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

OWASP
The Open Web Application Security Project

ISO/IEC 9126

CERT
Software Engineering Institute
Carnegie Mellon

Special Publication 800-64

NIST
National Institute of Standards and Technology
Technology Administration
U.S. Department of Commerce
THANK YOU!