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Vulnerability Management in an Application Security World

OWASP San Antonio

January 29th, 2009

Agenda

- Background
- A Little Bit of Theatre
- You Found Vulnerabilities – Now What?
- Vulnerability Management – The Security Perspective
- Defect Management – The Development Perspective
- Making it Work
- Case Studies
- Questions

Background

- Dan Cornell
  - *Principal at Denim Group www.denimgroup.com*
  - *Software Developer: MCSD, Java 2 Certified Programmer*

- Denim Group
  - *Texas-based consultancy*
  - *Application Development*
    - Java and .NET
  - *Application Security*
    - Assessments, penetration tests, code reviews, training, process consulting

A Little Bit of Theatre

- This is a one-act play entitled: “We Found Some Vulnerabilities”
- Need a volunteer

You Found Vulnerabilities – Now What?

- Security Industry is too focused on *finding* vulnerabilities
  - *Especially in application security this typically isn't hard*
- *Finding* vulnerabilities is of little value
- *Fixing* vulnerabilities is actually valuable
- Mark Curphey: Are You a Builder or a Breaker
  - *http://securitybuddha.com/2008/09/10/are-you-a-builder-or-a-breaker/*

Vulnerability Management – The Security Perspective

- Steps:
  - *Policy*
  - *Baseline*
  - *Prioritize*
  - *Shield*
  - *Mitigate*
  - *Maintain*
- For more information see: http://www.gartner.com/DisplayDocument?doc_cd=127481

So How Are We Doing?

- Policy
  - *Does your organization have policies for Application Security?*
  - *Or is your policy "Use SSL and do the OWASP Top 10"?*
- Baseline
  - *What are your organization's testing strategies?*
  - *Hopefully not "Run scanner XYZ the day before an application goes into production"*
  - *Also – do you actually know how many applications you have in production?*
- Prioritize
  - *How do you determine the business risk?*
  - *Critical, High, Medium, Low often does not account for enough context*
  - *To defend everything is to defend nothing*

So How Are We Doing? (continued)

- Shield
  - *Have you deployed technologies to help protect you in the interim?*
  - *WAFs, IDS/IPF*
- Mitigate
  - *Do your developers know what the actual problems are?*
  - *Do your developers know how to fix them?*
  - *When are these vulnerabilities going to be addressed and when do they go into production?*
- Maintain
  - *Web applications are dynamic – what is the ongoing testing strategy?*

Defect Management – The Developer Perspective

- Every day has 8 hours (12 if pizza and Jolt are made available)
- A given defect is going to require *X* hours to fix (+/- 50%)
- Tell me which defects you want me to fix and I will be done when I am done (+/- 50%)

Why is Vulnerability Management Hard for Application-Level Vulnerabilities

- Actual business risk is challenging to determine
- People who find the problems do not typically know how to fix them
  - *Or at the very least they are not going to be the people who fix them*
- People who have to fix the problems often do not understand them
- Infrastructure fixes are typically cookie-cutter, Application fixes are much more varied
  - *Patches and configuration settings*
  - *Versus a full custom software development effort*
- Software development teams are already overtaxed
- Applications no longer under active development may not have development environments, deployment procedures, etc

Making It Work

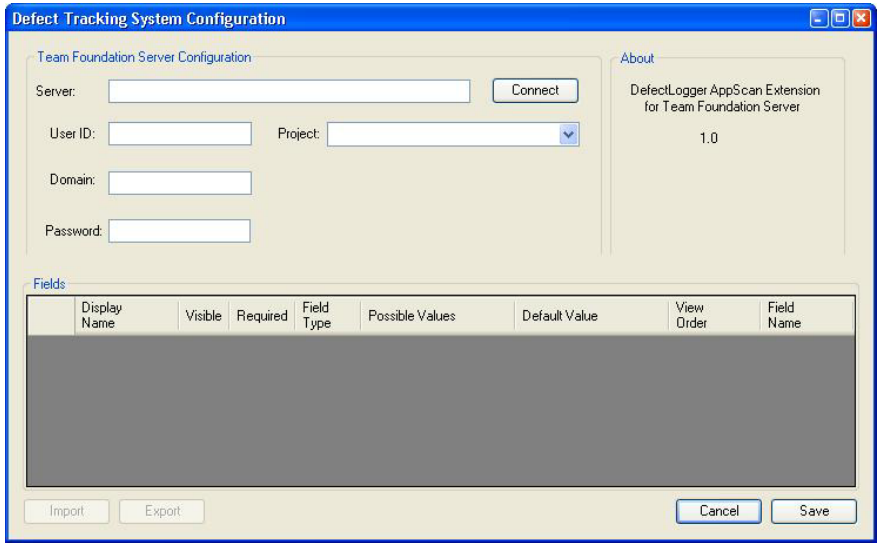
- Application security vulnerabilities must be treated as software defects
- Use risk and effort to prioritize

Application Vulnerabilities as Software Defects

- Track them in your defect management system (bug tracker)
- Select defects to address for each development cycle or release

Interesting Resource

- DefectLogger
  - *Extension to IBM Rational AppScan to send vulnerabilities to defect tracking systems*
  - *Available for Microsoft Team Foundation System (TFS), Quality Center and ClearQuest*
  - *I wrote the TFS version and won a Nintendo Wii*
  - *See: http://code.google.com/p/defectloggertfs/*



Risk and Effort

- Risk crossed with remediation effort
- Risk: STRIDE and DREAD (there are others)
- Effort: Development hours and other resources

Risk Calculation Exercise

- Quantitative risk can be hard to calculate
- Weighted Cost = Likelihood of occurrence x Cost of occurrence
- What is the chance (%) that Amazon.com will have a publicly-accessible SQL injection vulnerability exploited within the next year?
- What would the monetary damage be to Amazon.com if a publicly-accessible SQL injection vulnerability was exploited?

STRIDE

- Spoofing Identity
- Tampering with Data
- Repudiation
- Information Disclosure
- Denial of Service
- Elevation or Privilege

DREAD

- Damage Potential
- Reproducibility
- Exploitability
- Affected Users
- Discoverability

- Assign levels: 1, 2, 3 with 3 being the most severe
- Average the level of all 5 factors

- Define your DREAD levels up-front and apply consistently
  - *Organization-wide DREAD baseline*
  - *Application-specific DREAD standards*

Level of Effort Calculation

- Varies widely by type of vulnerability and number of vulnerabilities
- Logical Vulnerabilities versus Technical Vulnerabilities
  - *Technical Vulnerabilities tend to be based on coding issues*
    - Injection flaws, XSS, configuration issues
  - *Logical Vulnerabilities are specific to the application*
    - Depend on business logic and business context
    - Authentication, authorization, trust

Estimating Technical Vulnerabilities

- time per fix x number of issues
- Verification typically easier because the application should behave as it always did, except that it now handled problem inputs correctly
- Go back to “coding” phase of SDLC

Estimating Logical Vulnerabilities

- Fix strategies are more varied than technical vulnerabilities
- May have to go farther back in the SDLC
  - *Coding*
  - *Architecture/Design*
  - *Even Requirements*
- Change may require more broad change management initiatives
  - *If other applications within your organization or other organizations are impacted*

Application Vulnerability Management

- Policy
  - *Have specific, actionable policies*
  - *What are development standards?*
  - *What types and levels of risks are acceptable in production?*
- Baseline
  - *Know your application portfolio*
  - *Have a regular program of assessment in place*
- Prioritize
  - *Use a risk-based approach tuned to your organization*
  - *Involve development teams to understand levels of effort for remediation*

Application Vulnerability Management

- Shield
  - *Consider deploying technologies to provide short-term relief*
    - Web Application Firewalls (WAFs)
    - Web-relevant IDS/IPF
  - *Understand that these are temporary measures*
- Mitigate
  - *Work application remediation into development schedules*
  - *Confirm that fixes have been applied and were applied correctly*
  - *Be sure fixes are deployed into production*
- Maintain
  - *Vulnerability management is not a one-time activity*

Case Studies

- Authentication FUBAR
- Legacy Nightmares
- When Tools Fail

Authentication FUBAR

- Situation
  - *Several public-facing flagship applications under moderate ongoing development*
- Vulnerabilities
  - *Various SQL injection and XSS*
  - *Authorization problems*
  - *Pervasive poor deployment practices (backup files, configuration issues)*
  - *Verbose HTML comments with sensitive information*
  - *Major, fundamental issue with Authentication*
    - Along the line of using SSNs to authenticate users to a system
    - Connected to many partner organizations

Authentication FUBAR (continued)

- Approach
  - *Fix the serious SQL injection and publicly-accessible XSS immediately in an out-of-cycle release*
  - *Address authorization problems and some other issues during next planned release*
  - *Major full lifecycle, change management initiative to address Authentication issue*
  - *Defer remaining issues as "nice to fix"*

Legacy Nightmares

- Situation
  - *10 year old application with hundreds of pages*
  - *Has been on end-of-life status for 5 years*
  - *NO active development*
- Vulnerabilities
  - *Hundreds of SQL injection, XSS*
  - *Authorization issues*
- Approach
  - *Sit in the corner and cry softly for a few minutes*
  - *Identify most critical SQL injection and XSS issues for code-level fixes*
  - *Fix authorization issues*
  - *Rely on WAF to address remaining issues*

When Tools Fail

- Situation
  - *Thick-client application with a local database*
  - *Connects to web services and ERP*
- Vulnerabilities
  - *Code scanner identified many SQL injection vulnerabilities affecting the local database*
  - *Code scanner identified some quality issues that could impact security*
  - *Manual code inspection identified some frightening design issues affecting attack surface*
- Approach
  - *Ignore local SQL injection issues for now*
  - *Ignore quality issues for now*
  - *Address design issues before the initial release*

Questions?

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