SOFTWARE ASSURANCE FORUM

BUILDING SECURITY IN

Assurance for CMMI®: A Toolbox for Multiple Cyber Challenges

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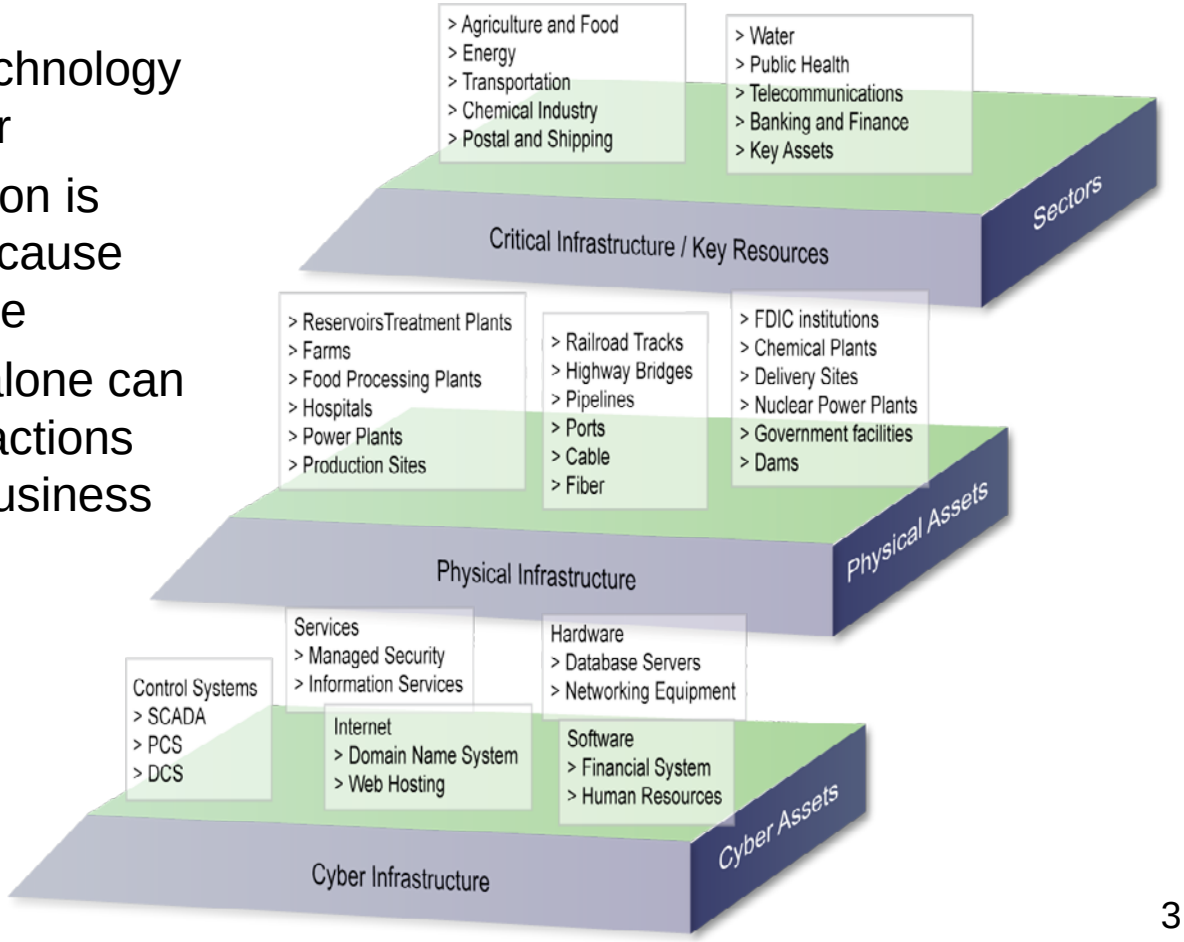
Agenda

- Setting the Stage
- Assurance for CMMI®
- Code Vulnerabilities
- Global Supply Chain
- Organizational Cyberspace
- Next Steps

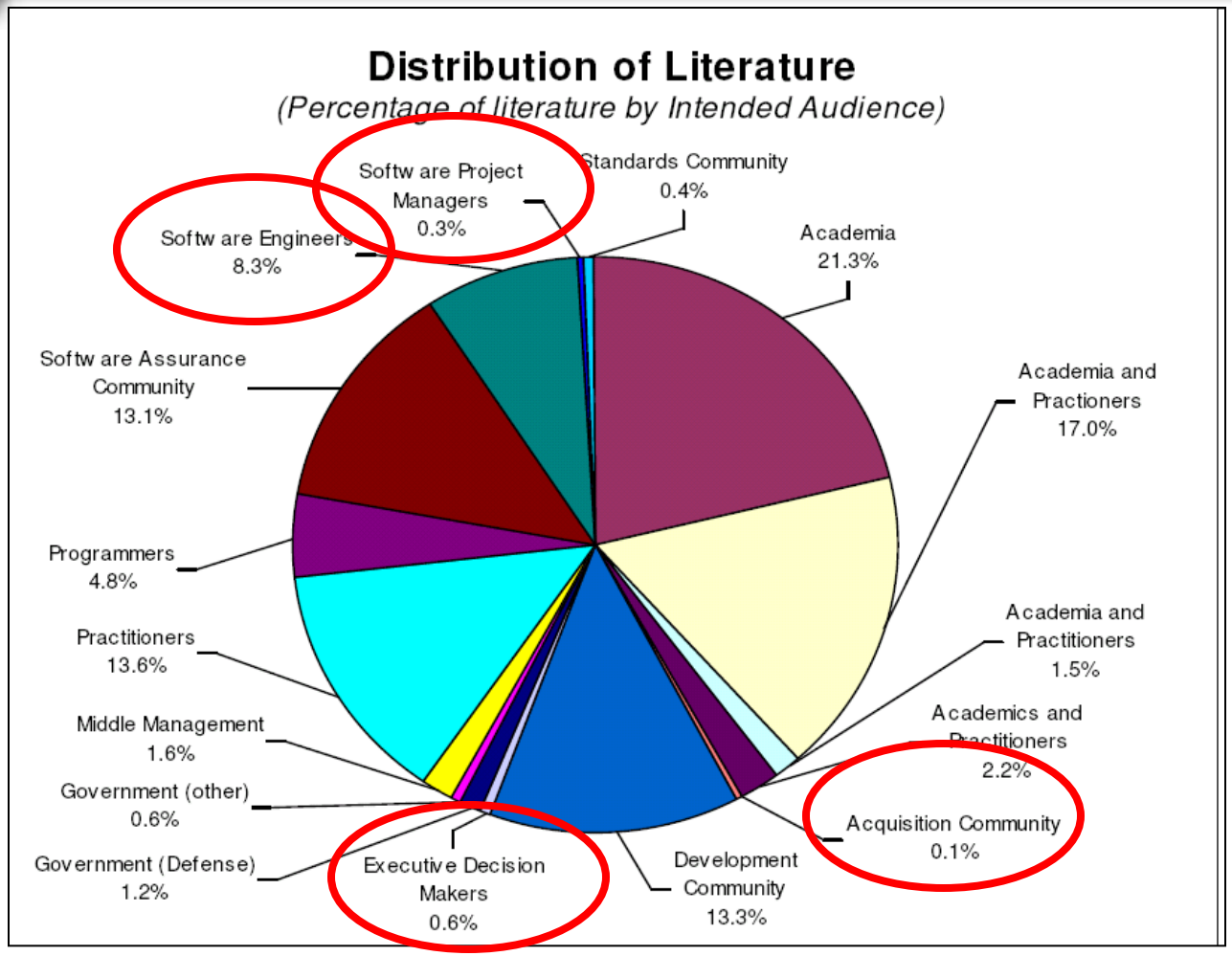
Today's Reality Requires Increased Confidence In Our IT Products and Services

- Dependencies on technology are greater then ever
- Possibility of disruption is greater than ever because software is vulnerable
- Loss of confidence alone can lead to stakeholder actions that disrupt critical business activities



Adapted from: Jarzombek, Mitigating Risks to the Enterprise through Development and Acquisition, SEPG 2009

Gaps Exist In The Intended Audience For SwA Literature



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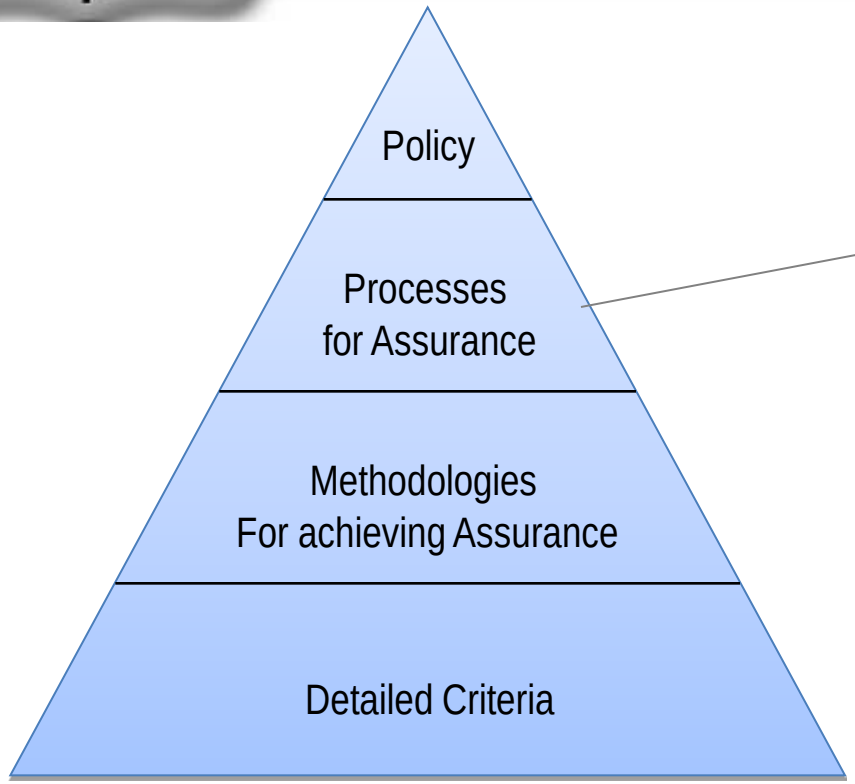
Assurance for CMMI® - A Place To Start



Project leadership and team members need to know where and how to contribute

Focus Topic: Assurance for CMMI® defines the Assurance Thread for Implementation and Improvement of Assurance Practices

https://buildsecurityin.us-cert.gov/swa/procresrc.html

Assurance Focus – Organizational Training

The purpose of Organizational Training (OT) is to develop the skills and knowledge of people so they can perform their roles effectively and efficiently. [1, p. 275]

Addressing an organization's assurance training needs increases the likelihood that qualified and appropriately trained resources are performing the necessary integrated assurance activities on the project.

The use of the Focus Topic as described throughout this document creates a natural inclusion of assurance activities for the following practices within the OT process area: SP1.2, SP1.4, SP2.1, SP2.2, and SP2.3.

SG 1. A training capability, which supports the organization's management and technical roles, is established and maintained.

SP 1.1 Establish and maintain the strategic training needs of the organization.

Understanding the capabilities needed to achieve the strategic business objectives of an organization provides the foundation for planning and executing the necessary assurance skills within the organization.

AF 1.1.1 Establish and maintain the assurance training needs of the organization [2, SP1,3,3]

Specialized skills are necessary to achieve project and organizational assurance objectives. Assurance objectives included in the organization's strategic business objectives and process improvement plan contribute to the identification of potential future training needs.

Examples of categories of training needs for assurance include (but are not limited to) the following:

- Assurance (general awareness, organizational considerations, stakeholder considerations, legal implications, missions needs, abuse/misuse analysis, secure coding, testing, etc)
- Workforce credentials and certification maintenance requirements (i.e. Project Management Professional (PMP), Certified Information Systems Security Professional (CISSP))

Typical Work Products:

- Assurance Training Needs
- Assurance Assessment Analysis

Context of Assurance for the PA

Assurance practice aligned with existing CMMI® Specific practice

Supporting examples, sub practices, etc that clarify the Assurance practice

Typical Work Products

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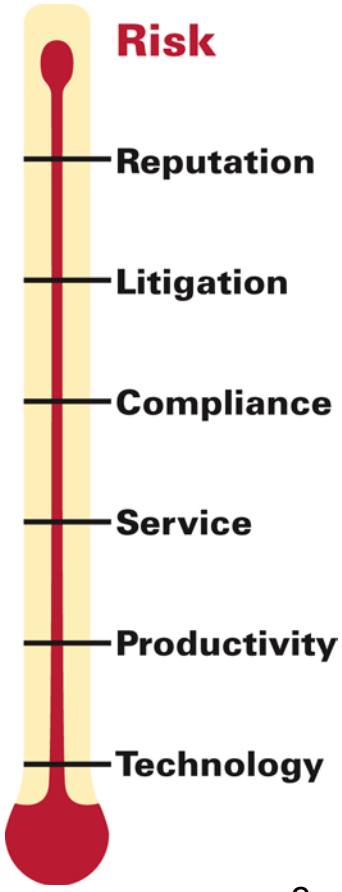
Assurance Risks and Software Quality

- 64% of the vulnerabilities in NVD in 2004 are due to programming errors*
  - 51% of those due to classic errors like buffer overflows, cross-site-scripting, injection flaws*
- Probability of serious vulnerabilities is 52.3% (Capers Jones Overview of the US software Industry, April 2008)
- 27% of development effort is devoted to defect removal, repair, and rework (Capers Jones Overview of the US software Industry, April 2008)
- 67% percent of the attacks in 2007 were "for profit" motivated, ideological hacking came second (Web Application Security Consortium Annual 2007 Report)

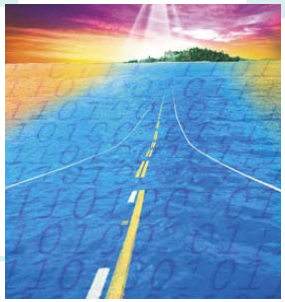


** courtesy of Robert Seacord*

Secure Coding Roadmap

Technology:
Static Analysis, CWE, CVE, CVSS

People:
Project manager
Security analyst
Developer



Assurance for CMMI® Practice
TS AF 3.1.2 Identify deviations from assurance coding standards

Secure Coding Practice Implementation

SDLC Activity	Assurance for CMMI	BSIMM	TSP Secure *
Code Review Checklists	*OPD AF 1.1.1 Establish and maintain organizational processes to achieve the assurance business objectives.* *TS AF 3.1.2 Identify deviations from assurance coding standards.*	SR Level 1: Provide easily accessible security standards and (compliance-driven) requirements	CERT SCI provides language specific secure coding guidelines for C, C++, and Java. To claim compliance with a standard, software developers must be able to produce on request documentation as to which systematic and specific deviations have been permitted during development.
Static Analysis Tools	*IPM AF 1.3.1 Establish and maintain assurance of the project's work environment based on the organization's work environment standards.*	CR Level 2: Enforce standards through mandatory automated code review and centralized reporting CR Level 3: Build an automated code review factory with tailored rules	Automatable guidelines are identified by WG14/N1393. Remaining guidelines are enforced through manual inspection. The CERT Source Code Analysis Laboratory certifies conformance to standards.

** courtesy of Robert Seacord*

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IT Risks from Supply Chain

- Deliberately embedded malicious functionality
- Theft to intellectual property
- Fake or counterfeit products
- Exploitable IT/software unintentionally produced by suppliers with poor security practices
- Lack of developer and acquirer awareness of associated risks

Increased Vigilance Is Critical To Reducing IT Risks From The Supply Chain

Adopted from Marcus H. Sachs, Verizon, "Supply Chain Risk Management: Can we Secure the IT Supply Chain in the Age of Globalization?" Software Assurance Forum, 15 Oct 2008

Supply Chain Integrity Roadmap

Technology:

Automated Penetration Testing Tools

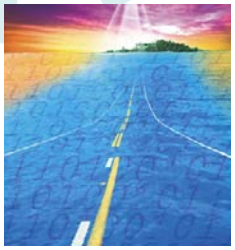
Network Vulnerability Scanners

People:

Project manager

Security analyst

Developer



Assurance for CMMI® Practice:

TS AF 2.1.1 Architect for assurance.

TS AF 2.1.2 Design for assurance.

TS AF 3.1.1 Implement the assurance designs of the product components.

VAL AF 2.2.1 Analyze the results of assurance validation activities.

VER AF 3.2.1 Analyze the results of assurance verification activities.

- **Established Design Principles**
  - **Chain of Custody: The confidence that** each change and handoff made during the source code's lifetime is authorized, transparent and verifiable.
  - **Least Privilege Access: Personnel can** access critical data with only the privileges needed to do their jobs.
  - **Separation of Duties: Personnel cannot** unilaterally change data, nor unilaterally control the development process.
  - **Tamper Resistance and Evidence:** Attempts to tamper are obstructed, and when they occur they are evident and reversible.
  - **Persistent Protection: Critical data is** protected in ways that remain effective even if removed from the development location.
  - **Compliance Management: The success** of the protections can be continually and independently confirmed.
  - **Code Testing and Verification: Methods** for code inspection are applied and suspicious code is detected.

The Software Supply Chain Integrity Framework Defining Risks and Responsibilities for Securing Software in the Global Supply Chain http://www.safecode.org/publications/SAFECode_Supply_Chain0709.pdf

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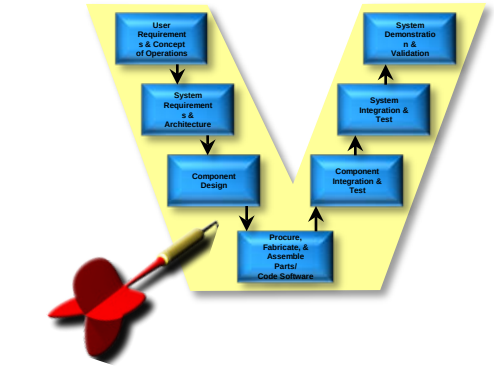
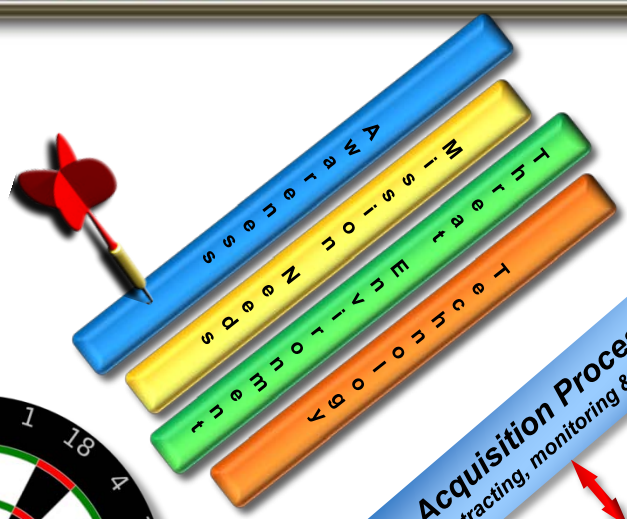
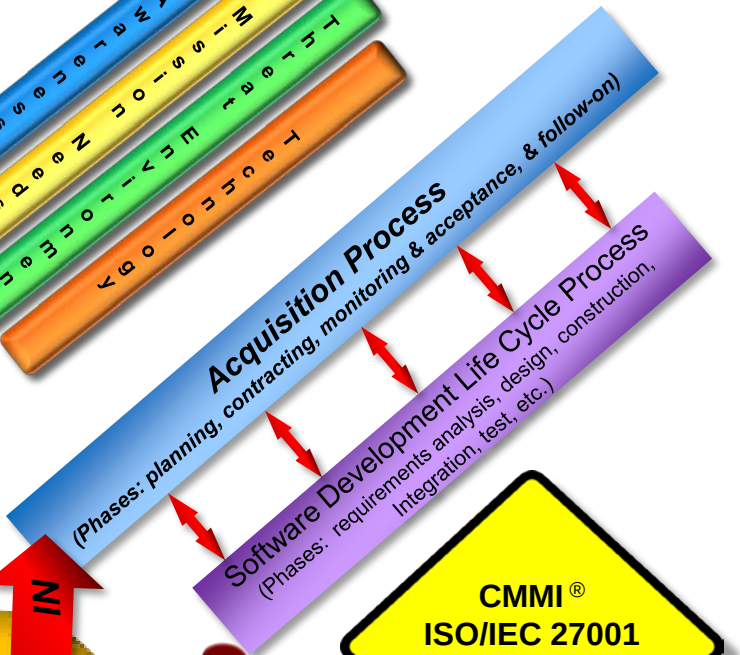
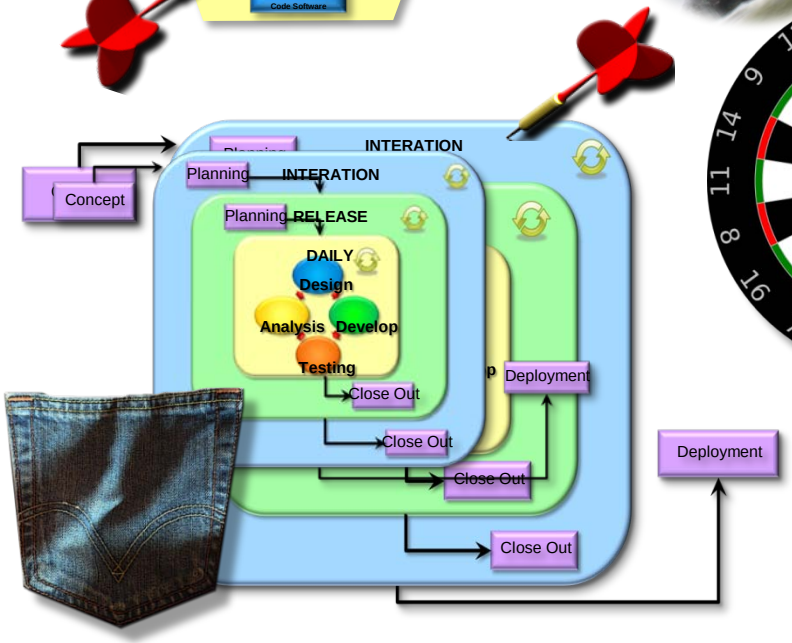
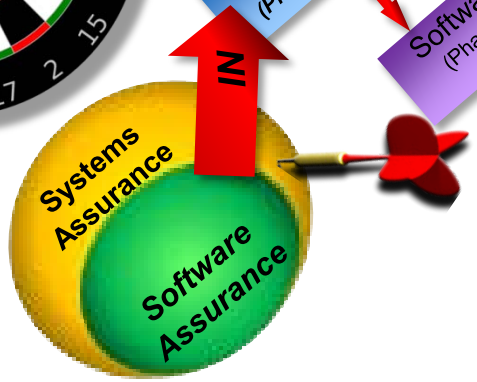
Stovepiped Assurance Efforts Miss The Dartboard











Organizational Cyberspace

Technology:

Process, Measurement, and Artifact Repositories

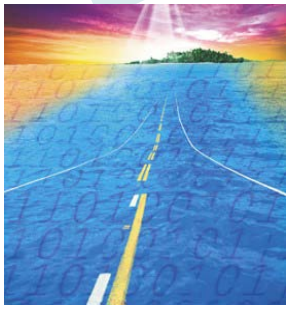
Social Media

People:

Executive Sponsors

Project Managers

Project Teams



Assurance for CMMI® Practice

OPF AF 1.1.1 Establish and maintain the description of the assurance context and objectives for the organization.

OPD AF 1.1.1 Establish and maintain organizational processes to achieve the assurance business objectives.

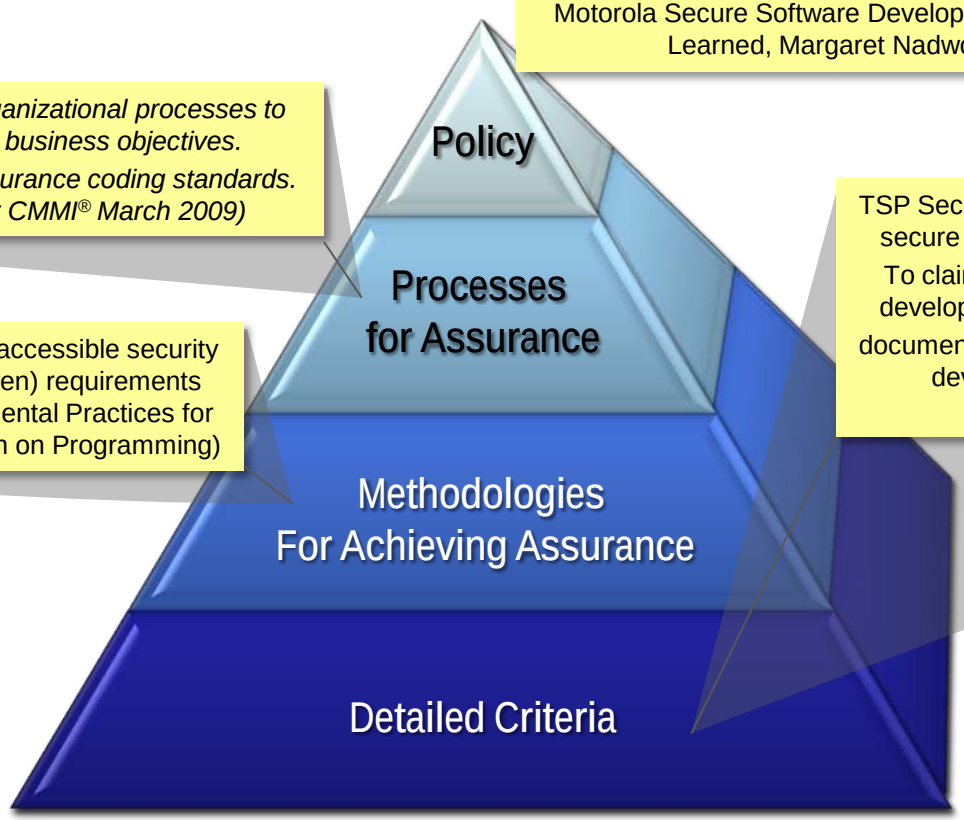
OT AF 1.1.1 Establish and maintain the strategic assurance training needs of the organization

Assurance for CMMI® Provides the Framework to Connect Development Activities to Assurance Goals

"It is the policy of Motorola to offer security solutions designed to protect the confidentiality, integrity and availability of information and other assets appropriate to their value to Motorola, and to service providers (and their customers) using Motorola products." (source: Motorola Secure Software Development Model (MSSDM) Lessons Learned, Margaret Nadworny, August 10, 2007)

Establish and maintain organizational processes to achieve the assurance business objectives.

Identify deviations from assurance coding standards. (Source: Assurance for CMMI® March 2009)



BSIMSR Level 1: Provide easily accessible security standards and (compliance-driven) requirements
Safecode Whitepaper - Fundamental Practices for Secure SW Development (section on Programming)

TSP Secure CERT SCI provides language specific secure coding guidelines for C, C++, and Java.

To claim compliance with a standard, software developers must be able to produce on request documentation as to which systematic and specific deviations have been permitted during development.

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SCAMPI[SM] Is A Tool To Identify Assurance Process Institutionalization Risks

Plan and Prepare for Appraisal

- Analyze Requirements
- Develop Appraisal Plan
- Obtain and Analyze Initial Objective Evidence
- Select and Prepare Appraisal Team
- Prepare for Collection of Objective Evidence

Conduct Appraisal

- Examine Objective Evidence
- Verify and Validate Objective Evidence
- Document Objective Evidence
- Generate Appraisal Results

Report Results

- Deliver Appraisal Results
- Package and Archive Appraisal Assets

Incorporate Assurance Focus Practices

[SM] SCAMPI is a service mark of Carnegie Mellon University

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What can you do?

- *Use "Draft Practices" to identify gaps in your assurance practices https://buildsecurityin.us-cert.gov/swa/procresrc.html*
- Measure and improve your *assurance practices*
- *Share your lessons learned (swawg-process @ cert.org)*

References for Integrating Assurance

- DHS Software Assurance Working Groups
  - https://buildsecurityin.us-cert.gov
  - http://www.us-cert.gov/swa/
- IATAC /DACS
  - http://iac.dtic/iatac
  - https://www.thedacs.com
  - Enhancing the Development Life Cycle to Produce Secure Software
  - State of the Art Report on Software Security Assurance
- NIST
  - http://csrc.nist.gov/
- NDIA
  - Systems Engineering Division
  - System Assurance Guidebook
- SANS
  - http://www.sans.org/
- International Organization for Standardization (ISO)
  - http://www.iso.org
- Software Security Engineering
  - http://www.softwaresecurityengineering.com/
  - http://www.amazon.com/Software-Security-Engineering-Project-Managers/dp/032150917X

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