National Institute of Standards and Technology
U.S. Department of Commerce

Information and Communications Technology Supply Chain Risk Management (ICT SCRM)

Celia Paulsen
Computer Security Division
IT Laboratory

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Agenda

- What is ICT SCRM and what is the Problem?
- NIST's Work
- NIST SP 800-161
  - Overview
  - Status

What is ICT SCRM?

What is the Problem?

From *The World Is Flat by Thomas Friedman*

Dell Inspiron 600m Notebook: Key Components and Suppliers

Component		Supplier or Potential Suppliers
Intel Microprocessor		US-owned factory in the Philippines, Costa Rica, Malaysia, or China *(Intel)*
Memory		South Korea *(Samsung)*, Taiwan *(Nanya)*, Germany *(Infineon)*, or Japan *(Elpida)*
Graphics Card		China *(Foxconn)*, or Taiwanese-owned factory in China *(MSI)*
Cooling fan		Taiwan *(CCI and Auras)*
Motherboard		Taiwan *(Compal and Wistron)*, Taiwanese-owned factory in China *(Quanta)*, or South Korean-owned factory in China *(Samsung)*
Keyboard		Japanese company in China *(Alps)*, or Taiwanese-owned factory in China *(Sunrex and Darfon)*
LCD		South Korea *(Samsung, LG.Philips LCD)*, Japan *(Toshiba or Sharp)*, or Taiwan *(Chi Mei Optoelectronics, Hannstar Display, or AU Optronics)*
Wireless Card		Taiwan *(Askey or Gemtek)*, American-owned factory in China *(Agere)* or Malaysia *(Arrow)*, or Taiwanese-owned factory in China *(USI)*
Modem		China *(Foxconn)*, or Taiwanese company in China *(Asustek or Liteon)*
Battery		American-owned factory in Malaysia *(Motorola)*, Japanese company in Mexico, Malaysia, or China *(Sanyo)*, or South Korean or Taiwanese factory *(SDI and Simplo)*
Hard Disk Drive		American-owned factory in Singapore *(Seagate)*, Japanese-owned company in Thailand *(Hitachi or Fujitsu)*, or Japanese-owned company in the Philippines *(Toshiba)*
CD/DVD		South Korean company with factories in Indonesia and Philippines *(Samsung)*, Japanese-owned factory in China or Malaysia *(NEC)*, Japanese-owned factory in Indonesia, China, or Malaysia *(Teac)*, or Japanese-owned factory in China *(Sony)*
Notebook Carrying Bag		Irish company in China *(Tenba)*, or American company in China *(Targus, Samsonite, and Pacific Design)*
Power Adapter		Thailand *(Delta)*, or Taiwanese-, South Korean-, or American-owned factory in China *(Liteon, Samsung, and Mobility)*
Power Cord		British company with factories in China, Malaysia, and India *(Volex)*
Removable Memory Stick		Israel *(M-System)*, or American company with factory in Malaysia *(Smart Modular)*

Source: Booz Allen Hamilton and DoD

The Problem

- Counterfeit products
- Vulnerabilities within the supply chain
- Software or hardware delivered with known vulnerabilities
- Malware that is inserted into software or firmware (by various means)

Example of Supply Chain Threats: Counterfeits

- Integrated circuits:
  - In 2010, a Florida company (Vision Tech) sold 60,000 counterfeit integrated circuits that went into DOD missile programs, DHS radiation detectors and DOT high speed trains.
  - Situations where failures in IT systems can be catastrophic.

    **(Hsu, Spencer, Washington Post, September 14, 2010)*
- Routers:
  - Between 2003-2005, eGlobe Solutions Inc. sold $788,000 of counterfeit equipment, primarily routers.
  - Sold to: DoD, GSA, defense contractors, power companies
  - These routers power U.S. Government networks all over the world.

    **(U.S. Attorney's Office Press Release on Indictment, November 2006)*

Example of Supply Chain Threats: Network Communications

Symantec's 2013 Internet Security Threat Report

- Attacks against *GOVERNMENT*
  - Down: *25%* in 2011 to *12%* in 2012
- Attacks against *MANUFACTURERS*, largely SMEs
  - Up: *15%* in 2011 to *24%* in 2012

Mandiant 2013 Threat Report

- Outside In: Attackers are increasingly using outsourced service providers as a means to gain access to their targets.

Example of Supply Chain Threats: Natural Disasters

- 2011 earthquake and tsunami in Japan
  - Major supplier to China, S. Korea, Taiwan, elsewhere
  - 25% world decline in chips
  - 75% world decline in the chemicals to make chips

    **(Yoneyama, Hidetaka, "The Lessons of the Great Tohoku Earthquake and Its Effects on Japan's Economy," Fujitsu Research Institute, April 8, 2011.)*
- 2011 Floods in Thailand
  - 2nd largest producer of hard-drives
  - 30% decrease in manufacturing
  - ~1 year to restore production

    **(Zhang, Fang, "Thai Floods Continue to Impact Hard Drive Manufacturing," Applied Market Intelligence, February 12, 2012)*

Threats	Vulnerabilities
Adversarial: e.g., insertion of counterfeits, tampering, theft, and insertion of malicious software.	External: e.g., weaknesses to the supply chain, weaknesses within entities in the supply chain, dependencies (power, comms, etc.)
Non-adversarial: e.g., natural disaster, poor quality products/services and poor practices (engineering, manufacturing, acquisition, management, etc).	Internal: e.g., information systems and components, organizational policy/processes (governance, procedures, etc.)

Likelihood (probability of a threat exploiting a vulnerability(s))

Adversarial: capability and intent	Non-adversarial: occurrence based on statistics/history

Impact - degree of harm

To: mission/business function	From: data loss, modification or exfiltration
	From: unanticipated failures or loss of system availability
	From: reduced availability of components

Risk

ICT SCRM Problem Definition

ICT

- Growing sophistication of ICT
- Number and scale of information systems
- Government's increasing reliance on COTS

Supply Chain

- Speed and scale of globalization
- Complex supply chain (logically long and geographically diverse)

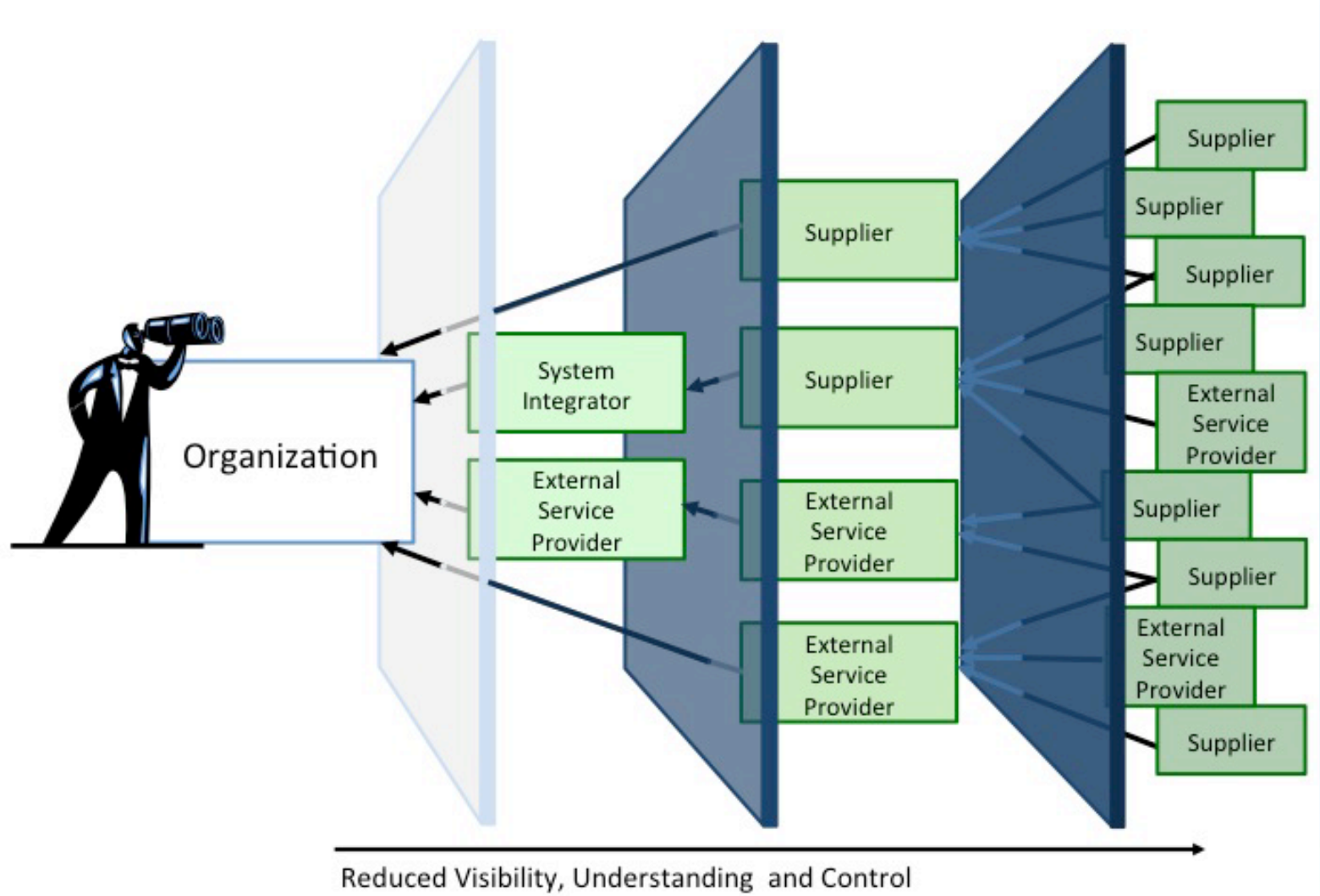
Risk

- Significant increase in the number of entities who 'touch' products and services
- Natural disasters, poor product/service quality and poor security practices

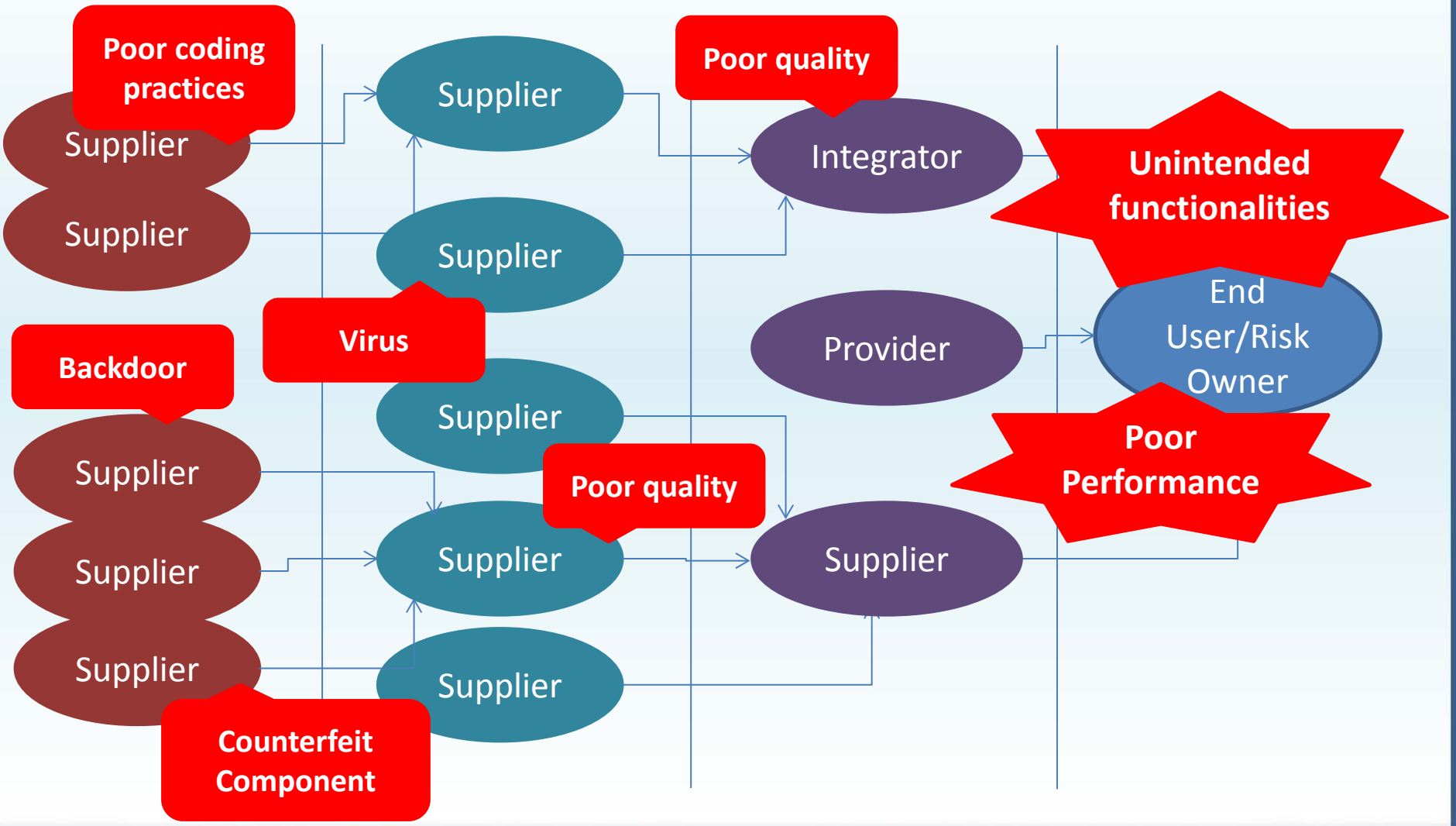
Management

- Lack of *visibility* and *understanding*: how technology is developed, integrated and deployed and practices to assure security.
- A lack of *control* of the decisions impacting the inherited risks and ability to effectively mitigate those risks.

Supply Chain Visibility, Understanding, and Control



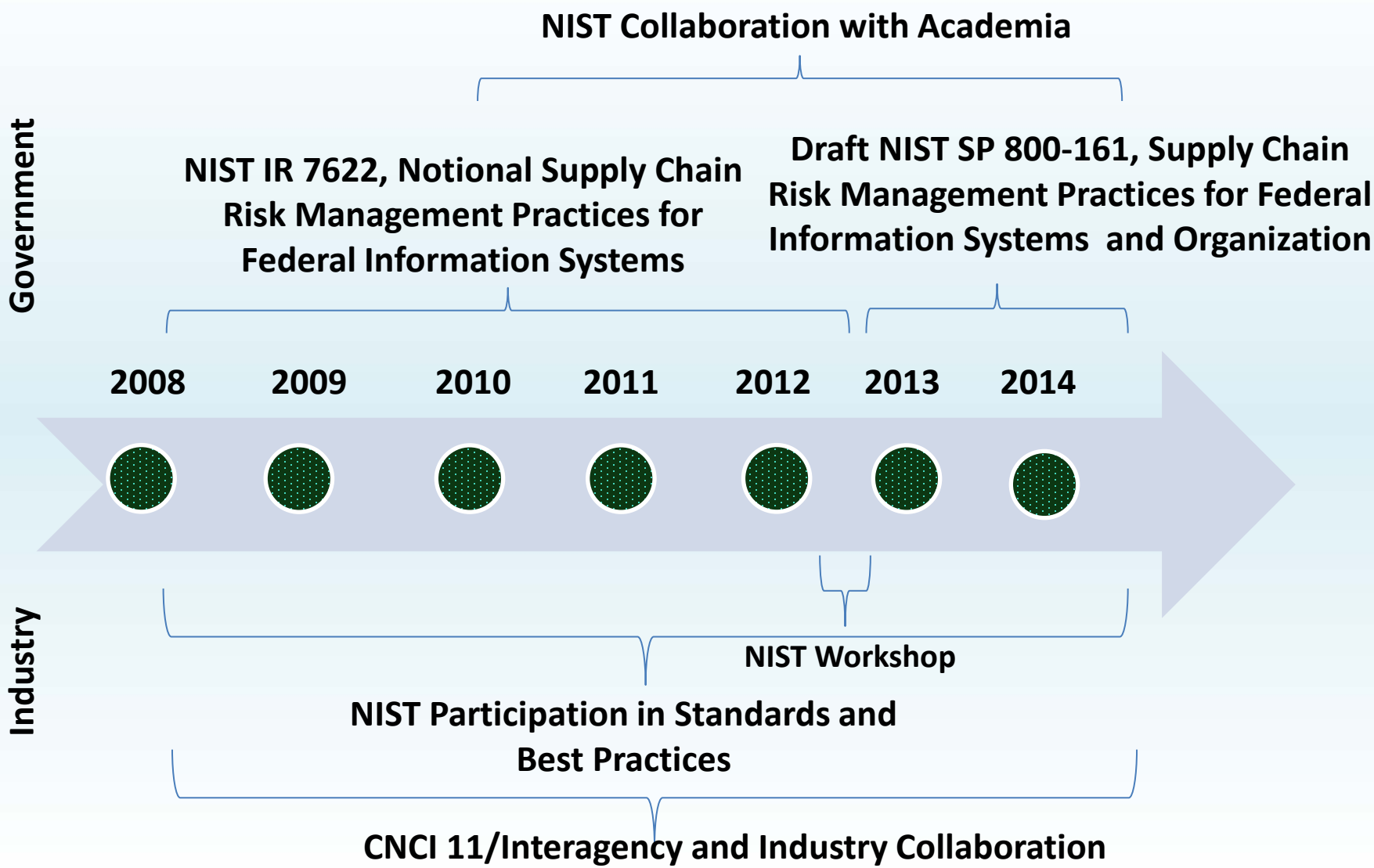
Counterfeits, Intentional Insertion of Malware and Poor Practices



NIST's Work: Enabling innovation, competitiveness and security

ICT SCRM Program

Evolution of NIST ICT SCRM Work

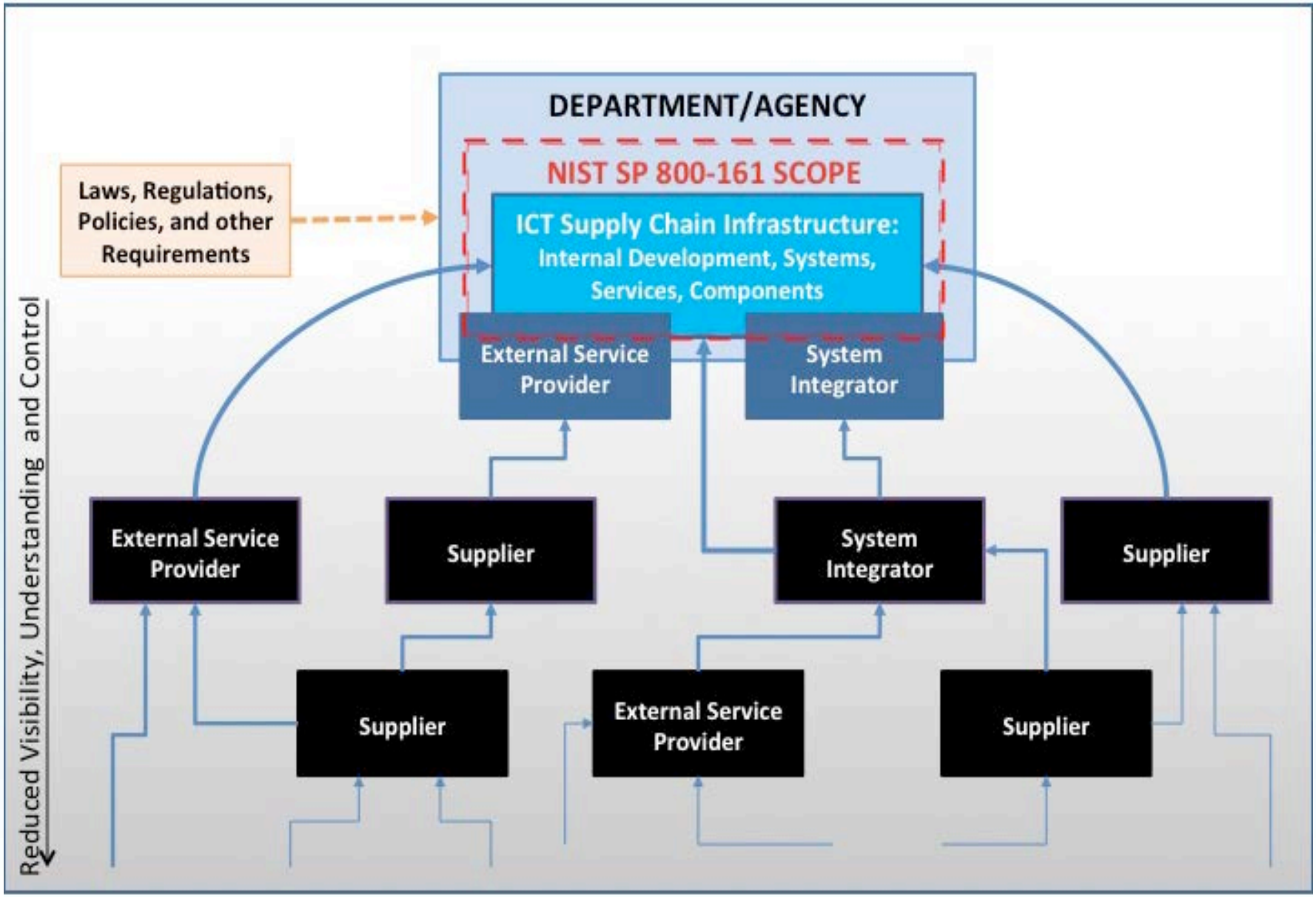


NIST SP 800-161 (Draft)

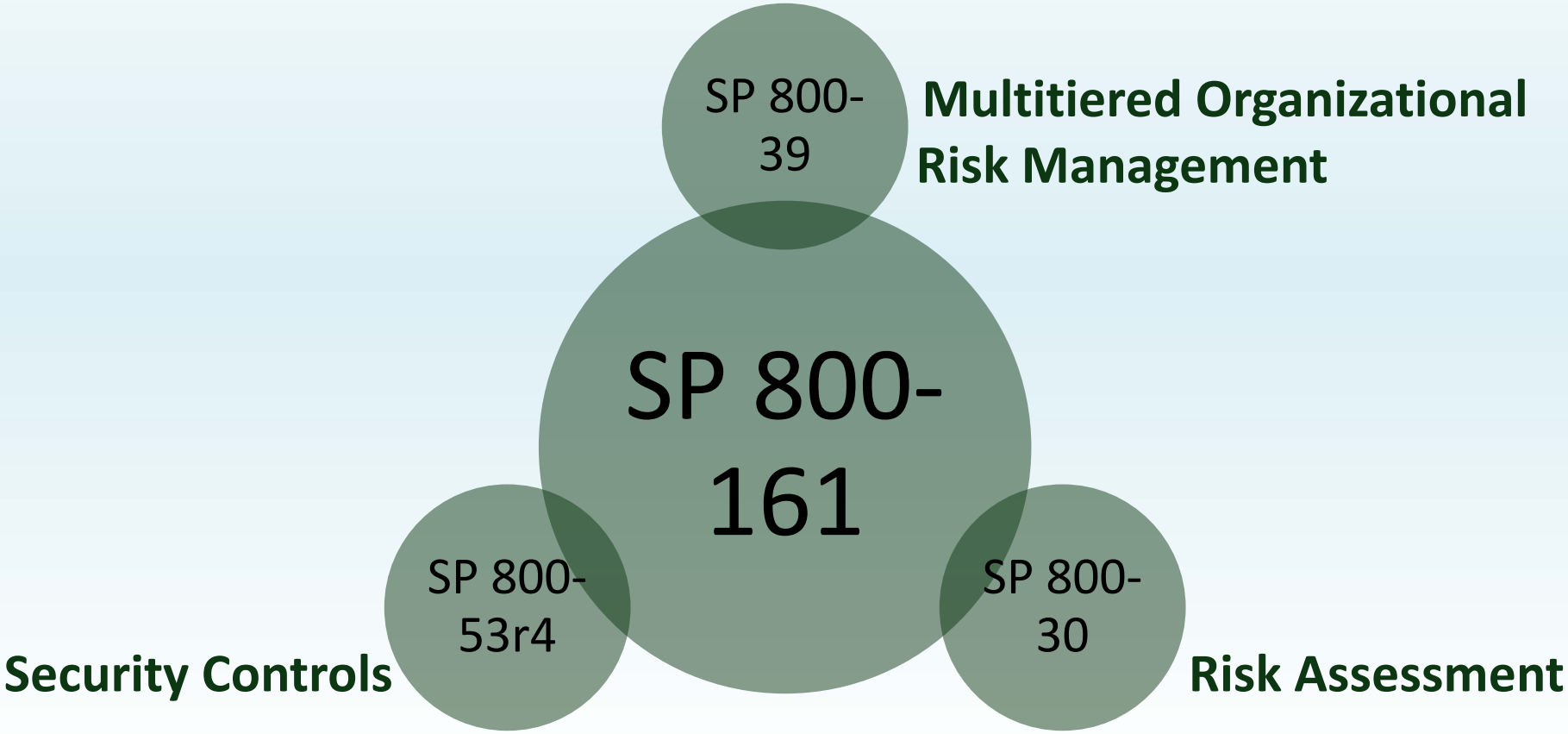
NIST SP 800-161 Overview

- Scope, Purpose, Background, Methodology
- Multi-tiered Approach
- Risk Management Process
- ICT SCRM Controls

- Associated NIST 800-53 Rev. 4 Controls
- Threat Events / Scenarios
- SCRM Plan Template


DEPARTMENT/AGENCY
NIST SP 800-161 SCOPE
Laws, Regulations, Policies, and other Requirements
ICT Supply Chain Infrastructure: Internal Development, Systems, Services, Components
External Service Provider
System Integrator
External Service Provider
Supplier
System Integrator
Supplier
Supplier
External Service Provider
Supplier
Reduced Visibility, Understanding and Control

Approach: Draft SP 800-161, Supply Chain Risk Management for Federal Information Systems and Organizations

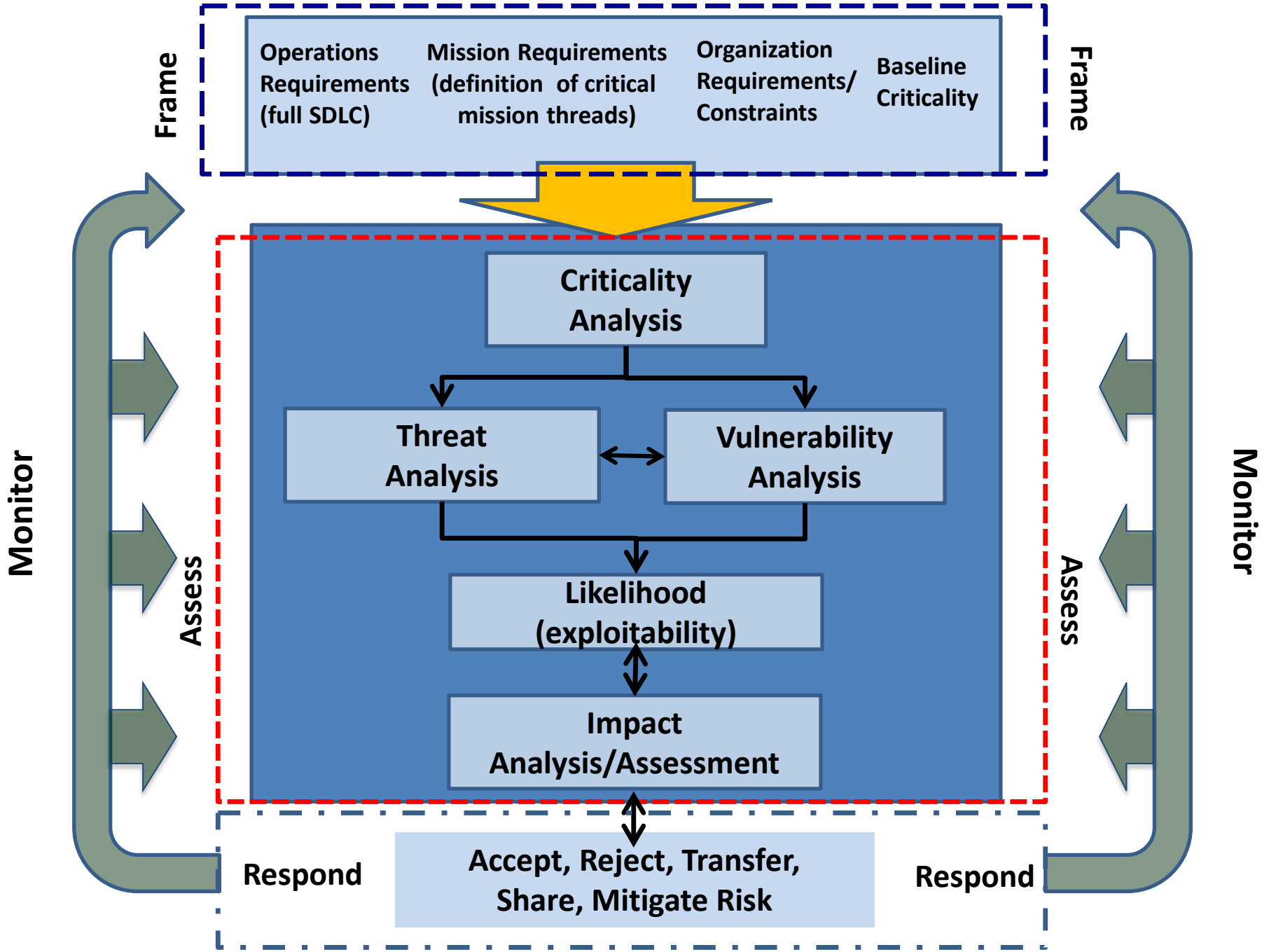


Multi-tiered Approach

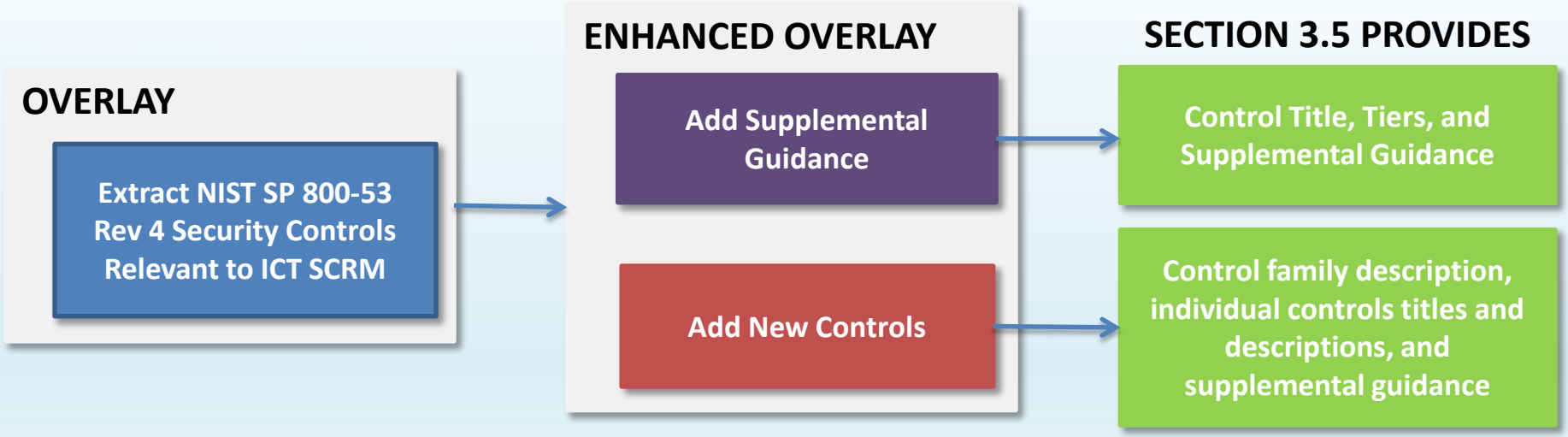
- ICT SCRM responsibilities at each level
- ICT SCRM Plans span all three tiers

Organizational Roles and Activities

Tiers	Tier Name	Type of Role	Activities
1	Organization	• Executive Leadership – CEO, CIO, COO, CFO • Risk executive	• Corporate Strategy • Policy
2	Mission	• Business Management (includes PM, R&D, and Engineering/SDLC oversight) • Procurement • Cost Accounting • ”ility” management – reliability, safety, quality	• Actionable policies and procedures • Guidance • Constraints
3	Operation	• Systems Management – architects, developers, QA/QC, testing • Contracting/procurement – approving selection, payment and approach for obtaining, • Maintenance • Disposal	• Policy implementation • Requirements • Constraints • Implementation


Frame
Operations Requirements (full SDLC)
Mission Requirements (definition of critical mission threads)
Organization Requirements/ Constraints
Baseline Criticality
Frame
Monitor
Assess
Criticality Analysis
Threat Analysis
Vulnerability Analysis
Likelihood (exploitability)
Impact Analysis/Assessment
Assess
Monitor
Respond
Accept, Reject, Transfer, Share, Mitigate Risk
Respond

ICT SCRM Controls



- 6 new controls/supplements
- New family – "Provenance"

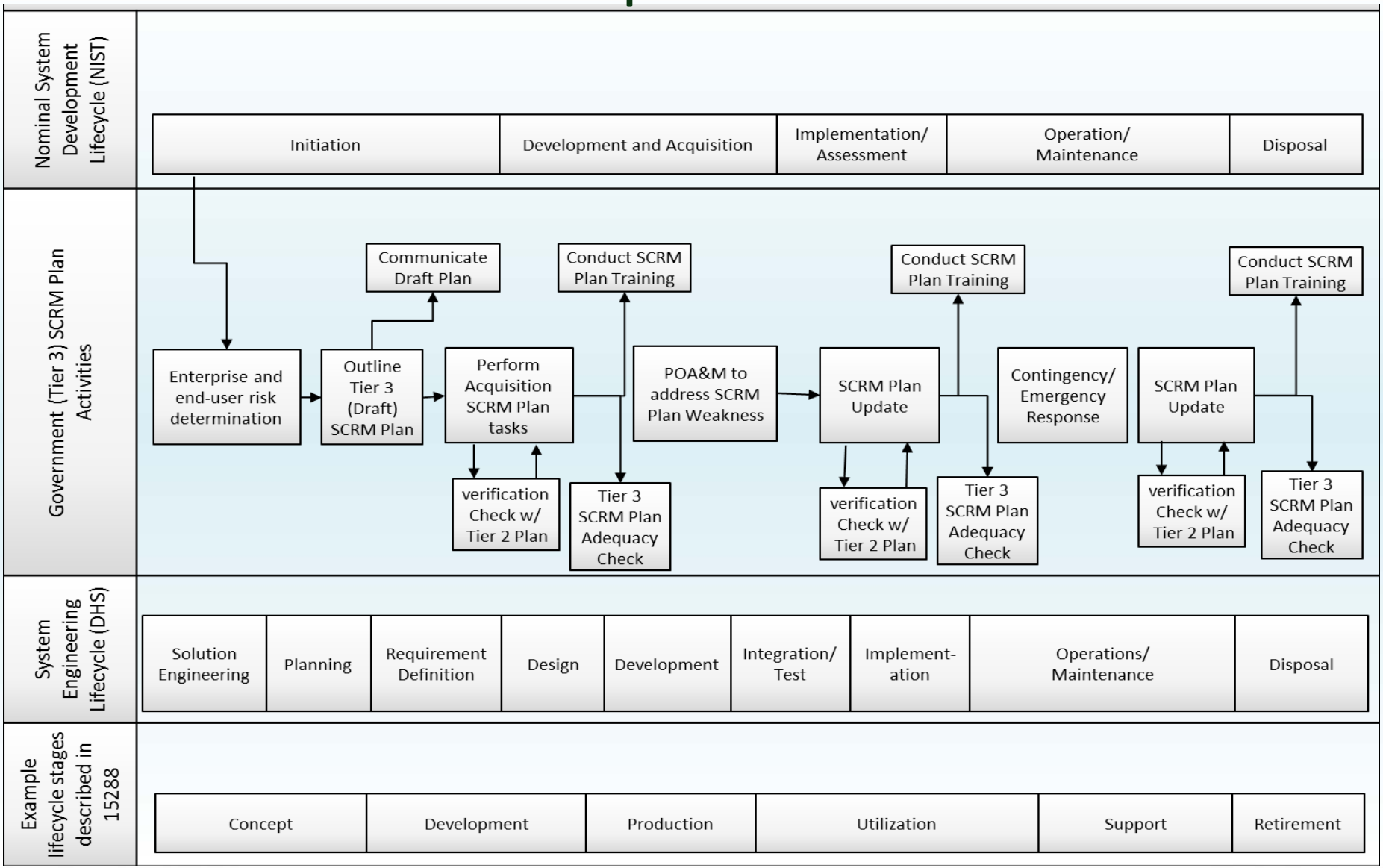
SCRM Control Summary

NIST SP 800-161 SCRM CNTL NO.	800-53 REV. 4 CNTL NO.	CONTROL NAME	800-53 REV. 4 HIGH BASELINE	SCRM BASELINE	TIERS		
		CONTROL ENHANCEMENT NAME			1	2	3
SCRM_AC-1	AC-1	ACCESS CONTROL POLICY AND PROCEDURES	X	X	X	X	X
SCRM_AC-2	AC-2	ACCOUNT MANAGEMENT	X	X		X	X
SCRM_AC-3	AC-3	ACCESS ENFORCEMENT	X	X		X	X
SCRM_AC-3(1)	AC-3 (8)	ACCESS ENFORCEMENT | REVOCATION OF ACCESS AUTHORIZATIONS		X		X	X
SCRM_AC-3(2)	AC-3 (9)	ACCESS ENFORCEMENT | CONTROLLED RELEASE		X		X	X
SCRM_AC-4	AC-4	INFORMATION FLOW ENFORCEMENT	X	X		X	X
…							

Threat Events/Scenarios

- Threat events from NIST SP 800-30
- Scenario framework
  - To aid in Risk Analysis
  - 4 example scenarios

ICT SCRM Plan Template



Status

- 2nd public draft comment review period ended
- Over 400 comments received
- Final draft
  - XML format

Contact

Jon Boyens

jon.boyens@nist.gov

Celia Paulsen

celia.paulsen@nist.gov

http://csrc.nist.gov/scrm/