Security Development Lifecycle

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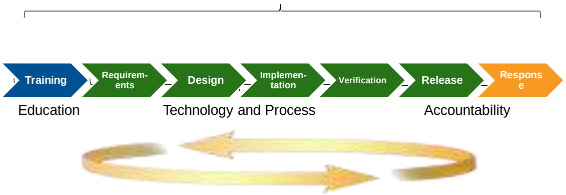
Where Do I Start?

- Microsoft Security
  - msdn.microsoft.com/en-us/security/default.aspx
  - msdn.microsoft.com/en-us/security/cc448120.aspx (pubs +)
  - msdn.microsoft.com/en-us/library/ee790621.aspx (agile dev)
  - www.microsoft.com/security/msec.aspx (Security Eng Ctr)
- Security Development Lifecycle
  - msdn.microsoft.com/en-us/security/cc448177.aspx
  - msdn.microsoft.com/en-us/library/84aed186-1d75-4366-8e61-8d258746bopq.aspx
  - 2004 – Microsoft mandatory policy
    - introduces security and privacy early and throughout the development process
    - is risk-based
      - msdn.microsoft.com/en-us/library/ms995349.aspx
  - NIST – The Economic Impacts of Inadequate Infrastructure for SW Testing
    - www.nist.gov/director/prog-ofc/report02-3.pdf
    - csrc.nist.gov/
- Digital Blackbelt Series
  - www.microsoft.com/events/series/digitalblackbelt.aspx?tab=overview
- Microsoft ForeFront (Business Ready Security)
  - www.microsoft.com/forefront/en/us/overview.aspx

Microsoft Security Development Lifecycle (SDL)

Delivering secure software requires:

Executive commitment → SDL a mandatory policy at Microsoft since 2004



Ongoing Process Improvements → 6 month cycle

Microsoft SDL Threat Modeling Overview

Microsoft SDL Threat Modeling: A process to understand security threats to a system, determine risks from those threats, and establish appropriate mitigations

- Microsoft SDL Threat Modeling
  1. Diagramming – Data Flow Diagrams (DFDs)
  2. Threat Enumeration
  3. Mitigation
  4. Validation
- Can be performed by both security and non-security experts
- 4 Steps
  - Diagram – Analyze – Describe – Report

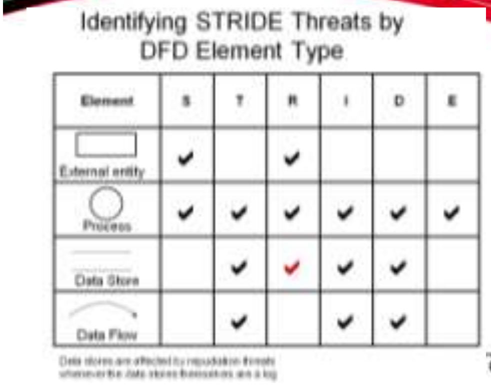
SDL Threat Modeling Tool

- is a tool designed for rich client/server app dev
  - requires Visio 2007
  - uses STRIDE methodology
    - Spoofing, Tampering, Repudiation, Info disclosure, DoS, Elevation of privilege
    - Based on Microsoft Security Response Center (MSRC) issues and Common Vulnerability and Exposures (CVE) (cve.mitre.org)
  - videos available
    - http://msdn.microsoft.com/en-us/security/sdl-threat-modeling-tool.aspx
  - assumes the final deployment pattern is unknown
    - if it will be used to manage business-critical applications with customer credit cards or not
  - focus -- to ensure security of the underlying code
  - Security Development Lifecycle Version 4.1a (127p)
    - Includes a SDL for Agile Development section
      - http://msdn.microsoft.com/en-us/security/sdl-process-guidance.aspx
      - http://msdn.microsoft.com/en-us/magazine/dd153756.aspx

STRIDE Threat Types

Desired Property	Threat	Definition
Authentication	Spoofing	Impersonating something or someone else
Integrity	Tampering	Modifying code or data without authorization
Non-repudiation	Repudiation	The ability to claim to have not performed some action against an application
Confidentiality	Information Disclosure	The exposure of information to unauthorized users
Availability	Denial of Service	The ability to deny or degrade a service to legitimate users
Authorization	Elevation of Privilege	The ability of a user to elevate their privileges with an application without authorization

NR-CIA3



Identifying STRIDE Threats by DFD Element Type

Element	S	T	R	I	D	E
External entity	✓		✓			
Process	✓	✓	✓	✓	✓	✓
Data Store		✓	✓	✓	✓	
Data Flow		✓		✓	✓	

Data stores are affected by repudiation threats whenever the data stores themselves are a log

Examples of Standard Mitigations

Threat	Example Standard Mitigations
Spoofing	IPsec Digital signatures Message authentication codes Hashes
Tampering	ACLs Digital signatures Message Authentication Codes
Repudiation	Strong Authentication Secure logging and auditing
Information Disclosure	Encryption ACLs
Denial of Service	ACLs Quotas High availability designs
Elevation of Privilege	ACLs Group or role membership Input validation

- Refer to Chapter 9 of the Microsoft SDL for a more complete listing
  - http://www.microsoft.com/learning/en/us/books/8753.aspx

SDL Optimization Model

- A framework to gradually move development organizations towards the adoption of the Security Development Lifecycle (SDL)
    - http://msdn.microsoft.com/en-us/security/sdl-model-optimization.aspx
- 5 docs
  - Intro (14p)
    - 4 maturity levels
  - Basic to Standardized (lvls 1 - 2) (29p)
    - Security is reactive; customer risk is undefined
    - Security is proactive; customer risk is understood
  - Standardized to Advanced (lvls 2 – 3) (29p)
    - Security is integrated; customer risk is controlled
  - Advanced to Dynamic (lvls 3 - 4) (18p)
    - Security is specialized; customer risk is minimized
  - Self-Assessment Guide (21p)

Overview - SDL Developer Starter Kit

- Secure Design Principles
  - Attack surface
  - Threat modeling
  - SDL principles
- Secure Implementation Principles
  - covers some the more common types of attacks
  - basically reflects the tools that they currently have
- Threat Modeling Principles Overview
  - SDL
  - STRIDE
- Threat Modeling Tool Principles
  - 4 steps – SDL Threat Modeling tool

Overview - SDL Developer Starter Kit

- Specific to the developer
  - Includes videos, documentation, PPTs, & MSDN Virtual Labs*
    - Patterns & Practice virtual labs+ and videos
      - channel9.msdn.com/wiki/securitywiki/inputvalidationtrainingmodules/
  - SQL Injection*+
  - Cross-Site Scripting*+
  - Security Code Review*
  - Fuzz Testing*
  - Code Analysis*
    - FxCop & PREFast (C/C++)
  - Source Code Annotation Language (C/C++)*
  - Compiler Defenses (C/C++)*
  - Buffer Overflows (C/C++)*
  - Banned APIs (C/C++)
    - http://msdn.microsoft.com/en-us/library/bb288454.aspx

Tools

- Many of these integrate with VS 2008
    - blogs.msdn.com/sdl/archive/2009/09/16/two-new-security-tools-for-your-sdl-tool-belt-bonus-a-7-easy-steps-whitepaper.aspx
- MiniFuzz File Fuzzer
  - inputting malformed data into an application and analyzing the application's reaction to the malformed data
    - blogs.msdn.com/sdl/archive/2007/09/20/fuzz-testing-at-microsoft-and-the-triage-process.aspx
- BinScope Binary Analyzer
  - reports on dangerous constructs of your binaries
    - blogs.msdn.com/sdl/archive/2009/09/16/two-new-security-tools-for-your-sdl-tool-belt-bonus-a-7-easy-steps-whitepaper.aspx
- FxCop
    - an application that analyzes managed code assemblies (code that targets the .NET Framework common language runtime) and reports information about the assemblies, such as possible design, localization, performance, and security improvements
      - msdn.microsoft.com/en-us/library/bb429476(VS.80).aspx

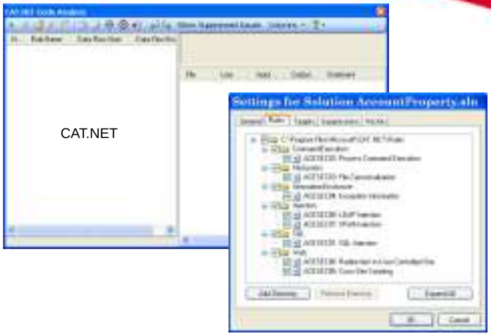
Tools

- SiteLock
  - for ActiveX controls -- can be used in an Active Template Library (ATL) or C++ project to help you write a secure control that restricts the domains in which it can be scripted
    - msdn.microsoft.com/en-us/library/aa752035(VS.85).aspx
  - Copy sitelock.h to your include directory or into your Visual C++/ATL project to use it.
- Anti-Cross Site Scripting v3 beta
    - www.codeplex.com/AntiXSS
  - How do I sanitize HTML using Anti-XSS
    - msdn.microsoft.com/en-us/security/ee658075.aspx
  - Protecting Contoso
    - msdn.microsoft.com/en-us/library/aa973813.aspx
      - technet.microsoft.com/en-us/library/cc779714(WS.10).aspx

Tools

- Banned.h
  - lists all banned APIs and allows any developer to locate/remove them in a code
  - msdn.microsoft.com/en-us/security/sdl-tools-download.aspx
  - blogs.msdn.com/sdl/archive/2008/10/22/good-hygiene-and-banned-apis.aspx
- Code Analysis Tool .NET (CAT.NET) v1 CTP
  - Code Analysis for C/C++ (integrates – VS2008)
  - CAT.NET is a static code analysis tool, helps id security flaws within a managed code (C#, Visual Basic .NET, J#) app
    - msdn.microsoft.com/en-us/library/dd264897(VS.100).aspx
    - msdn.microsoft.com/en-us/library/ms998364.aspx
    - blogs.msdn.com/securitytools/
    - blogs.msdn.com/syedab/archive/2009/07/16/how-to-use-cat-net-1-1-as-a-visual-studio-add-in-to-identify-security-flaws-within-managed-code.aspx

Tools



CAT.NET

Tools

- Web App Configuration Analyzer (WACA)
  - designed to scan the development environment against best practices for .NET security configuration, IIS settings, SS Security best practices and some Windows permission settings
    - channel9.msdn.com/posts/Jossie/Web-Application-Configuration-Analyzer-WACA/
  - a lightweight stand-alone tool focused towards developers and testers - in an un-managed, insecure environment
  - uses the Best Practice Analyzers (BPA's)
  - compliments the CAT.NET
  - can be downloaded via Microsoft Connect
    - connect.microsoft.com
- Coded UI Tests (CUIT) (VS2010)
  - msdn.microsoft.com/en-us/library/dd286726(VS.100).aspx
  - blogs.msdn.com/securitytools/

Tools

- Web Protection Library (WPL)
  - contains libraries to protect web applications from common vulnerabilities and attacks – Security Runtime Engine (SRE)
  - goal - comprehensive web app protection with minimal configuration
  - protection for SQL Injection, Click Jacking, File Canonicalization
    - blogs.msdn.com/securitytools/archive/2009/07/09/web-protection-library-wpl-a-brief-introduction.aspx
    - channel9.msdn.com/posts/Jossie/Using-the-Web-Protection-Library-WPL-CTP-Version/
    - msdn.microsoft.com/en-us/security/dd547422.aspx
- Connected Information Security Framework or CISF
    - blogs.msdn.com/securitytools/archive/2009/07/28/an-introduction-to-the-connected-information-security-platform-or-cisf.aspx
- Risk Tracker
    - risktracker.codeplex.com/
- !exploitable -- crash analysis & security risk assessment
    - www.codeplex.com/msecdbg

SQL Injection Code Scanning Tools

- Any code, developed in any language, that accesses any type of database using a dynamically built SQL statement is suspect for SQL injection

Microsoft Tool	Applies To
Microsoft FxCop	.NET Framework languages
Microsoft Visual Studio Code Analysis Feature (/analyze)	.NET Framework languages
Microsoft Source Code Analyzer for SQL Injection (in ASP code)	Legacy ASP Code

SDL Process Template for VSTS

- The SDL Process Template -- leverages the technology of Visual Studio Team System & Team Foundation Server to integrate the policy, process and tools of the SDL v4.1
- There are 5 short videos (downloadable)
  – A lot of features apply to C/C++

SDL Blog & War Stories

- How to open a parachute during free-fall: Introducing Quick Security References (QSRs)
- HeapSetInformation in Visual C++ 2010 beta 2
- Introducing the InfoSec Assessment & Protection Suite
- SDL War Story Videos
    - http://www.microsoft.com/security/bakingsecurityin/video.htm
  – Steve Lipner & Michael Howard
  – comic strip with a cast of characters
    - Agents of SDL (Kevlarr) vs Legion of Malware

Data Flow Diagrams (DFDs) Elements

Element	Represented By	Description
External Entity	□	Any entity not within the control of the application, such as people and external systems
Process	○	Code, such as native code executables and .NET assemblies
Data Store	=	Data at rest, such as registry keys and databases
Data Flow	⌒	How data flows between elements, such as function calls and network data
Trust Boundary	- - -	A point within an application where data flows from one privilege level to another, such as network sockets, external entities and processes with different trust levels

SDL Book

- The Security Development Lifecycle: SDL: A Process for Developing Demonstrably More Secure Software
- By: Michael Howard; Steve Lipner
- Publisher: Microsoft Press
- Pub. Date: June 28, 2006
- Print ISBN-10: 0-7356-2214-0
- Print ISBN-13: 978-0-7356-2214-2
- Pet Shop 4.0 risk analysis example (Chapter 9)
  – PetShop for .NET 3.5 on www.codeplex.com

TAM Tool

- Threat Analysis & Modeling Tool – SDL-LOB
  – an asset-focused tool designed for LOB applications for the non-security subject matter expert
    – msdn.microsoft.com/en-us/library/dd831975.aspx
  – based on the CIA model
  – where business objectives, deployment pattern, and data assets and access control are clearly defined
  – focus -- to understand the business risk in the application, help identify controls needed to manage that risk, and protect the assets
- App Consulting & Engineering (ACE) team
    - http://msdn.microsoft.com/en-us/security/aa570413.aspx
    - http://blogs.msdn.com/ace_team/
  – Six Rules to Stop Bad Guys
  – InfoSec Assessment & Protection Suite
  – Dogfooding: How Microsoft IT InfoSec Dogfoods:

TAM Tool

- 3 main areas of the tool
  – threat modeling methodology
  – gathering application architecture
  – security guidance
    – http://msevents.microsoft.com/cui/eventdetail.aspx?eventid=1032253724&culture=en-us
  – 3.0 beta (videos available)
    - http://www.microsoft.com/downloads/details.aspx?familyid=AAD6DEC7-26CF-4053-9963-D5974631C070&displaylang=en
    - http://channel9.msdn.com/posts/Jossie/Thread-Analysis--Modeling-Tool-TAM-30/
    - http://blogs.msdn.com/threatmodeling/archive/2009/07/20/threat-analysis-and-modeling-tam-v3-0-learn-about-the-new-features.aspx
- The Value of Microsoft TAM (2009)
    - www.ciozone.com/index.php/Security/The-Value-of-Microsoft-TAM.html

TAM Tool

TAM Tool

Other Microsoft Resources

- Security Guidance for Applications (2005)
  - msdn.microsoft.com/en-us/library/ms998408.aspx
- Security Guidance Center
  - www.microsoft.com/security/default.aspx
- MSDN Security Center
  - msdn.microsoft.com/en-us/security/aa570411.aspx
- Channel9 Videos
  - channel9.msdn.com/tags/Security/
- MSDN Webcast: Writing Secure Code
  - msevents.microsoft.com/cui/eventdetail.aspx?eventid=1032253724&culture=en-us
- Patterns & Practices (2003)
  - msdn.microsoft.com/en-us/library/aa302419.aspx
- Threat Modeling for Web Applications Using STRIDE (2004)
  - www.securityworld.be/security/threat%20modeling%20for%20web%20applications%20using%20the%20STRIDE%20model.pdf
- IT Compliance Management Guide (GovncRskComp) (2009)
  - http://technet.microsoft.com/en-us/library/dd206732.aspx

Other Threat Modeling Systems

- OWASP
  - http://www.owasp.org/index.php/Threat_Risk_Modeling
- Trike (Squeak)
  - www.octotrike.org/faq/
  - map.squeak.org/package/2b30afd8-a8f2-46ad-ba5e-3a72f2456d5a
  - seclists.org/webappsec/2005/q3/138
- AS/NZ 4360:2004 Risk Mgmt
  - superseded by AS/NZS ISO 31000:2009
    - infostore.saiglobal.com/store/getpage.aspx?path=/publishing/shop/promotions/AS_NZS_ISO_31000:2009_Risk_Management_Principles_and_guidelines.htm&site=RM
- OCTAVE (CERT)
- CVSS – Common Vulnerability Scoring System(DHS)
- Open Source Risk Mgmt Tools

OCTAVE

- CERT
  - www.cert.org/octave/methodintro.html
  - Operationally Critical Threat, Asset, and Vulnerability Evaluation
  - CIA based
  - for smaller organizations
  - 3 Phases – 8 Processes
    - Build Asset-Based Threat Profiles (P1-4)
    - Identify Infrastructure Vulnerabilities (P5-6)
    - Develop Security Strategy and Plans (P7-8)
  - presented at 2009 ISACA Information Security and Risk Management conference
  - OWASP does not anticipate that OCTAVE will be used at large by application designers/developers
    - it fails to take threat risk modeling into consideration by all participants, to reduce the overall risk of an application becoming vulnerable to attack

DHS CVSS

- National Vulnerability Database
  - http://nvd.nist.gov/
  - Vulnerability Search Engine (CVE software flaws and CCE misconfigurations)
  - National Checklist Program (automatable security configuration guidance in XCCDF and OVAL)
  - SCAP (program and protocol that NVD supports)
  - SCAP Compatible Tools
  - SCAP Data Feeds (CVE, CCE, CPE, CVSS, XCCDF, OVAL)
  - Impact Metrics (CVSS)
  - Product Dictionary (CPE)
  - Common Weakness Enumeration (CWE)

DHS CVSS

- Forum of Incident Response and Security Teams (FIRST)
  - an international confederation of trusted computer incident response teams who cooperatively handle computer security incidents and promote incident prevention programs
    - www.first.org/cvss/
  - Common Vulnerability Scoring System v2
    - nvd.nist.gov/cvss.cfm?version=2
  - open framework for communicating the characteristics and impacts of IT vulnerabilities
  - ensures repeatable accurate measurement while enabling users to see the underlying vulnerability characteristics that were used to generate the scores
  - Two uses are:
    - prioritization of vulnerability remediation activities
    - calculating the severity of vulnerabilities discovered on one's systems

DHS CVSS

Open Source Risk Mgmt Tools

- Information can be found at SourceForge.net (or not)
- CORAS Risk Assessment Platform*
- Open Source Requirements Mgmt Tool (OSRMT)*
- ISO 17799 Risk Assessment Toolkit (RAT)
- ThreatMind (2005) – based on FreeMind
- OSMR (2005) -- based on ISO 17799
- MARCO -- MAximized Risk COntrol
- Easy Risk Assessment (2006)
- ARMS (2007) -- based on ISO 17799 (27001)
- Minaccia (2005)

Open Source Risk Mgmt Tools

- CORAS Risk Assessment Platform
  - a European research and technological development project for model-based security risk assessment
    - www.ercim.eu/publication/Ercim_News/enw49/dimitrakos.html
  - platform for risk analysis of security critical IT systems using UML, based on the CORAS model-based risk assessment methodology
    - coras.sourceforge.net/
  - contains an XML and UML repository, facilitating management and reuse of analysis results (beta 2.1b1 Windows)
    - www2.nr.no/coras/

Open Source Risk Mgmt Tools

- Open Source Requirements Management Tool
  - requirements management tool designed to achieve full SDLC traceability for features, requirements, design, implementation and testing (osrmt_01_50_mar28)
  - It is rated well (25/29 users)
- ISO 17799 (27000) Risk Assessment Toolkit
  - there was nothing on SourceForge
  - plenty of other organizations with their own 27k tools (~$1k)
    - www.riskworld.net/
    - www.27001.com/products/32
    - www.27005.net/
    - www.securitypark.co.uk/books-governance.asp
    - www.17799central.com/iso17799.htm
    - www.17799-toolkit.com/

Whatever Else

- DREAD (is dead)
  - weblogs.asp.net/rhurlbut/archive/2005/11/15/430662.aspx
- A Practical Approach to Threat Modeling (2008)
  - www.devx.com/security/Article/37502/1763/page/1
- Software Security Assurance Report (2007)
  - Information Assurance Technology Analysis Center (IATAC)
  - Data and Analysis Center for Software (DACS)
- Software security blog – hackerco.de/
- SAFECode -- www.safecode.org/
- Improving Information Security Risk Analysis Practices …
  - Beachboard, Cole & others
    - Issues in Informing Science and Information Technology, vol 5, 2008 (iisit.org)
- Secure World -- www.hellosecureworld.com
- “Beautiful Security” Chapter 9 download
    - securitybuddha.com/2009/06/22/free-pdf-download-of-beautiful-security-chapter-tomorrows-security-cogs-and-levers-here/
- DataLossDB -- datalossdb.org/