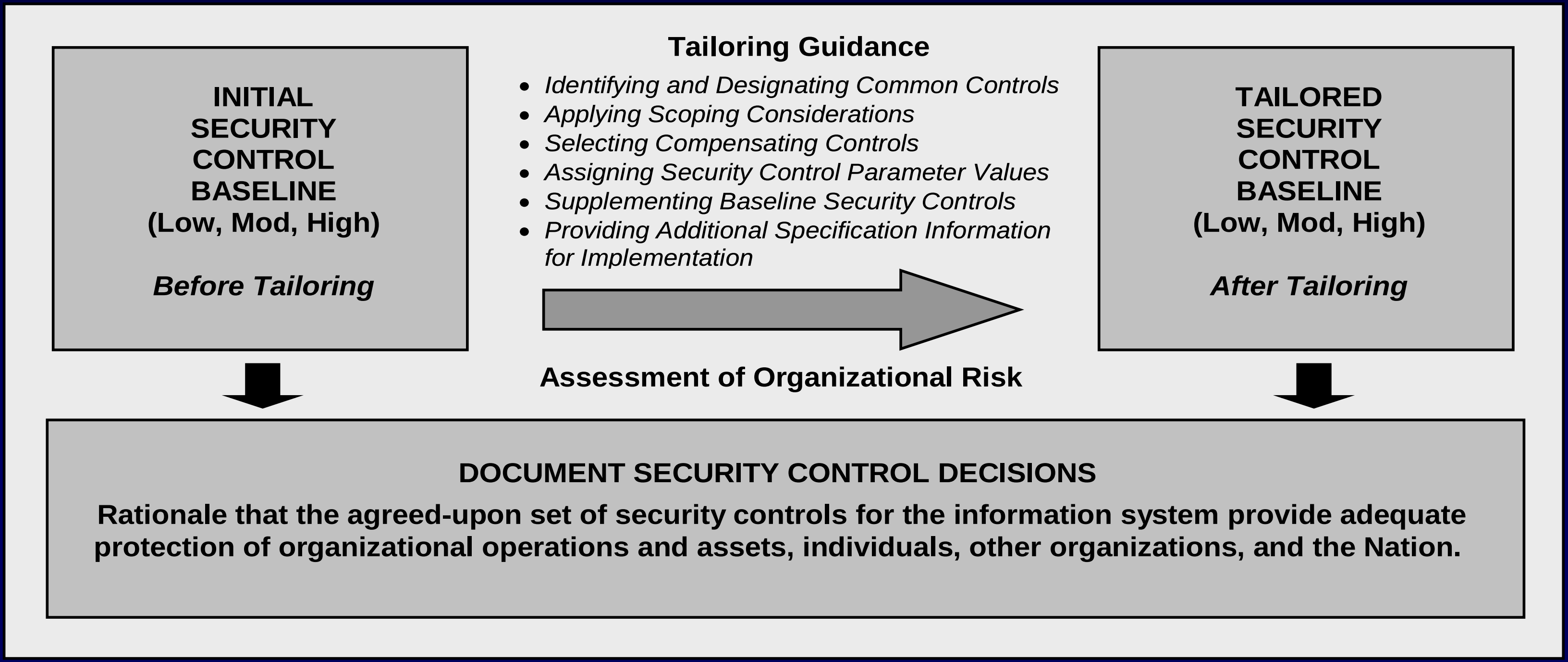
Expanded Tailoring Guidance
(2 of 2)

- Supplementing baselines with additional security controls and control enhancements, if needed.
- Providing additional specification information for control implementation.

Supplementing the Baseline

- Inputs may include risk assessment during the security control selection process and/or regulations, policies, etc.
- Example of supplementation for a specific threat—
  - ADVANCED PERSISTENT THREAT
    Security control baselines do not assume that the current threat environment is one where adversaries have achieved a significant foothold and presence within organizations and organizational information systems; that is, organizations are dealing with an advanced persistent threat. Adversaries continue to attack organizational information systems and the information technology infrastructure and are successful in some aspects of such attacks. To more fully address the APT, concepts such as insider threat protection (CM-5 (4)), diversity/heterogeneity (SC-27 and SC-29), deception (SC-26 and SC-30), non-persistence (SC-25 and SC-34), and segmentation (SC-7(13)) can be considered.

Tailoring the Baseline



INITIAL SECURITY CONTROL BASELINE (Low, Mod, High)

Before Tailoring

Tailoring Guidance

- *Identifying and Designating Common Controls*
- *Applying Scoping Considerations*
- *Selecting Compensating Controls*
- *Assigning Security Control Parameter Values*
- *Supplementing Baseline Security Controls*
- *Providing Additional Specification Information for Implementation*

Assessment of Organizational Risk

TAILORED SECURITY CONTROL BASELINE (Low, Mod, High)

After Tailoring

DOCUMENT SECURITY CONTROL DECISIONS

Rationale that the agreed-upon set of security controls for the information system provide adequate protection of organizational operations and assets, individuals, other organizations, and the Nation.

Document risk management decisions made during the tailoring process to provide information necessary for authorizing officials to make risk-based authorization decisions.

Overlays

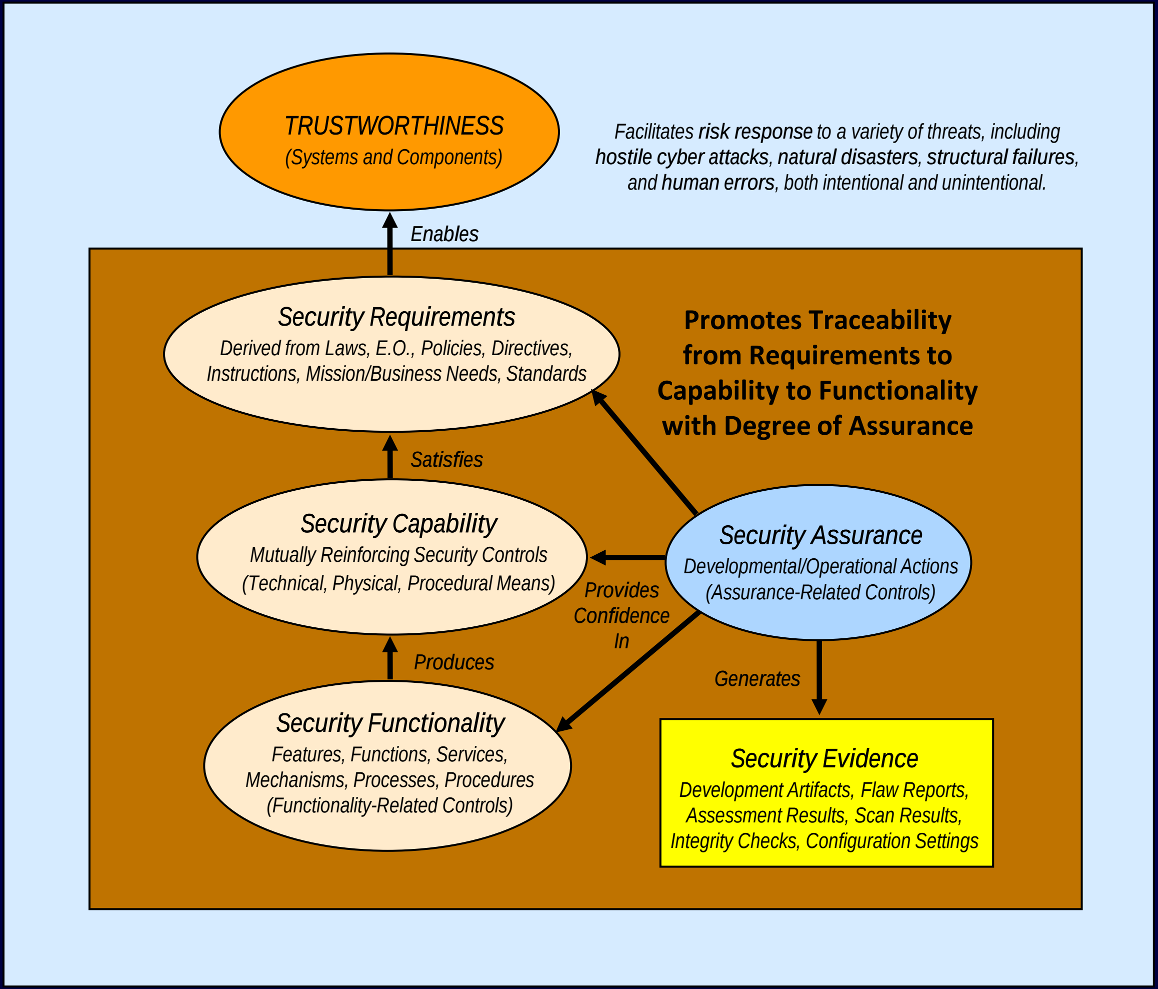
Overlays complement initial security control baselines—

- Provide the opportunity to add or eliminate controls.
- Provide security control applicability and interpretations.
- Establish community-wide parameter values for assignment and/or selection statements in security controls and control enhancements.
- Extend the supplemental guidance for security controls, where necessary.

Types of Overlays

- Communities of interest (e.g., healthcare, intelligence, financial, law enforcement).
- Information technologies/computing paradigms (e.g., cloud/mobile, PKI, Smart Grid).
- Industry sectors (e.g., nuclear power, transportation).
- Environments of operation (e.g., space, tactical).
- Types of information systems (e.g., industrial/process control systems, weapons systems).
- Types of missions/operations (e.g., counter terrorism, first responders, R&D, test, and evaluation).

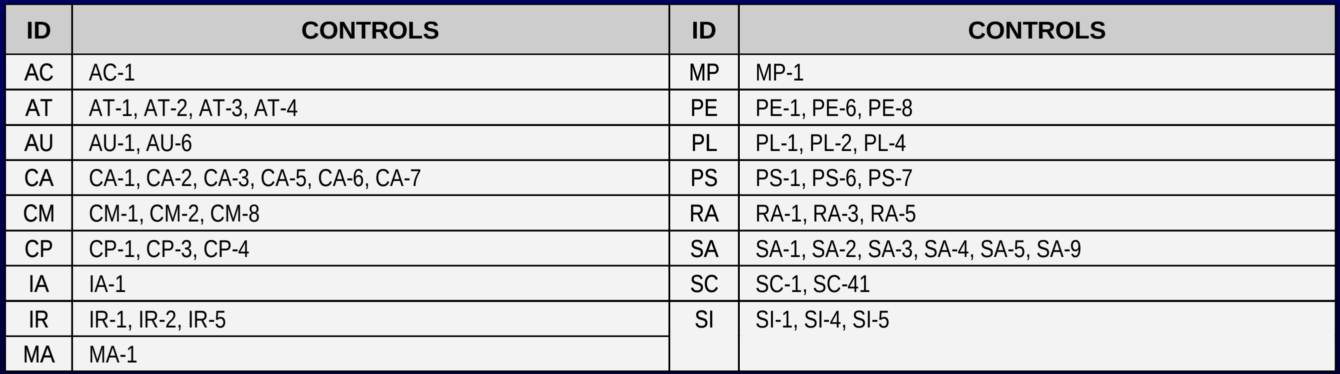
Assurance and Trustworthiness


TRUSTWORTHINESS
(Systems and Components)
Facilitates risk response to a variety of threats, including hostile cyber attacks, natural disasters, structural failures, and human errors, both intentional and unintentional.
Enables
Security Requirements
Derived from Laws, E.O., Policies, Directives, Instructions, Mission/Business Needs, Standards
Promotes Traceability from Requirements to Capability to Functionality with Degree of Assurance
Satisfies
Security Capability
Mutually Reinforcing Security Controls (Technical, Physical, Procedural Means)
Security Assurance
Developmental/Operational Actions (Assurance-Related Controls)
Provides Confidence In
Produces
Generates
Security Functionality
Features, Functions, Services, Mechanisms, Processes, Procedures (Functionality-Related Controls)
Security Evidence
Development Artifacts, Flaw Reports, Assessment Results, Scan Results, Integrity Checks, Configuration Settings

Minimum Assurance – Appendix E

- Appendix E has been completely revised and reworked.
- The *minimum* required assurance is provided by implementation of the appropriate baseline set of controls.
- The *assurance-related* controls for each baseline are provided in tables E-1, E-2, and E-3.
- Additional assurance-related controls are provided in table E-4, i.e., assurance-related controls not in any baseline.

Table E-1 - Minimum Assurance for Low Impact Baseline



ID	CONTROLS	ID	CONTROLS
AC	AC-1	MP	MP-1
AT	AT-1, AT-2, AT-3, AT-4	PE	PE-1, PE-6, PE-8
AU	AU-1, AU-6	PL	PL-1, PL-2, PL-4
CA	CA-1, CA-2, CA-3, CA-5, CA-6, CA-7	PS	PS-1, PS-6, PS-7
CM	CM-1, CM-2, CM-8	RA	RA-1, RA-3, RA-5
CP	CP-1, CP-3, CP-4	SA	SA-1, SA-2, SA-3, SA-4, SA-5, SA-9
IA	IA-1	SC	SC-1, SC-41
IR	IR-1, IR-2, IR-5	SI	SI-1, SI-4, SI-5
MA	MA-1		

Strengthening of Specification Language

- Significant changes to security controls and control enhancements in—
- Configuration Management (CM) family.
- System and Services Acquisition (SA) family.
- System and Information Integrity (SI) family.

Applying best practices in software development at all stages in the SDLC.

Privacy – Appendix J
(1 of 2)

- Privacy and security are complementary and mutually reinforcing.
- Appendix J complements security controls in Appendix F.
- Privacy control families are the same as those in the FEA Security and Privacy Profile, v3, September 2010.
- Appendix J is based on:
  - Fair Information Practice Principles from Privacy Act of 1974;
  - E-Government Act of 2002, Section 208; and
  - Privacy-related OMB guidance.

Privacy – Appendix J

(2 of 2)

- Objective of Appendix J is to promote closer cooperation between privacy and security officials.
- Intended for organizational privacy officials (e.g., CPOs) working with:
  - Program managers;
  - Information system developers;
  - Information technology staff; and
  - Information security personnel.
- Apply each control with respect to organization’s distinct mission and operational needs based on legal authorities and obligations.

Privacy Control Families

- Authority and Purpose (AP)
- Accountability, Audit, and Risk Management (AR)
- Data Quality and Integrity (DI)
- Data Minimization and Retention (DM)
- Individual Participation and Redress (IP)
- Security (SE)
- Transparency (TR)
- Use Limitation (UL)

Security Engineering Guideline

Special Publication 800-160

Three major objectives —

- Describe best practices for security engineering.
- Show how security engineering can be integrated into the traditional systems engineering process.
- Demonstrate linkage from system and security engineering processes to information security and risk management processes.

There are no shortcuts.

The sky was falling yesterday.

The sky is falling today.

The sky will be falling tomorrow.

The bottom line.

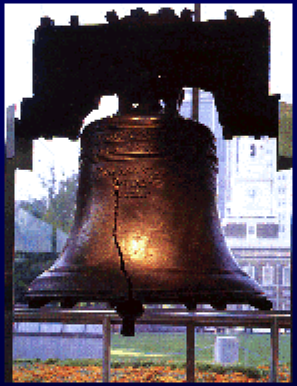
If adversaries own your information system…

They own your intellectual property…

They own your identity…

They own you.

And you have lost your freedom.



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