DENIM GROUP

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Vulnerability Management in an Application Security World

OWASP DC

August 5th, 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
  - *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

Audience Composition?

- Software Developer
- Infrastructure Security
- Application Security
- Project Manager
- Other
- All of It

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/*

- Organization's goal is to understand their risk exposure and bring that in-line with their policies
- Finding vulnerabilities is only the first step on that road

Vulnerability Management – The Security Perspective

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

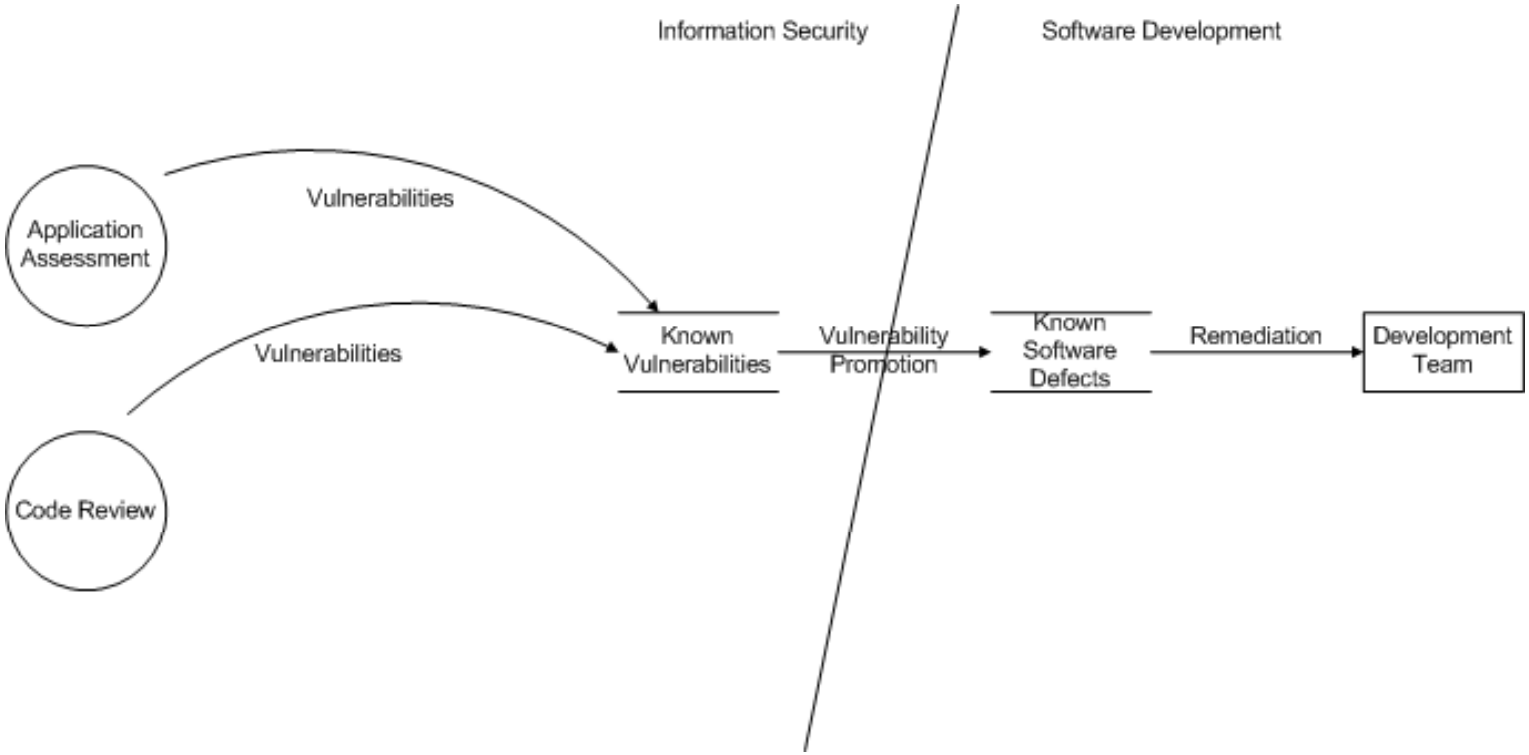
So How Are We Doing?

- 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?*
  - *Did the application development team* actually *fix the vulnerabilities when they said they did?*
- Maintain
  - *Web applications are dynamic – what is the ongoing testing strategy?*

Process



Defect Management – The Developer Perspective

- Every day has 8 hours
  - *12 if pizza and Jolt Cola 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

Why is Vulnerability Management Hard for Application-Level Vulnerabilities

- 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

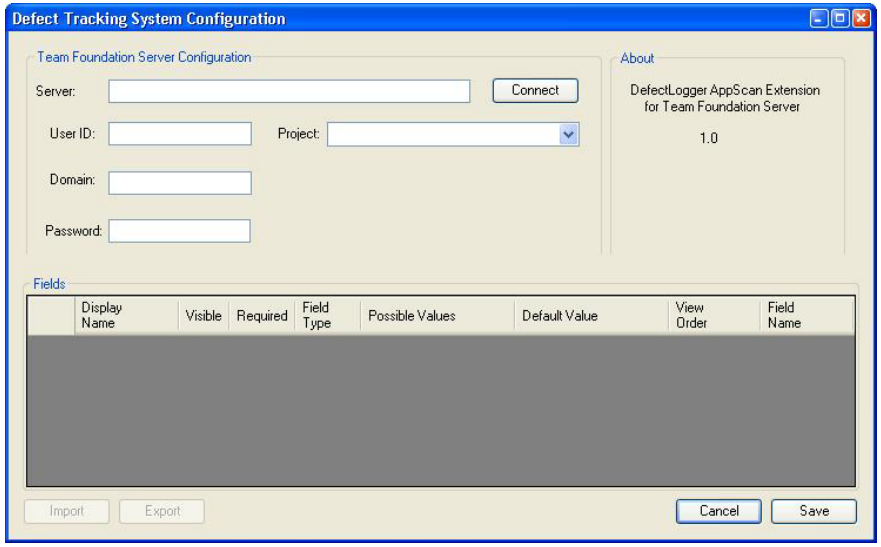
- Application security vulnerabilities must be treated as software defects
- Use risk and effort to prioritize

Application Vulnerabilities as Software Defects

- Track them in your defect management system (bug tracker)
- Select defects to address for each development cycle or release
  - *Serious vulnerabilities may require out-of-cycle releases*

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 financial damage be to Amazon.com if a publicly-accessible SQL injection vulnerability was exploited?

STRIDE

- **S**poofing Identity
- **T**ampering with Data
- **R**epudiation
- **I**nformation Disclosure
- **D**enial of Service
- **E**levation or Privilege

DREAD

- **D**amage Potential
- **R**eproducibility
- **E**xploitability
- **A**ffected Users
- **D**iscoverability

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

- Key: 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
- Don’t guess - build a Work Breakdown Structure (WBS)

Estimating Technical Vulnerabilities

- Go back to “coding” phase of SDLC
- Time per fix x Number of issues
  - *Grouping similar vulnerabilities into a smaller number of defects can aid communication*
- Verification typically straightforward
  - *Application should behave as it always did, except that it now handles problem inputs correctly*
  - *In some cases, the application depends on the vulnerable behavior*

Estimating Logical Vulnerabilities

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

Great Remediation Resource: OWASP ESAPI

- Enterprise Security API
- http://www.owasp.org/index.php/ESAPI
- Provide developers with an easy-to-understand API allowing them to code securely
- Encoding functions are great for remediating technical flaws
- Framework has components that help remediate logical flaws

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*

Recommendations

- Policy
  - *Have actual policies for secure software development and risk acceptance*
    - Must go beyond OWASP Top 10 or SANS 25
    - Tool classifications can be incorporated into these standards, but the standards must be business-focused rather than technology-focused
  - *Pennies spent on prevention save dollars spent on cures*
- Baseline
  - *Know your application portfolio*
  - *Have an ongoing program of controls in place*
    - Static testing
    - Dynamic testing
- Prioritize
  - *Involve development teams*
  - *Determine business risk*
  - *Determine fix level of effort*

Recommendations (continued)

- Shield
  - *Consider using adding signatures to WAFs or web-relevant IDS/IPS systems*
  - *Understand that these do not address the underlying problem*
- Mitigate
  - *Features > Performance > Security*
    - (unfortunate fact of life in many cases)
  - *Communicate the business risk and compliance implications*
  - *Work into development schedules as resources are available*
  - *Consider out-of-cycle releases for serious vulnerabilities*
- Maintain
  - *Web applications are dynamic and attacks evolve – this is an ongoing process*

Questions?

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