Web Application Security Development

CSE 403
2013-11-20

Introduction

- Who am I?
  - Zak Dehlawi

- Why am I here?
  - Talk to you about Secure Development Lifecyles (SDL) and WebApp security

Introduction

- PhD Student
  - UW Information School
  - Advising Committee
    - Dr. Barbara Endicott-Popovsky
    - Dr. Jochen Scholl
    - Dr. Yoshi Kohno
- Education
  - Johns Hopkins M.S. Security Informatics
  - UW CSE and PoliSci bachelor degrees

Introduction

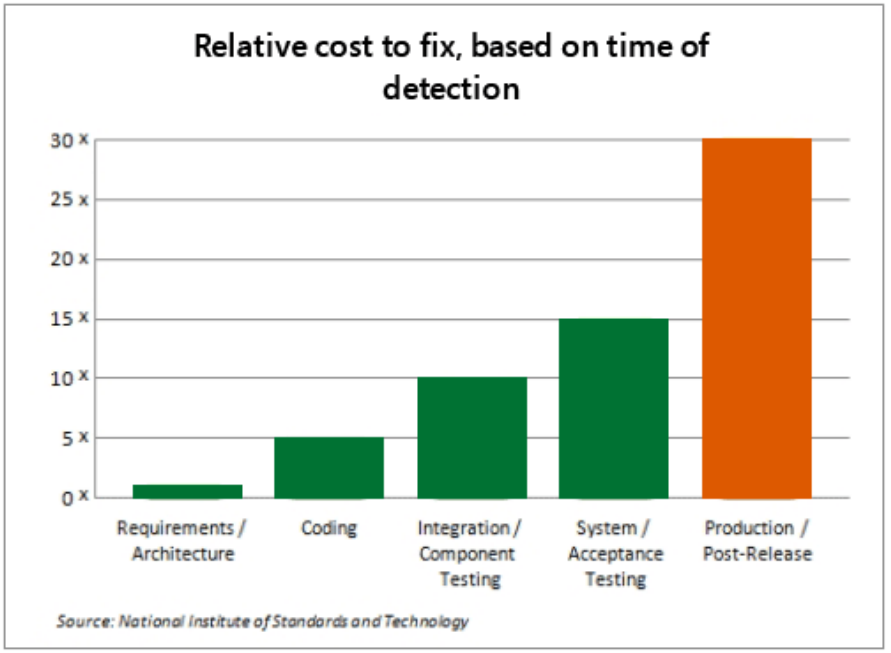
- Senior Security Engineer
  - Security Innovation, Inc.
    - Cool place, come work there with me
  - Primary Tasks:
    - Threat Modeling
    - Secure Development Lifecycle
    - Penetration Testing

Outline

- SDL
- OWASP
- A1-Injection
- A2-Broken Authentication and Session Management
- A3-Cross-Site Scripting (XSS)
- A6-Sensitive Data Exposure

SDL

- Why a Secure Development Lifecycle?
  - Reduces the total number of vulnerabilities
  - Addresses compliance requirements
  - Reduce the cost of development
    - Fixes later in development cycle are more costly to address



Source: Micrsoft SDL - Benefits, NIST May 2002

SDL

- Phases
  - Training (Regularly scheduled)
  - Requirements
  - Design
  - Implementation
  - Verification
  - Release
  - Response (Post-Release)

SDL

- Phases
  - Training (Regularly scheduled)
    - Developers, Testers, PMs, Architects
  - Requirements
    - Establish security requirements (Compliance + regulation
  - Design
    - Security architecture review
    - Attack surface analysis
    - Threat modeling

SDL

- Phases
  - Implementation
    - Security code reviews
    - Static code analysis
  - Verification
    - Penetration testing
    - Fuzz testing
  - Release
    - Incident response plan
    - Black-box penetration testing
  - Response (Post-Release)
    - Execute incident response plan

OWASP

OWASP
The Open Web Application Security Project

- OWASP Top 10-2013 (Select few)
  - A1-Injection
  - A2-Broken Authentication and Session Management
  - A3-Cross-Site Scripting (XSS)
  - A6-Sensitive Data Exposure

OWASP: A1-Injection

- Types:
  - SQL
    - Update, delete, read arbitrarily from database
      - Little Bobby Tables
        - Robert'); DROP TABLE Students;--
  - OS
    - Execute arbitrary OS or interpreter commands
  - XML
    - XML Bombs with inline DTD
    - XML External Entity attacks
  - JSON
    - Define arbitrary entities
  - etc.

OWASP: A1-Injection

- Mitigations
  - SQL
    - Use ORMs and DALs
    - Use parameterized queries
  - OS
    - Never eval or execute user supplied input
  - XML
    - Disable inline DTD in the XML parser
      - Default in most parsers now
  - JSON
    - Use CSRF tokens
  - etc.

OWASP: A1-Injection

OWASP: A2-Broken Authentication and Session Management

- Types:
  - Session Fixation
  - Session tokens are weakly generated
  - Session tokens are not protected by SSL/TLS
- Mitigations
  - Issue new sessions upon login
  - Use cryptographically secure random number generators
    - Or make sure your framework is using one
  - Use HTTPS and mark cookies as Secure

OWASP: A3-Cross-Site Scripting

- Types:
  - Stored
  - Reflected
  - DOM based
  - Includes HTML injection
    - Favorite test is to use ><marquee> tag
- Mitigations
  - Escape untrusted input
    - Frameworks have tools for that

OWASP: A3-Cross-Site Scripting

OWASP: A6-Sensitive Data Exposure

- Types:
  - Personally Identifiable Information
  - Credit Cards
  - Passwords
- Mitigations
  - Encrypt in database
    - Attackers can steal encryption keys
  - Use SSL/TLS for transmission
  - DON’T STORE IT!
    - Use OpenID
    - Email based authentication

OWASP: A6-Sensitive Data Exposure

- Password Storage
  - Thou Shalt NOT:
    - Store plaintext passwords
    - Encrypt passwords
    - Use vanilla SHA1, SHA512, MD5, etc.
  - Thou Shalt:
    - Use password storage mechanism
      - bcrypt, scrypt, PBKDF2
    - Use a unique salt per password

Information Security Careers

- 0% unemployment rate
- Federal government is hiring
- Corporate world is hiring
- Pays pretty well
- Information security is fun
- You get to be a cyber-warrior

Contact Information

- Contact Information
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Questions!?? and Brainstorm!!1