Secure Code Development

ISACA South Florida

7th Annual WOW! Event

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Background

- What is software security?
  - Protecting software against malicious attack so that the software continues to function correctly
  - The ability of the software to ensure the Confidentiality, Integrity, and Availability of the sensitive data on the system

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Background

- Measuring software security
  - Dependability
  - Trustworthiness
  - Resilience
  - Conformance

Software Assurance

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Background

- Perspective Case Study: **Target Data Breach**

  "Target said 40 million credit and debit card accounts had been affected by a data breach that happened between November 27th and December 15th, 2013."

  "The Consumer Bankers Association estimated that the cost of card replacement for its members has reached $172 M."

  "When the final tally is in, Target's breach may eclipse the theft at TJX, which compromised more than 90 million records."

- The Associated Press

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Building a Business Case for Secure Coding

- The cost of insecure software
  - ✓ Software consumers are demanding software assurance
  - ✓ Fixing bugs and flaws is very costly after implementation
  - ✓ Compliance with technology security standards

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Top-Down Approach to Develop Secure Code

- Make enterprise security the responsibility of leaders at a governance level
- Develop a secure code initiative and create a secure coding team (not just developers)
- Empower IT leadership with a budget and the political capital to succeed
- Use a benchmark to evaluate the performance of the organization's secure code initiative. For example, Building Security In Maturity Model (BSIMM)

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Developing a Secure Code Initiative

- Select a framework to help the organization formulate and implement a strategy for software security. For example, Open Software Assurance Maturity Model (OpenSAMM)
- Adopt a secure coding standard
- Integrate secure coding best practices into the SDLC
- Implement an awareness and training program for secure code development
- Integrate collaborative testing tools and techniques to facilitate code reviews (automated processes)

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Integrating Best Coding Practices into the SDLC

- **Software Development Models:**
  - ❖ Waterfall model
  - ❖ Spiral model
  - ❖ Rapid application development
  - ❖ Agile development
  - ❖ And others

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Integrating Best Coding Practices into the SDLC

- **Agile Development Model:**
  - **Agile Manifesto (2001):** Promotes software development following these principles:
    - ✓ Individuals and interactions over processes and tools
    - ✓ Working software over comprehensive documentation
    - ✓ Customer collaboration over contract negotiation
    - ✓ Responding to change over following a plan

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Integrating Best Coding Practices into the SDLC

- **Agile Development Model**
  - Agile Methods Security Concerns:
    - ✓ Agile is about building software quickly
    - ✓ Move fast and iterate
    - ✓ Respond to feedback
    - ✓ Emphasis on velocity and business value
    - ✓ Deliver software before it is finished

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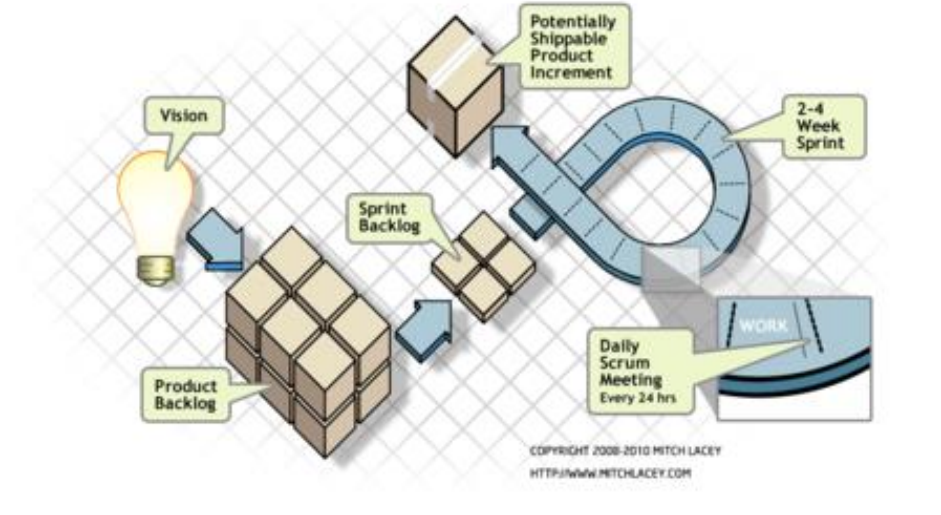
Integrating Best Coding Practices into the SDLC

➢ Agile Scrum

- Scrum is an agile method for project management
  - ✓ It is a TEAM based collaborative approach
  - ✓ Iterative and incremental
  - ✓ Always focus on delivery



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Integrating Best Coding Practices into the SDLC

➢ Agile Scrum

- Sprints are the basic units of development in Scrum
  - ✓ Usually from 2 to 4 weeks long
  - ✓ The release date of a product determines the number of Sprints
  - ✓ Sprint planning sessions assign tasks to developers
  - ✓ At the end of each sprint there is a customer (product owner) demo
  - ✓ Requirements may change after the demo phase

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Integrating Best Coding Practices into the SDLC

- **Agile Scrum**
  - Scrum Master Role
    - Facilitate sprint planning, retrospective and sprint demos
    - Assist the product owner with keeping the backlog groomed
    - Ensure cross-team coordination
    - Reach out to the larger company network for impediment removal
    - Etc.

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Integrating Best Coding Practices into the SDLC

- **What about software security?**

"Incorporate Security activities into all phases of the SDLC process, from initiation to disposal, regardless of the software development method used."

Agile Method: Development life cycle is divided into "increments" or "iterations", in which each of these increments touches on each of the conventional phases of development.

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Integrating Best Coding Practices into the SDLC

- **What about software security?**

"Incorporate Security activities into all phases of the SDLC process, from initiation to disposal, regardless of the software development method used."

Traditional Methods: Development life cycle is divided into systems analysis and requirements definition, systems design, development, integration and testing, acceptance, installation, deployment, evaluation, and disposal.

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Integrating Best Coding Practices into the SDLC

- **Software Requirements Definition**
  - Consider security requirements, not just functional requirements
    - ✓ Authentication
    - ✓ Role Based access controls
    - ✓ Separation of duties
    - ✓ Automated data integrity checks

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Integrating Best Coding Practices into the SDLC

- **System Design**
  - ➢ Perform software architecture risk analysis
    - ✓ Review exception handling for application overrides
    - ✓ Evaluate:
      - ❑ Functional and security requirements
      - ❑ Component interfaces
      - ❑ Component communications and dependencies
      - ❑ Component responsibilities

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Integrating Best Coding Practices into the SDLC

- **System Implementation**
  - Perform code reviews before application goes into deployment
    - ✓ Pay attention to “backdoors” in the source code
    - ✓ Look out for shortcuts to get the product out the door
    - ✓ Don’t accept the comment “But the user would never do that!

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Integrating Best Coding Practices into the SDLC

- **System Deployment**
  - Review separation of duties during deployment
  - Examine backup procedures and documentation
  - Test passwords used on the sandbox environment
  - Monitor application behavior for unexpected results

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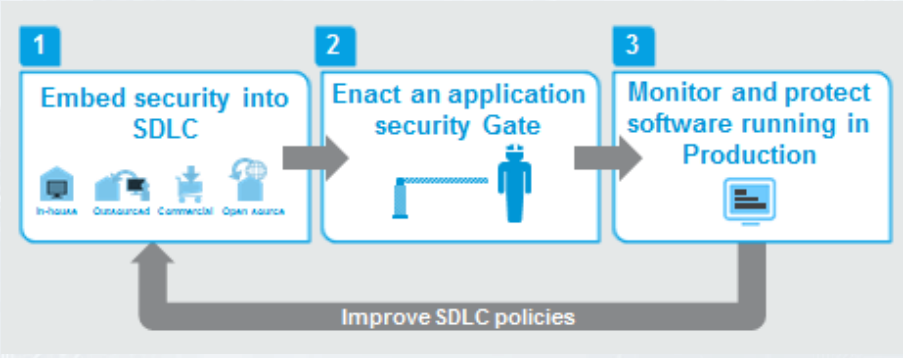
Integrating Best Coding Practices into the SDLC

- **System Maintenance**
  - Conduct regular code reviews
  - Evaluate change management controls
  - Review major changes to components of the application



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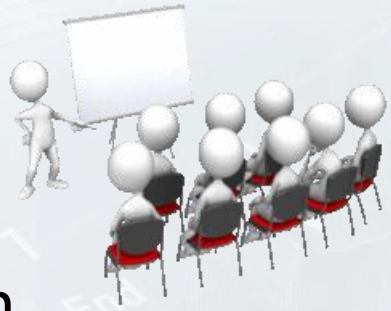
Secure Code Awareness and Training for Developers

- Awareness + Training = Education
- Embed training into the SDLC
- Education should be an ongoing process
- Measure the effectiveness of this program
- Outcome of Training = Accountability



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Conduct an Independent Secure Code Audit

- **Purpose:**
  - **Security Flaws and Bugs:** Discover flaws in the programming that may be lead to security exploitations. For example:
    - ✓ **Unsecure and unvalidated input or output** - Cross-site scripting, SQL injection
    - ✓ **Improper Exception Handling** - Debugging and error messages
    - ✓ **Insecure communication protocols**- Clear-text and unauthenticated protocols
    - ✓ **Broken or incomplete authentication controls** - User ID manipulation
    - ✓ **Flawed session management** - Session or Cookie hijacking
    - ✓ **Bounds checking** - Buffer or Integer overflows
    - ✓ **Weak storage encryption** - Broken or insecure encryption algorithms

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- **Auditing Software after a Breach**

  - **Forensic investigative and analytical skills and abilities are needed**
    - ✓**Technical skills**
      - Building a digital audit trail
      - Understand computer fraud techniques
      - Understand information collected from various computer logs
      - Understand the inner workings of web servers, firewalls, attack methodology, security procedures & penetration testing

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- **Auditing Software after a Breach**

  - **Forensic investigative and analytical skills and abilities are needed**
    - ✓**Conduct a review of:**
      - Computer Incident Response Plan and its performance after a successful cyber attack
      - Chain-of-custody process
      - Information Security Policies and Procedures
      - Secure Code Awareness and Training for Developers
      - Organizational and legal protocols for incident handling
      - Other elements of the Secure Code Development Program

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Summary

- ✓ Software assurance implies dependability, trustworthiness, resilience, and conformance
- ✓ Consumers are demanding better software security
- ✓ Security is the responsibility of leaders at a governance level
- ✓ Integrate secure coding best practices early
- ✓ Embed software architecture and code risk analysis into the SDLC
- ✓ Develop a secure code awareness and training program for all stakeholders
- ✓ Conduct independent secure code audits
- ✓ Assume the organization will have a security breach , so be prepared

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References

ISO/IEC 9126

Special Publication 800-64

Q & A

THANK YOU!