Microsoft SDL: Agile Development

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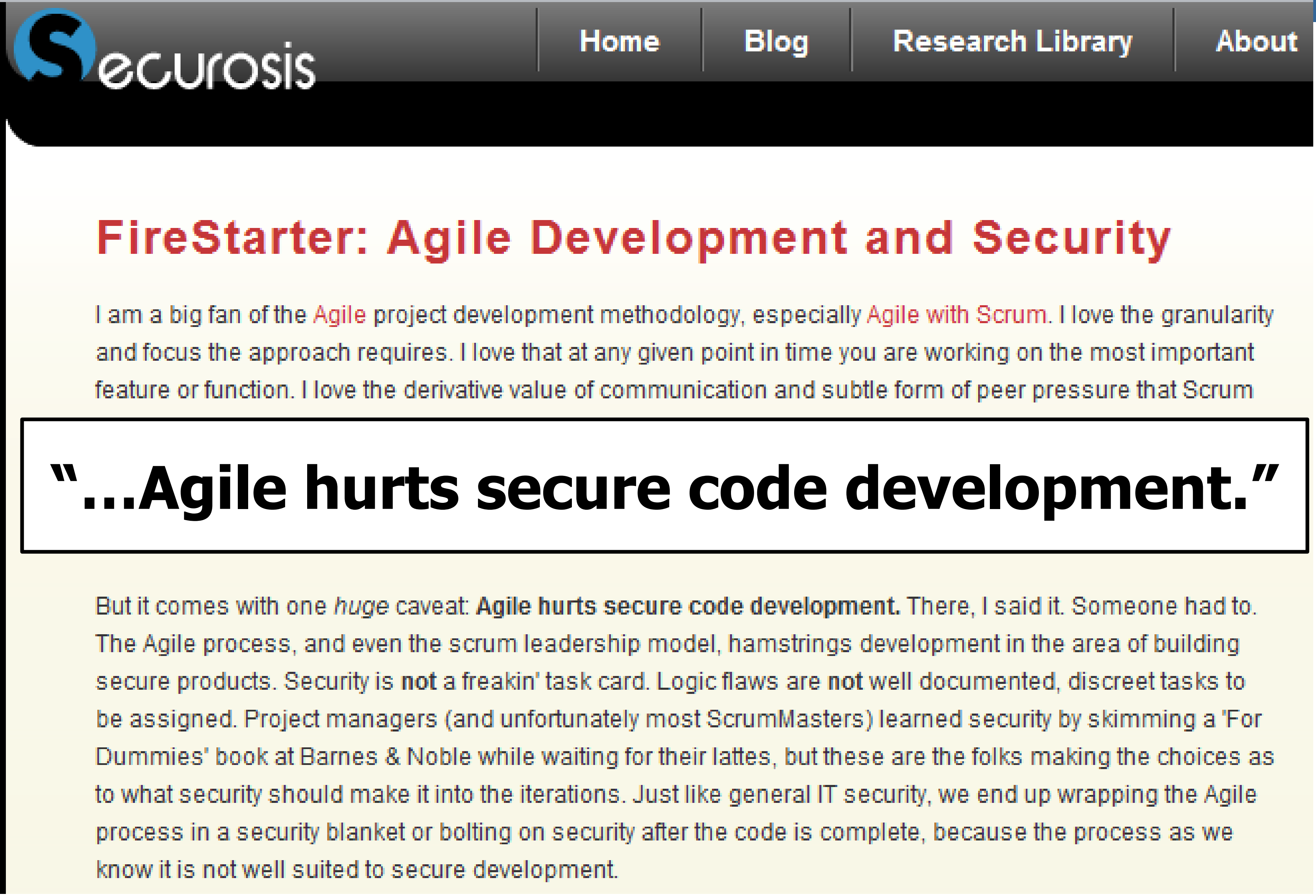
OWASP
June 24, 2010

The OWASP Foundation
http://www.owasp.org

Bio

- AT&T Consulting:
  - Application Security
    - Penetration testing
    - Code review
    - Architecture and design reviews
    - Application security program development
    - Secure development methodology improvement

- Research
  - **ISSA Journal: Web Application Security Portfolios**
  - **SAMM Interview Template**
  - **Reducing Info Disclosure in ASP.NET Web Services and WCF Data Services**
  - Turn Application Assessment Reports into Training Classes
  - Observed Secure Software Development Stages
  - Vulnerability Tracking, Workflow, and Metrics with Redmine
  - Using Microsoft's AntiXSS Library 3.1



FireStarter: Agile Development and Security

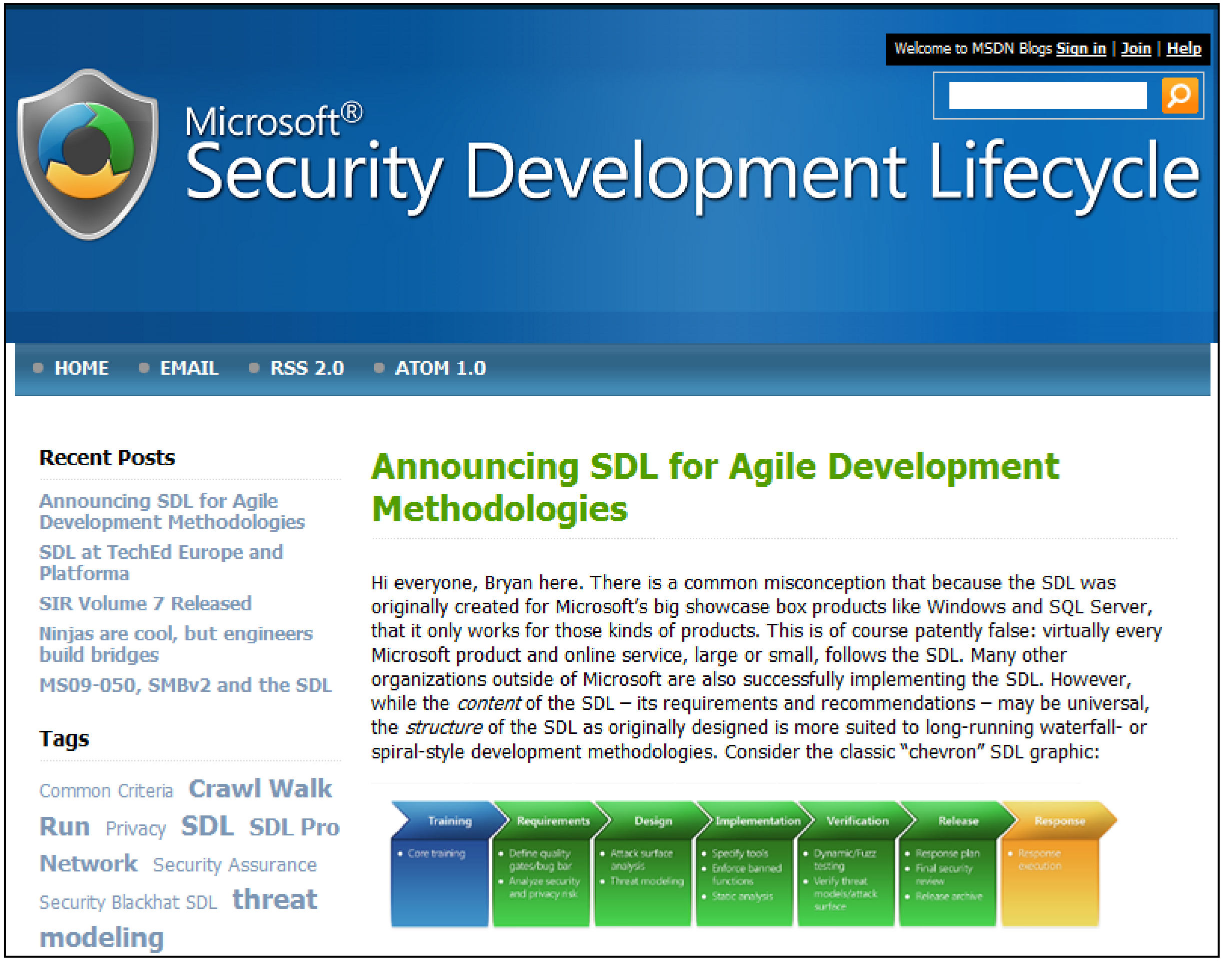
I am a big fan of the Agile project development methodology, especially Agile with Scrum. I love the granularity and focus the approach requires. I love that at any given point in time you are working on the most important feature or function. I love the derivative value of communication and subtle form of peer pressure that Scrum

"…Agile hurts secure code development."

But it comes with one *huge* caveat: **Agile hurts secure code development.** There, I said it. Someone had to. The Agile process, and even the scrum leadership model, hamstrings development in the area of building secure products. Security is **not** a freakin' task card. Logic flaws are **not** well documented, discreet tasks to be assigned. Project managers (and unfortunately most ScrumMasters) learned security by skimming a 'For Dummies' book at Barnes & Noble while waiting for their lattes, but these are the folks making the choices as to what security should make it into the iterations. Just like general IT security, we end up wrapping the Agile process in a security blanket or bolting on security after the code is complete, because the process as we know it is not well suited to secure development.

Adrian Lane:
http://securosis.com/blog/agile-development-and-security/

Microsoft SDL For Agile Released



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Recent Posts

- Announcing SDL for Agile Development Methodologies
- SDL at TechEd Europe and Platforma
- SIR Volume 7 Released
- Ninjas are cool, but engineers build bridges
- MS09-050, SMBv2 and the SDL

Tags

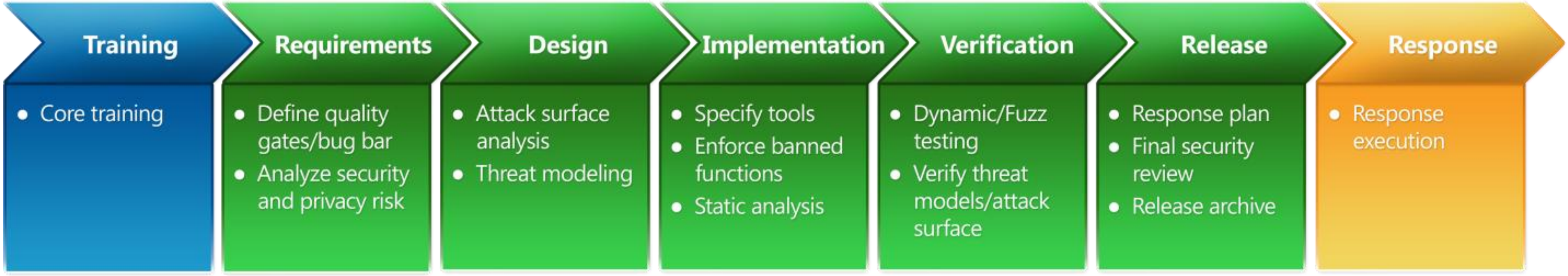
Common Criteria Crawl Walk Run Privacy SDL SDL Pro Network Security Assurance Security Blackhat SDL threat modeling

Announcing SDL for Agile Development Methodologies

Hi everyone, Bryan here. There is a common misconception that because the SDL was originally created for Microsoft's big showcase box products like Windows and SQL Server, that it only works for those kinds of products. This is of course patently false: virtually every Microsoft product and online service, large or small, follows the SDL. Many other organizations outside of Microsoft are also successfully implementing the SDL. However, while the *content* of the SDL – its requirements and recommendations – may be universal, the *structure* of the SDL as originally designed is more suited to long-running waterfall- or spiral-style development methodologies. Consider the classic "chevron" SDL graphic:

Source: http://blogs.msdn.com/sdl/archive/2009/11/10/announcing-sdl-for-agile-development-methodologies.aspx

Microsoft SDL



Training	Requirements	Design	Implementation	Verification	Release	Response
• Core training	• Define quality gates/bug bar • Analyze security and privacy risk	• Attack surface analysis • Threat modeling	• Specify tools • Enforce banned functions • Static analysis	• Dynamic/Fuzz testing • Verify threat models/attack surface	• Response plan • Final security review • Release archive	• Response execution

Microsoft Security Development Lifecycle (SDL)

Components:

- Best Practices
- Processes
- Standards
- Security Activities
- Tools

Goal:

"minimize security-related vulnerabilities in the design, code, and documentation and to detect and eliminate vulnerabilities as early as possible in the development life cycle."

Microsoft®
Security Development Lifecycle

Which Software?

SDL applies to software that:

- Is used in Business environments
- Stores or transmits PII
- Communicates over the Internet or other networks

Source: Microsoft's Product Website

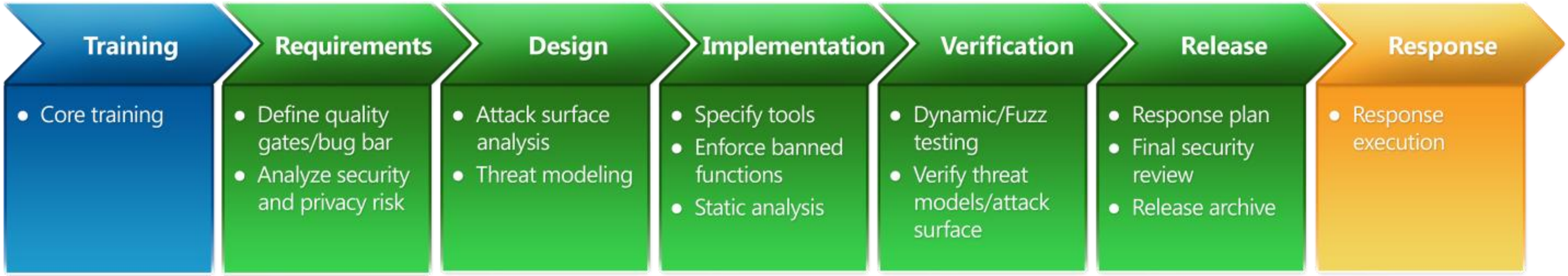
SDL Principles and Process

SD3+C

- Secure by Design
- Secure by Default
- Secure in Deployment
- Communications

PD3+C

- Privacy by Design
- Privacy by Default
- Privacy in Deployment
- Communications



Training

- Core training

Requirements

- Define quality gates/bug bar
- Analyze security and privacy risk

Design

- Attack surface analysis
- Threat modeling

Implementation

- Specify tools
- Enforce banned functions
- Static analysis

Verification

- Dynamic/Fuzz testing
- Verify threat models/attack surface

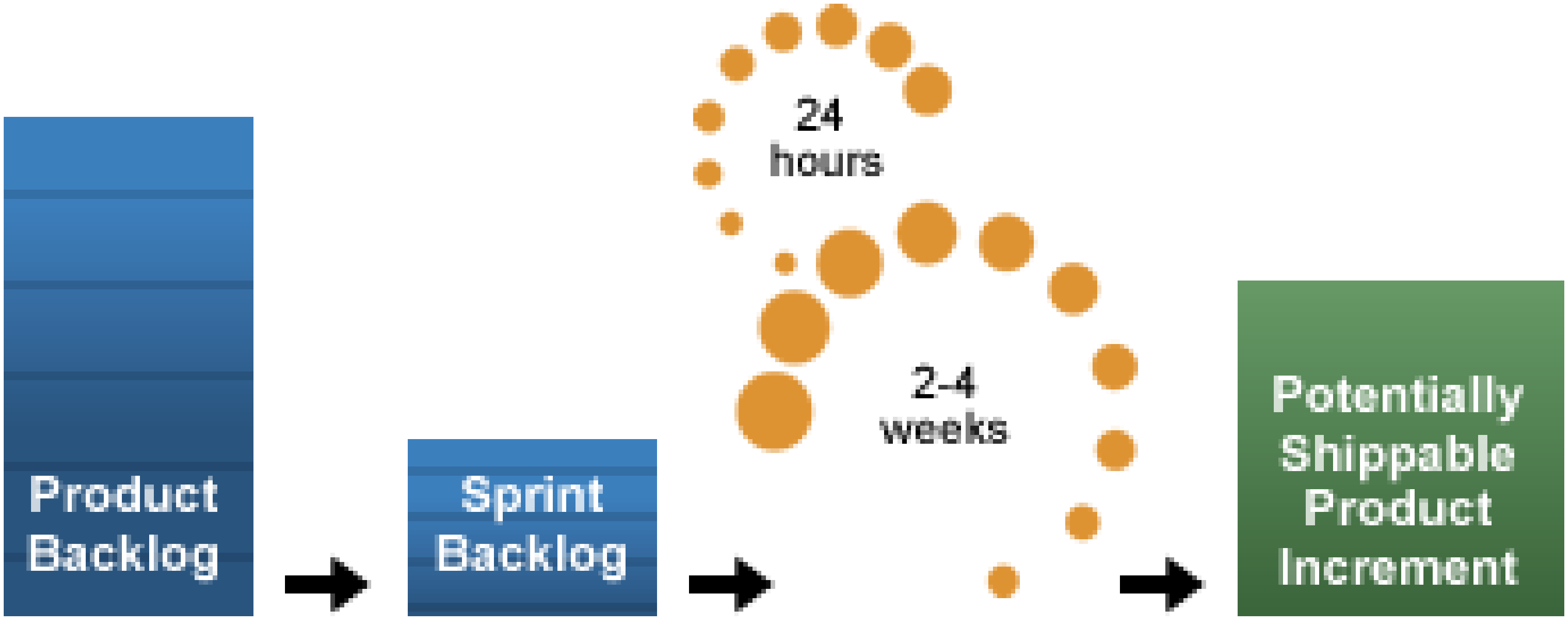
Release

- Response plan
- Final security review
- Release archive

Response

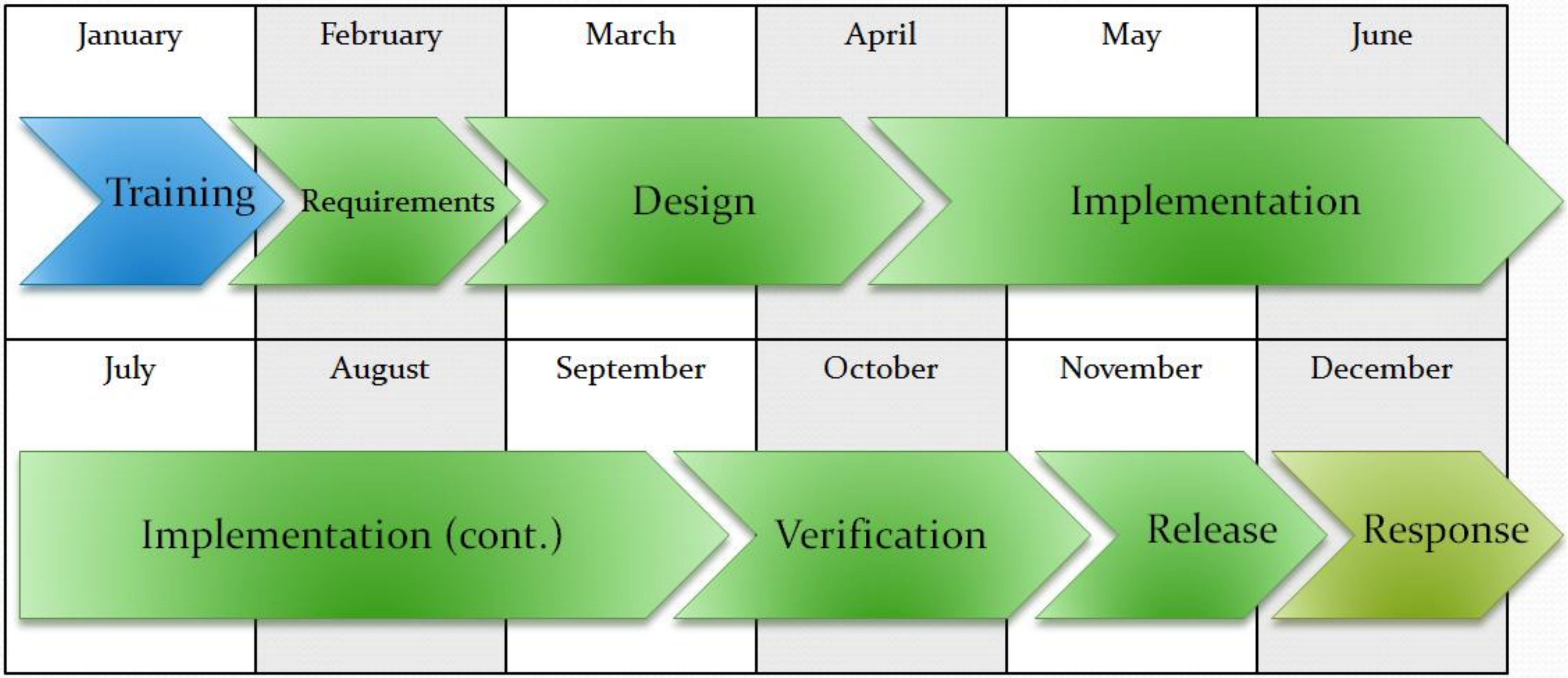
- Response execution

What is Agile Development?



Source: http://www.scrumalliance.org/pages/what_is_scrum

SDLC (Waterfall Methodology)



January February March April May June

Training

Requirements

Design

Implementation

July August September October November December

Implementation (cont.)

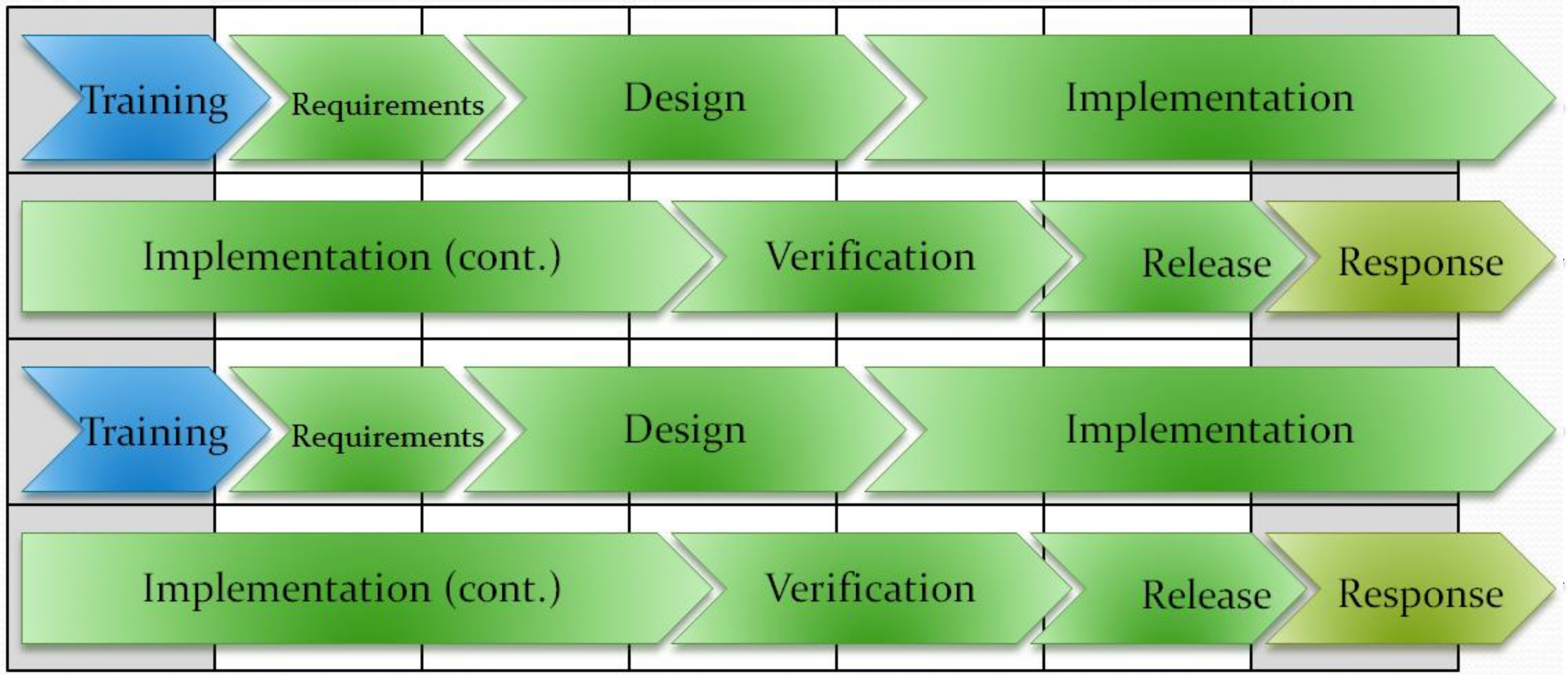
Verification

Release

Response

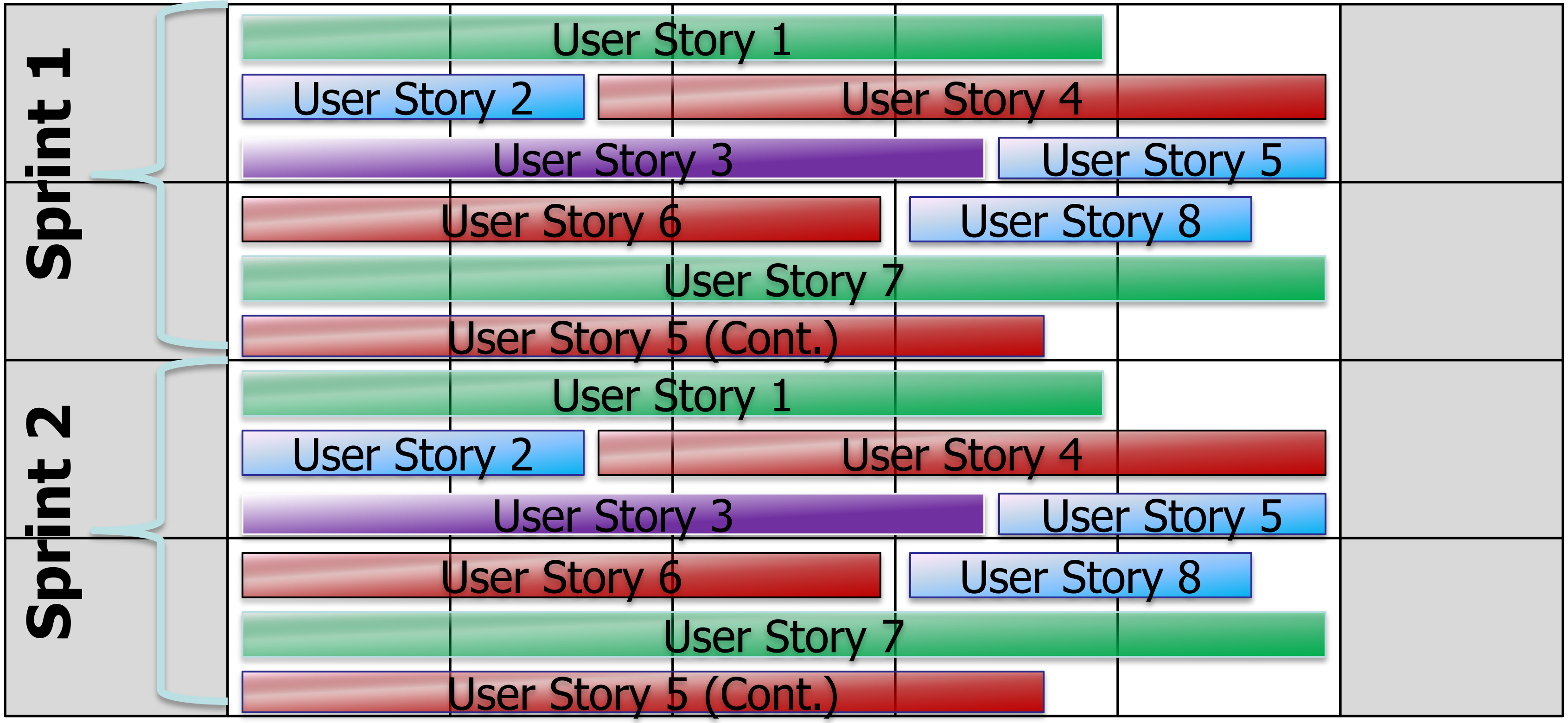
This Is NOT Agile Development

January



Agile Development

January



Sprint 1

User Story 1

User Story 2

User Story 4

User Story 3

User Story 5

User Story 6

User Story 8

User Story 7

User Story 5 (Cont.)

Sprint 2

User Story 1

User Story 2

User Story 4

User Story 3

User Story 5

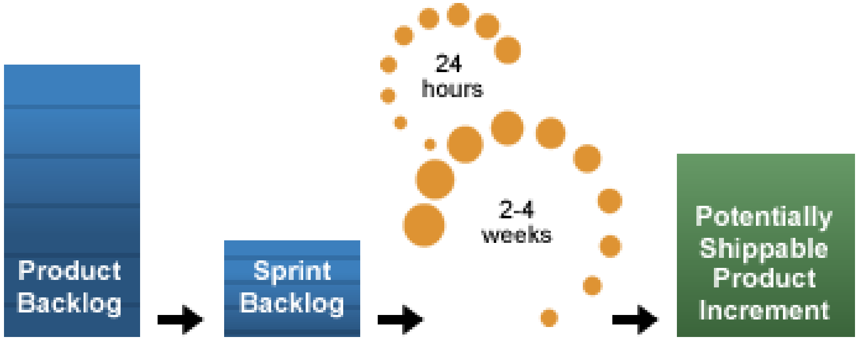
User Story 6

User Story 8

User Story 7

User Story 5 (Cont.)

Agile Development



Source: http://www.scrumalliance.org/pages/what_is_scrum

- Cross-functional, self-organizing teams
- Short, time-boxed development iterations
- Delivery of small functional stories
- No *extensive* up front design or documentation

Planning and Design

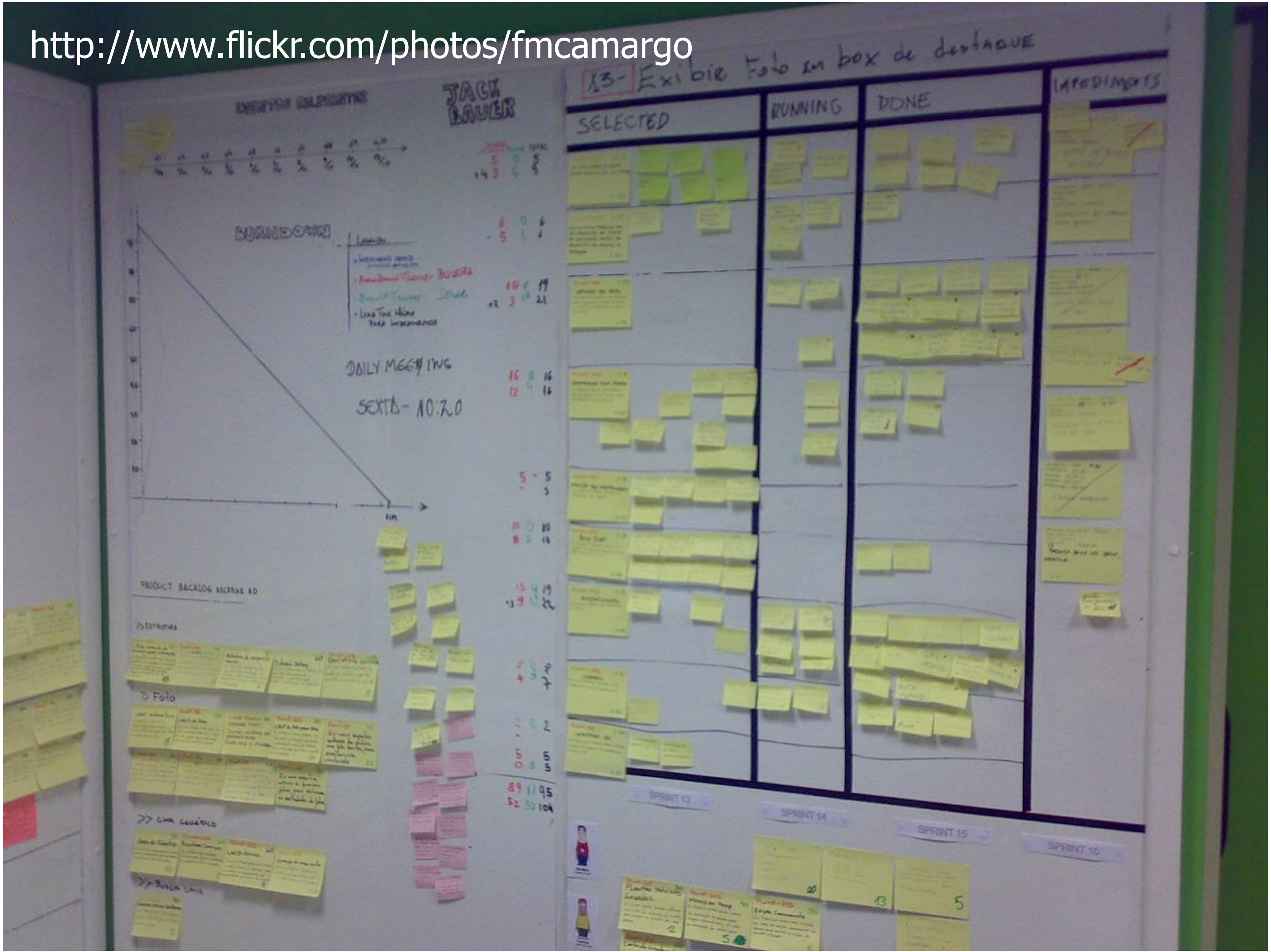
http://www.flickr.com/photos/acarlos1000

Planning and Design (cont.)

http://www.flickr.com/photos/acarlos1000

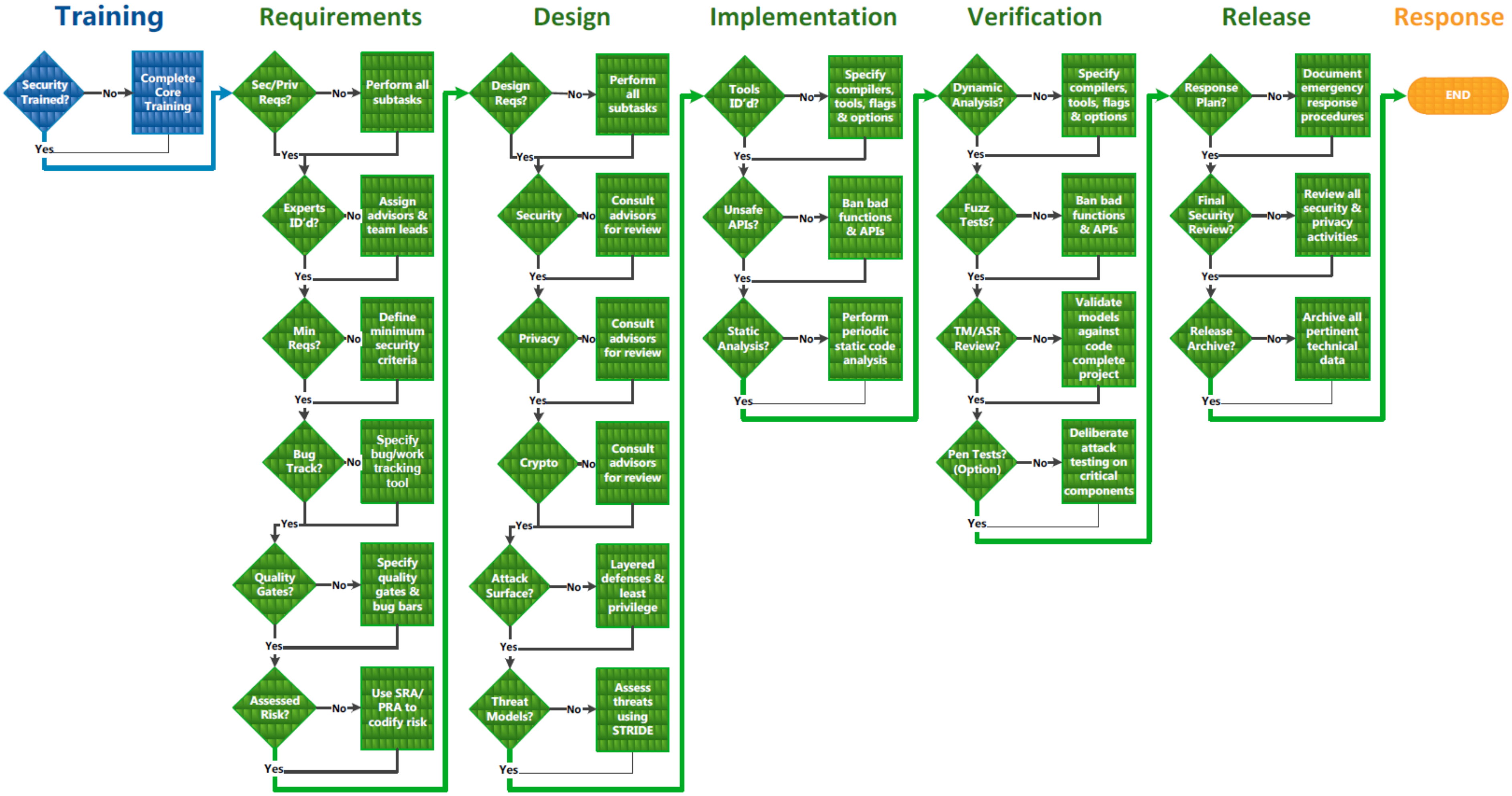
OWASP

User Stories and Documentation



http://www.flickr.com/photos/fmcamargo

SDL SECURITY ACTIVITIES



Training

Security Trained? — No → Complete Core Training — Yes

Requirements

Sec/Priv Reqs? — No → Perform all subtasks — Yes

Experts ID'd? — No → Assign advisors & team leads — Yes

Min Reqs? — No → Define minimum security criteria — Yes

Bug Track? — No → Specify bug/work tracking tool — Yes

Quality Gates? — No → Specify quality gates & bug bars — Yes

Assessed Risk? — No → Use SRA/ PRA to codify risk — Yes

Design

Design Reqs? — No → Perform all subtasks — Yes

Security — No → Consult advisors for review — Yes

Privacy — No → Consult advisors for review — Yes

Crypto — No → Consult advisors for review — Yes

Attack Surface? — No → Layered defenses & least privilege — Yes

Threat Models? — No → Assess threats using STRIDE — Yes

Implementation

Tools ID'd? — No → Specify compilers, tools, flags & options — Yes

Unsafe APIs? — No → Ban bad functions & APIs — Yes

Static Analysis? — No → Perform periodic static code analysis — Yes

Verification

Dynamic Analysis? — No → Specify compilers, tools, flags & options — Yes

Fuzz Tests? — No → Ban bad functions & APIs — Yes

TM/ASR Review? — No → Validate models against code complete project — Yes

Pen Tests? (Option) — No → Deliberate attack testing on critical components — Yes

Release

Response Plan? — No → Document emergency response procedures — Yes

Final Security Review? — No → Review all security & privacy activities — Yes

Release Archive? — No → Archive all pertinent technical data — Yes

Response

END

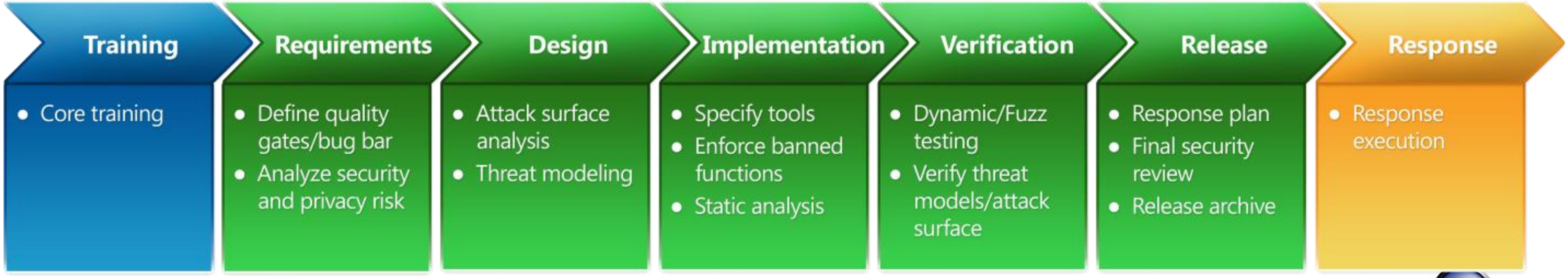
Source: Simplified Implementation of the Microsoft SDL

SDL Security Activities

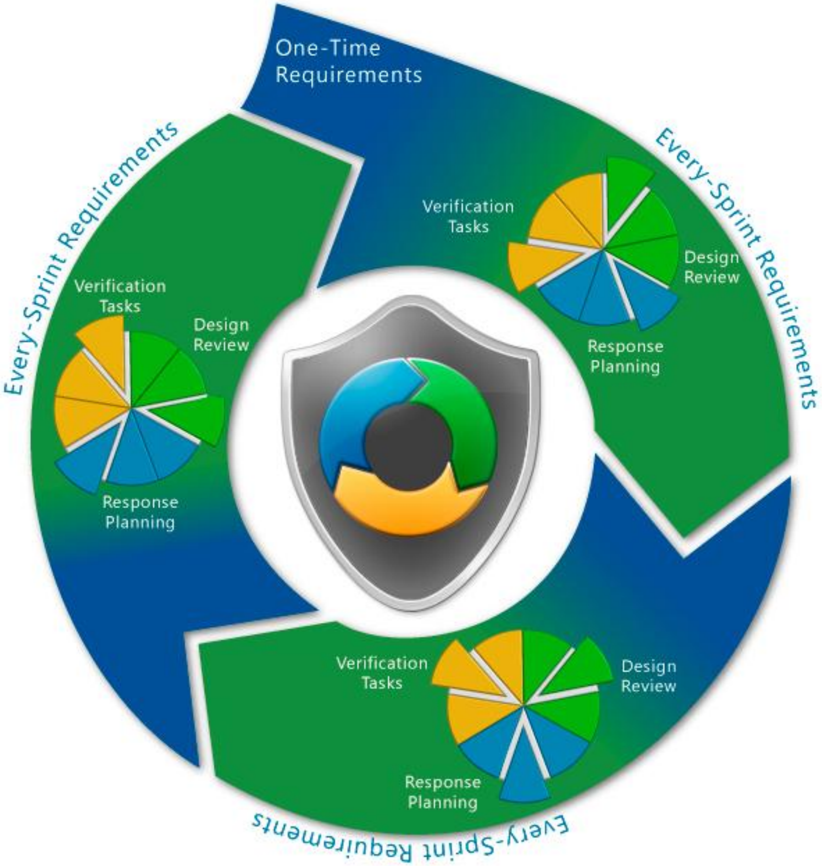
- Training
- Requirements
  - Security Requirements
  - Quality Gates/Bug Bars
  - Security and Privacy Risk Assessment
- Design
  - Design Requirements
  - Attack Surface Reduction
  - Threat Modeling
- Implementation
  - Use Approved Tools
  - Deprecate Unsafe Functions
  - Static Analysis
- Verification
  - Dynamic Program Analysis
  - Fuzz Testing
  - Threat Model and Attack Surface Review
- Release
  - Incident Response Plan
  - Final Security Review
  - Release/Archive
- Optional Activities
  - Manual Code Review
  - Penetration Testing
  - Vulnerability Analysis of Similar Applications

Traditional SDL Pain Points for Agile

- Can’t complete all SDL activities in each sprint
- Requirements, architecture, and design evolves over time
- Threat model/documentation becomes dated quickly
- Data sensitivity, protection, and connections to third parties may not be immediately known
- Teams don’t include application security specialists



Microsoft SDL For Agile Development



SDL Requirement Categories:

- Every-Sprint
- Bucket
  - Verification Tasks
  - Design Review Tasks
  - Response Planning Tasks
- One-Time

Source: Microsoft SDL v4.1a

Every-Sprint SDL Requirements

"…so essential to security that no software should ever be released without these requirements being met."

Examples:

- Update the threat model
- Communicate privacy-impacting design changes to the team's privacy advisor
- Fix all issues identified by code analysis tools for unmanaged code
- Follow input validation and output encoding guidelines to defend against cross-site scripting attacks

Bucket SDL Requirements

- Teams prioritize the pool of tasks over many sprints
- Each sprint, one task from each bucket completed
- Each tasks must be completed at least every 6 months

Examples:

- Security Verification Tasks
  - Run fuzzing tools
  - Manual and automated code review
- Design Review Tasks
  - Conduct privacy review
  - In-depth threat model
- Response Planning Tasks
  - Define security/privacy bug bar
  - Create support documents

One-Time Requirements

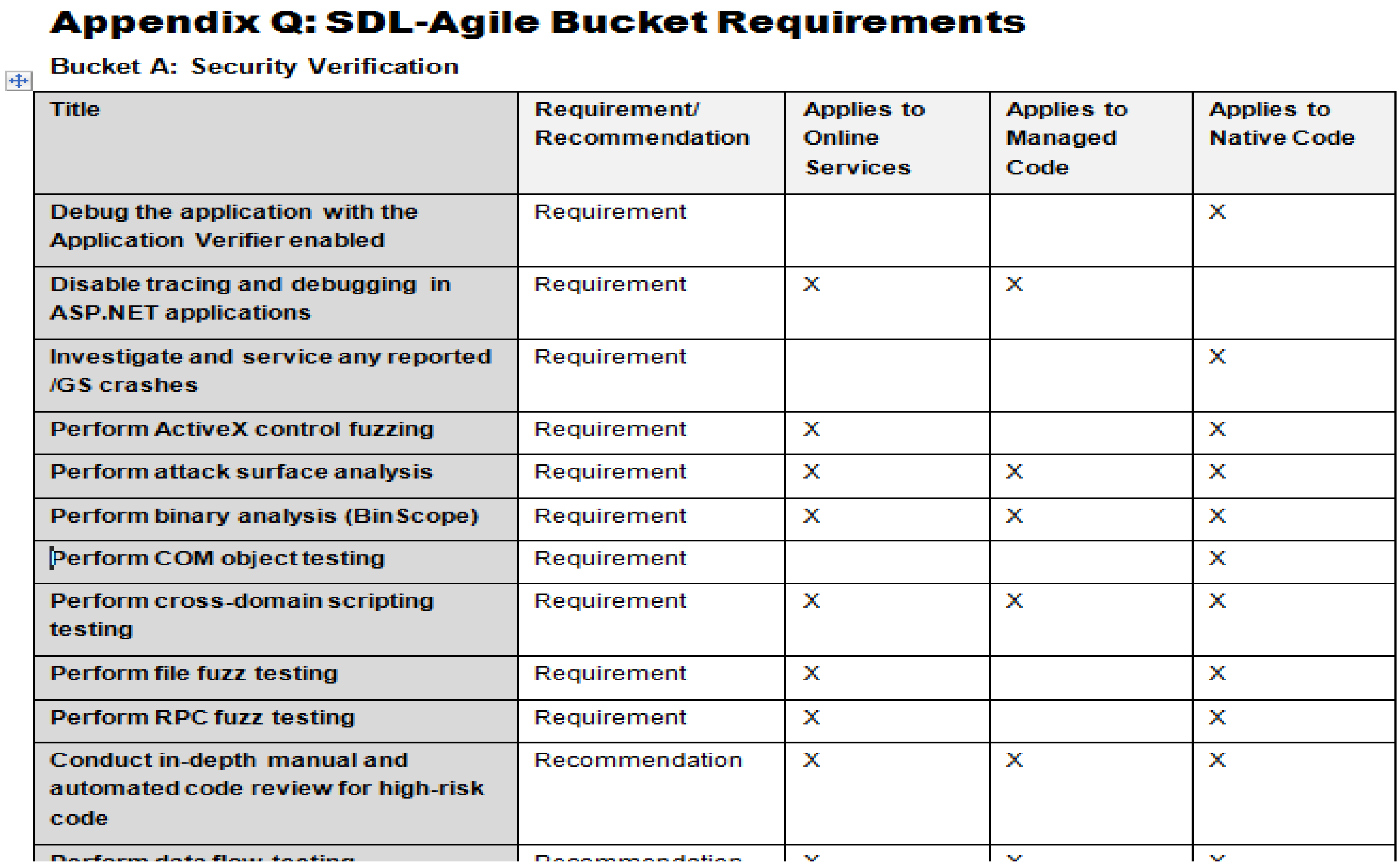
Why?

- Repetition not necessary
- Must occur at the beginning of the project
- Not possible at the beginning of the project

Examples:

- Configure bug tracking system (3 months)
- Identify security/privacy experts (1 month)
- Baseline threat model (3 months)
- Establish a security response plan (6 months)

SDL-Agile Appendix

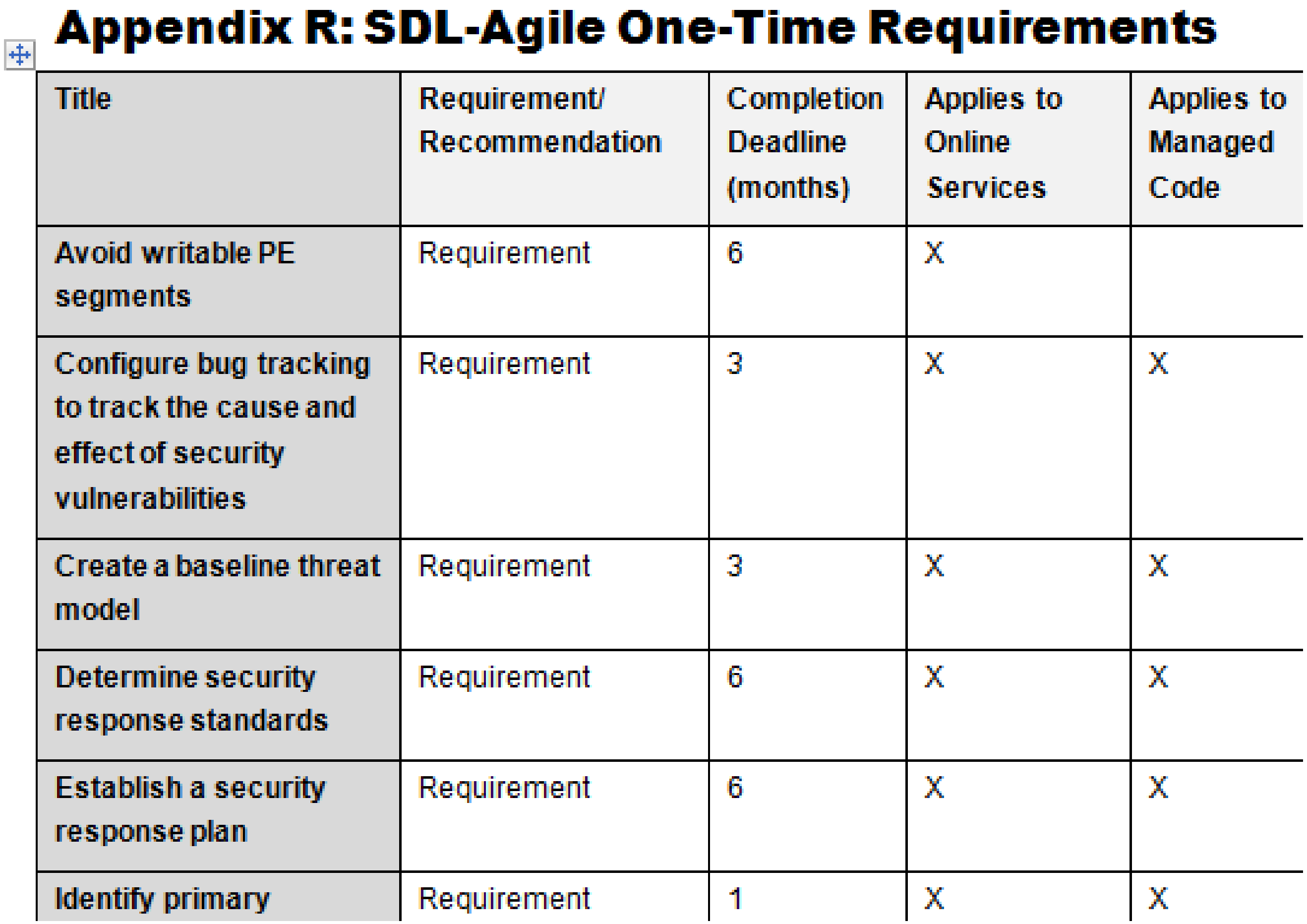


Appendix Q: SDL-Agile Bucket Requirements

Bucket A: Security Verification

Title	Requirement/ Recommendation	Applies to Online Services	Applies to Managed Code	Applies to Native Code
Debug the application with the Application Verifier enabled	Requirement			X
Disable tracing and debugging in ASP.NET applications	Requirement	X	X	
Investigate and service any reported /GS crashes	Requirement			X
Perform ActiveX control fuzzing	Requirement	X		X
Perform attack surface analysis	Requirement	X	X	X
Perform binary analysis (BinScope)	Requirement	X	X	X
Perform COM object testing	Requirement			X
Perform cross-domain scripting testing	Requirement	X	X	X
Perform file fuzz testing	Requirement	X		X
Perform RPC fuzz testing	Requirement	X		X
Conduct in-depth manual and automated code review for high-risk code	Recommendation	X	X	X
Perform data flow testing	Recommendation	X	X	X

SDL-Agile Appendix: Deadlines

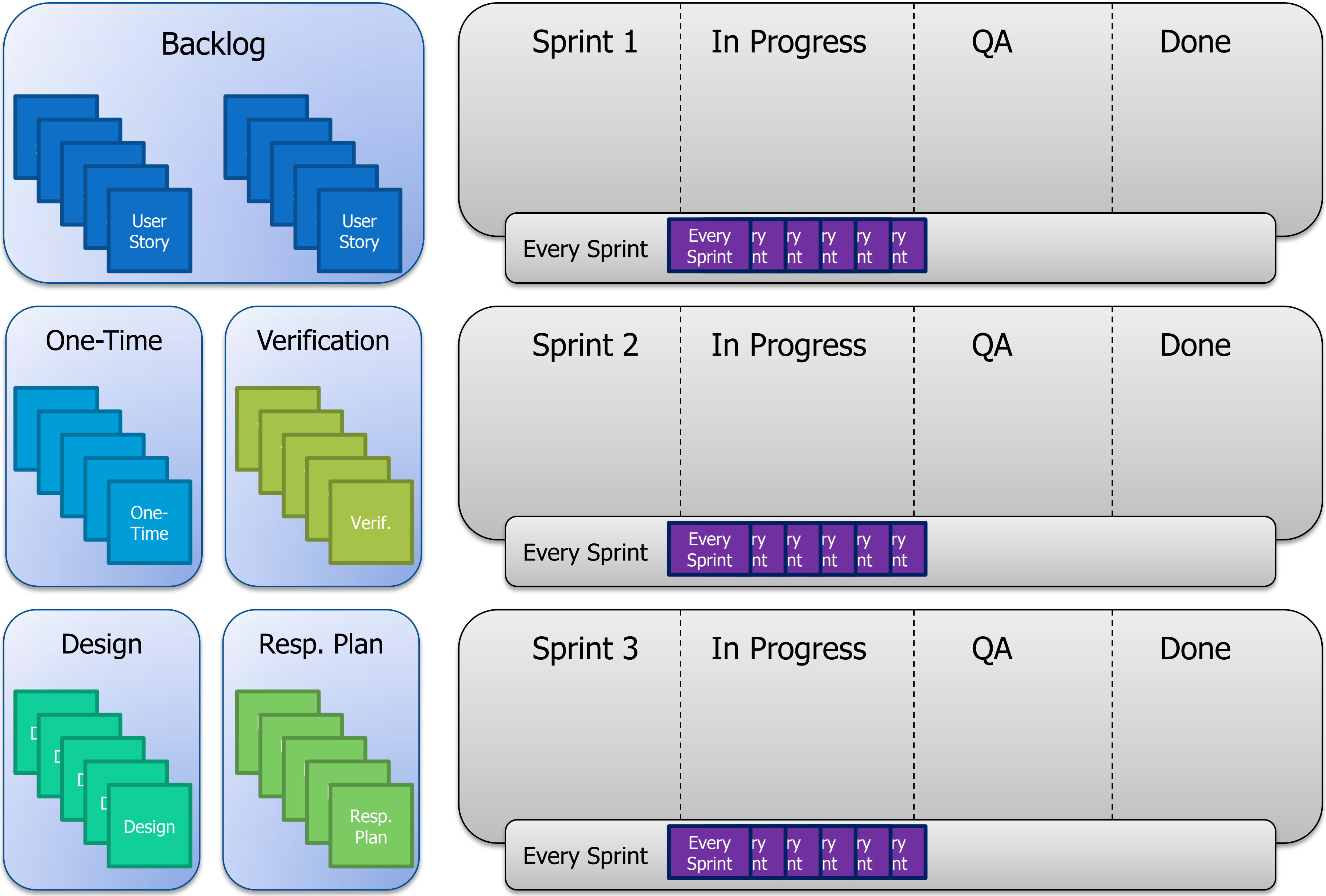


Appendix R: SDL-Agile One-Time Requirements

Title	Requirement/ Recommendation	Completion Deadline (months)	Applies to Online Services	Applies to Managed Code
Avoid writable PE segments	Requirement	6	X	
Configure bug tracking to track the cause and effect of security vulnerabilities	Requirement	3	X	X
Create a baseline threat model	Requirement	3	X	X
Determine security response standards	Requirement	6	X	X
Establish a security response plan	Requirement	6	X	X
Identify primary	Requirement	1	X	X

Final Security Review

- Occurs at the end of every sprint
- Checklist:
  - ☑All every-sprint requirements have been completed
  - ☑No one-time requirements have exceeded deadline
  - ☑At least one requirement from each bucket category has been completed
  - ☑No bucket requirements exceed the six month deadline
  - ☑No security or privacy bugs are open that exceed the severity threshold



Backlog

User Story

User Story

One-Time

One-Time

Verification

Verif.

Design

Design

Resp. Plan

Resp. Plan

Sprint 1	In Progress	QA	Done

Every Sprint

Every Sprint ry nt ry nt ry nt ry nt ry nt

Sprint 2	In Progress	QA	Done

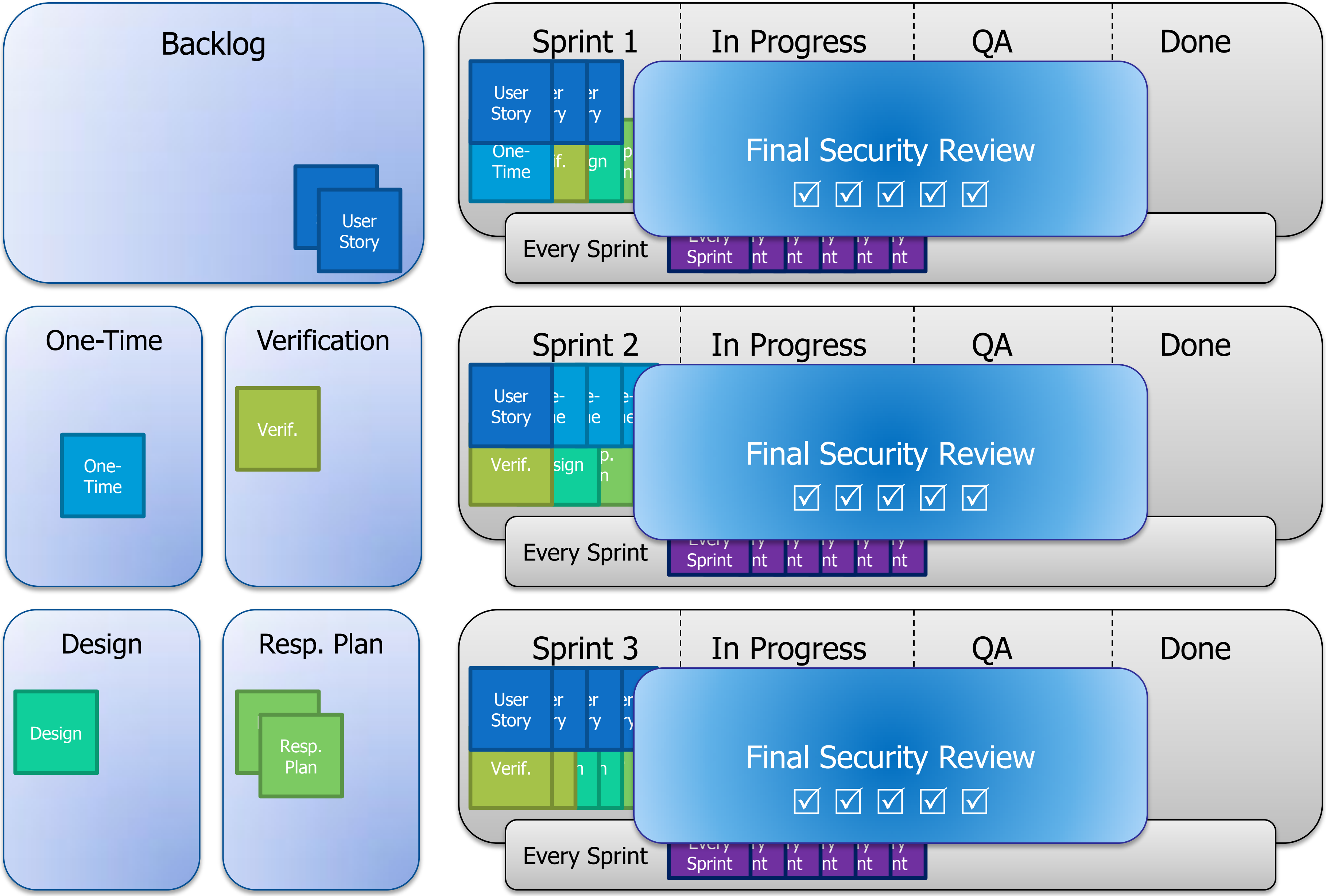
Every Sprint

Every Sprint ry nt ry nt ry nt ry nt ry nt

Sprint 3	In Progress	QA	Done

Every Sprint

Every Sprint ry nt ry nt ry nt ry nt ry nt


Backlog
User Story
One-Time
One-Time
Verification
Verif.
Design
Design
Resp. Plan
Resp. Plan
Sprint 1
In Progress
QA
Done
User Story
One-Time
Final Security Review
☑ ☑ ☑ ☑ ☑
Every Sprint
Sprint
Sprint 2
In Progress
QA
Done
User Story
Verif.
Final Security Review
☑ ☑ ☑ ☑ ☑
Every Sprint
Sprint
Sprint 3
In Progress
QA
Done
User Story
Verif.
Final Security Review
☑ ☑ ☑ ☑ ☑
Every Sprint
Sprint

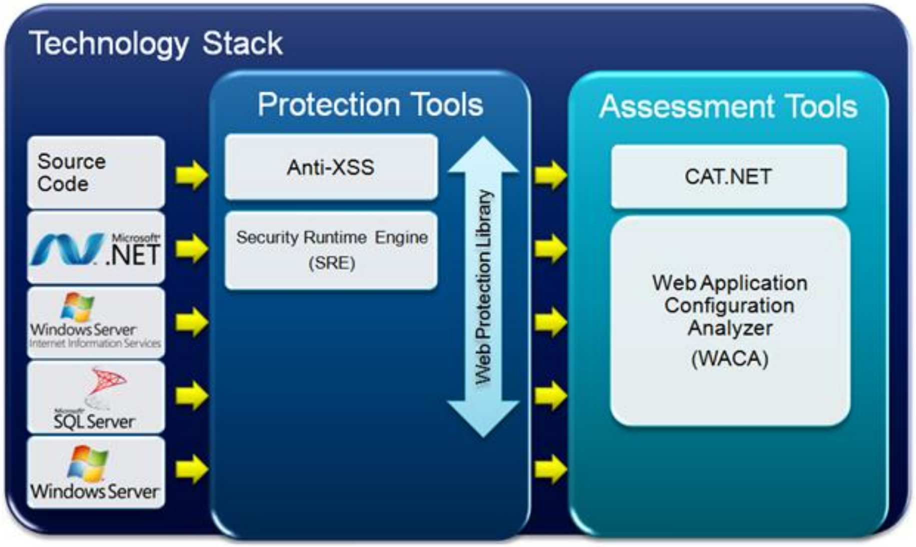
OWASP

Making SDL-Agile Manageable

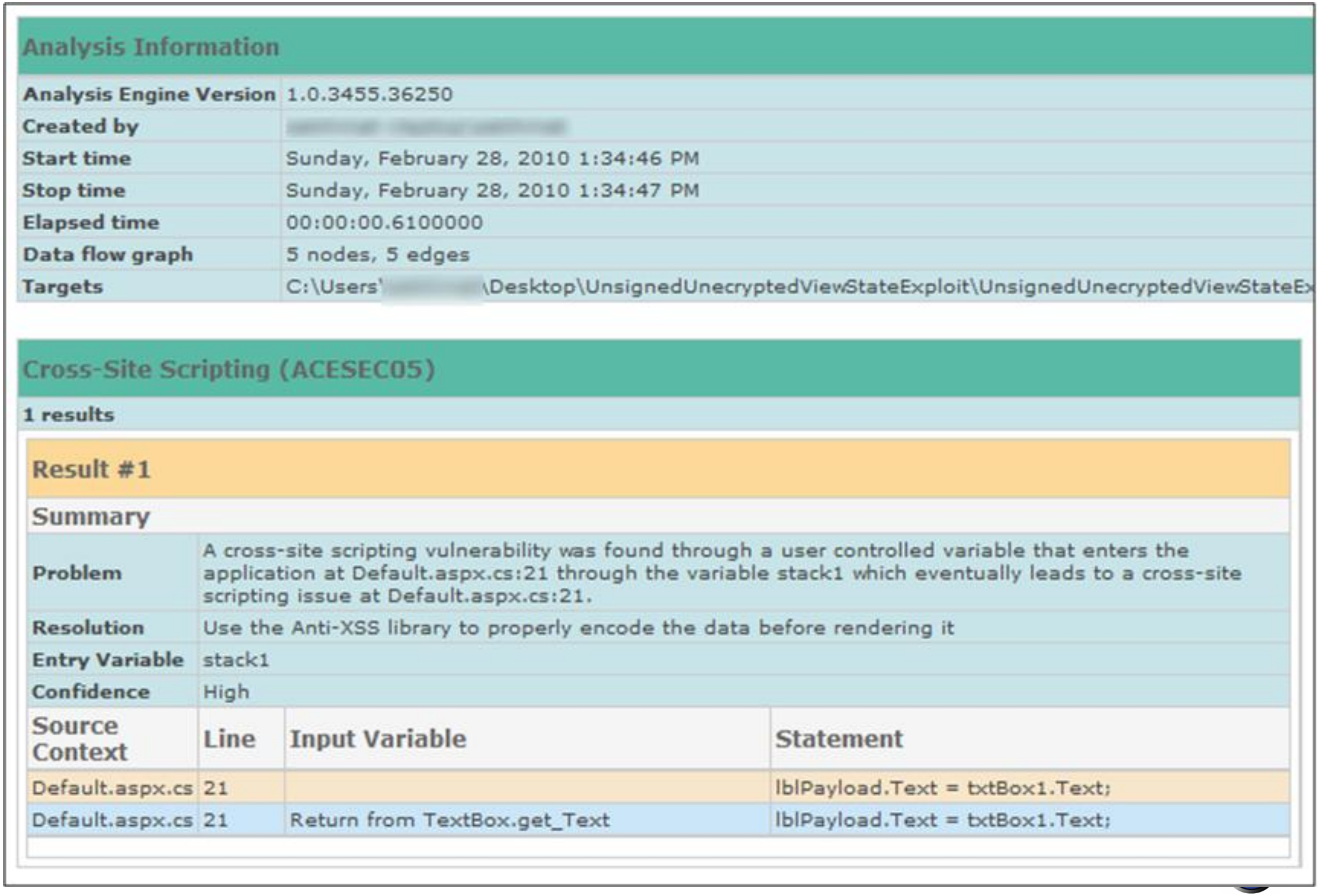
- Documented standards
- Security training
- Automation
  - Continuous Integration
    - Secure Configuration
    - Security Unit Tests
    - Automated Secure Code Analysis
    - Automated Deployment and Vulnerability Scanning
- Process
  - Continuous updates to the threat model
  - SDL Process Templates for VSTS
  - MSF-Agile + SDL Process Template
- Light on security artifacts/documentati on

Making SDL-Agile Manageable

- Tooling
  - Code Analysis/Scanning
    - CAT.NET
    - MiniFuzz
    - BinScope Binary Analyzer
    - Fiddler w/ Watcher
    - FxCop
  - MS Threat Modeling Tool



CAT.NET: Cross-site Scripting Vulnerability



Analysis Information

Analysis Engine Version	1.0.3455.36250
Created by	[redacted]
Start time	Sunday, February 28, 2010 1:34:46 PM
Stop time	Sunday, February 28, 2010 1:34:47 PM
Elapsed time	00:00:00.6100000
Data flow graph	5 nodes, 5 edges
Targets	C:\Users\[redacted]\Desktop\UnsignedUnecryptedViewStateExploit\UnsignedUnecryptedViewStateEx

Cross-Site Scripting (ACESEC05)

1 results

Result #1

Summary

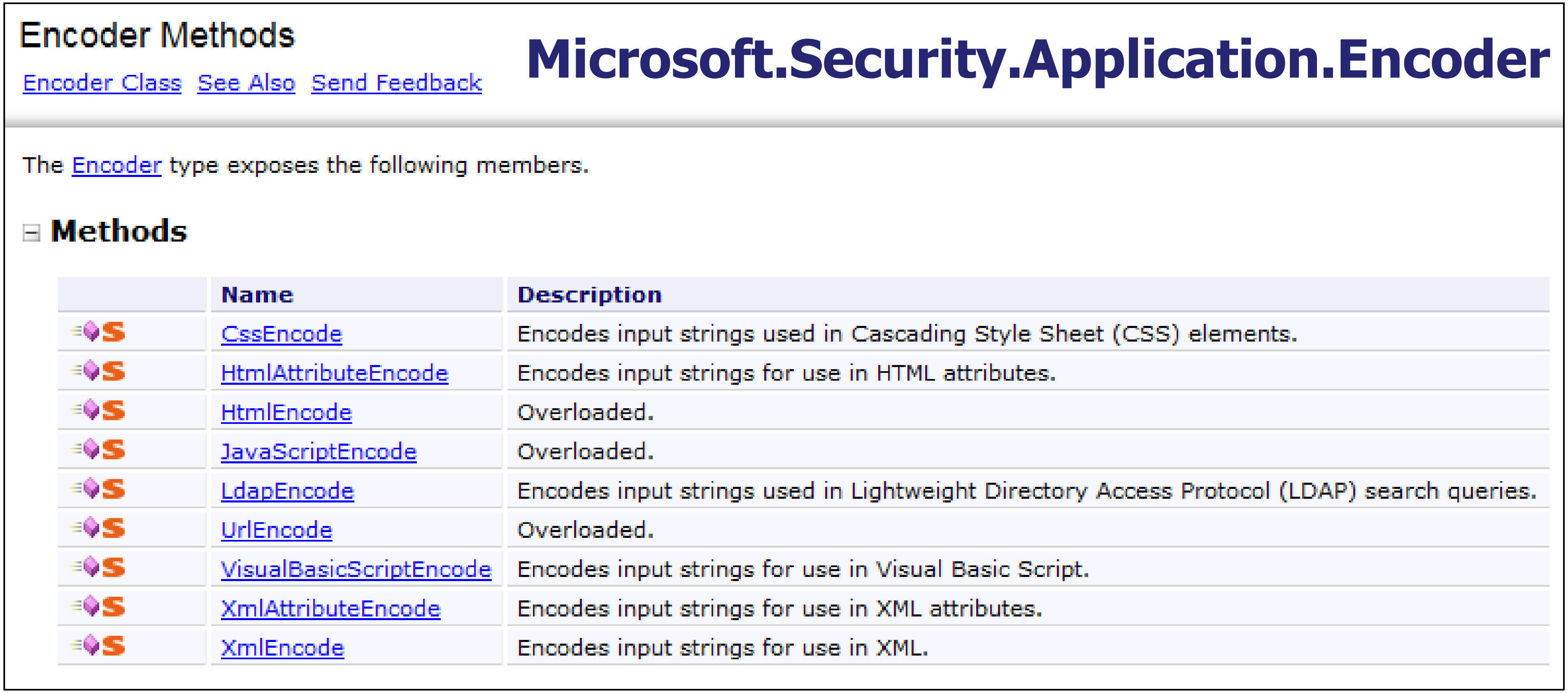
Problem	A cross-site scripting vulnerability was found through a user controlled variable that enters the application at Default.aspx.cs:21 through the variable stack1 which eventually leads to a cross-site scripting issue at Default.aspx.cs:21.
Resolution	Use the Anti-XSS library to properly encode the data before rendering it
Entry Variable	stack1
Confidence	High

Source Context	Line	Input Variable	Statement
Default.aspx.cs	21		lblPayload.Text = txtBox1.Text;
Default.aspx.cs	21	Return from TextBox.get_Text	lblPayload.Text = txtBox1.Text;

Making SDL-Agile Manageable

- Libraries
  - Web Protection Library (WPL)
    - Encoder/~~Anti-XSS Library~~
    - Security Runtime Engine (SRE)
    - Sanitizer.GetSafeHTML

Web Protection Library - Encoder/~~AntiXSS~~



Encoder Methods

Encoder Class See Also Send Feedback

Microsoft.Security.Application.Encoder

The Encoder type exposes the following members.

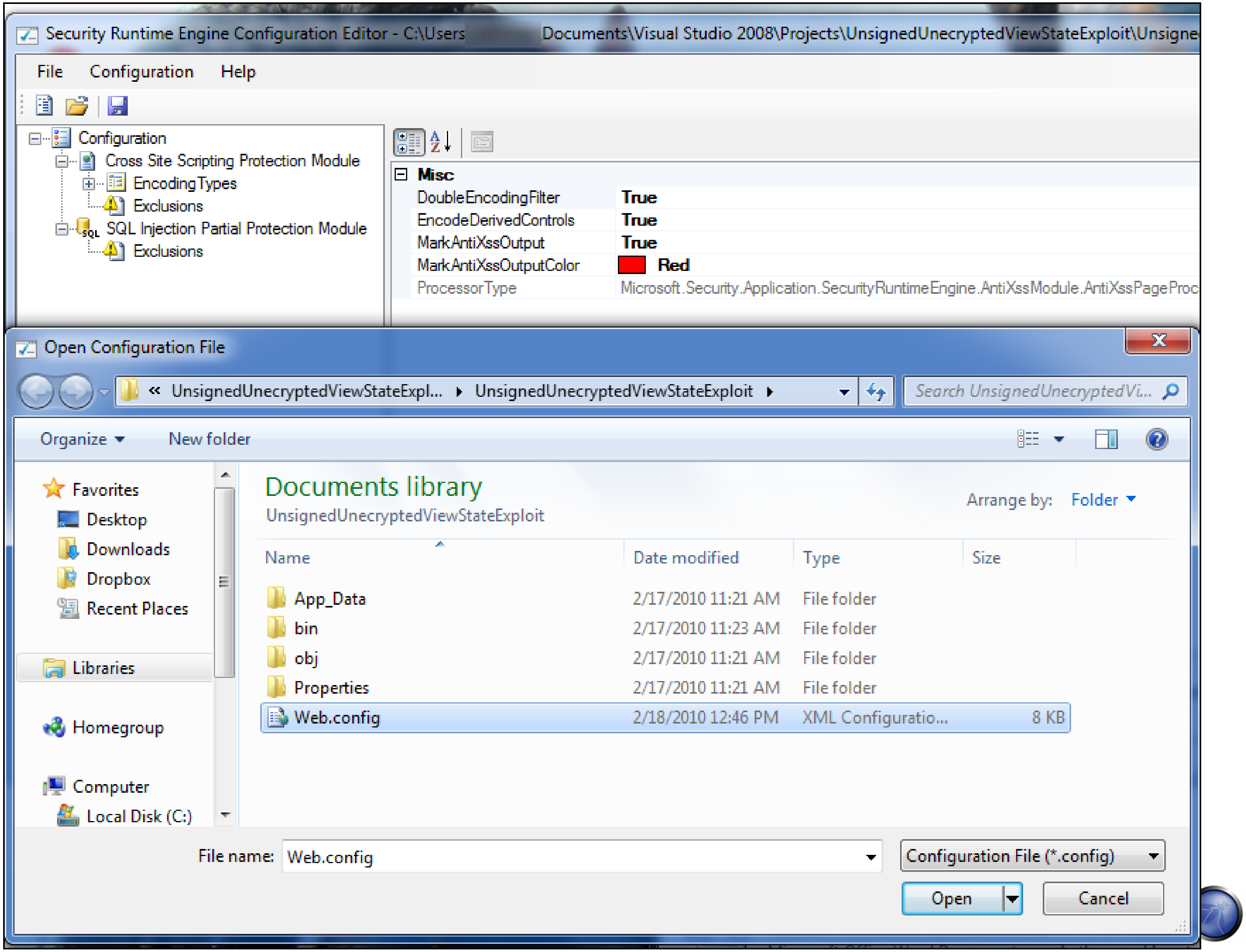
⊟ **Methods**

	Name	Description
S	CssEncode	Encodes input strings used in Cascading Style Sheet (CSS) elements.
S	HtmlAttributeEncode	Encodes input strings for use in HTML attributes.
S	HtmlEncode	Overloaded.
S	JavaScriptEncode	Overloaded.
S	LdapEncode	Encodes input strings used in Lightweight Directory Access Protocol (LDAP) search queries.
S	UrlEncode	Overloaded.
S	VisualBasicScriptEncode	Encodes input strings for use in Visual Basic Script.
S	XmlAttributeEncode	Encodes input strings for use in XML attributes.
S	XmlEncode	Encodes input strings for use in XML.

The Security Runtime Engine (SRE)

- “The Security Runtime Engine (SRE) is an HTTP module that acts like a gatekeeper to protect ASP.NET web applications from cross-site scripting (XSS) attacks.”
- “It works by inspecting each control that is being reflected by ASP.NET and then automatically encoding data of vulnerable controls in their appropriate context.”
- SRE Configuration Editor GUI Tool

The Security Runtime Engine (SRE)



Security Runtime Engine Configuration Editor - C:\Users Documents\Visual Studio 2008\Projects\UnsignedUnecryptedViewStateExploit\Unsigne

File
Configuration
Help
Configuration
Cross Site Scripting Protection Module
Encoding Types
Exclusions
SQL Injection Partial Protection Module
Exclusions
Misc

DoubleEncodingFilter	True
EncodeDerivedControls	True
MarkAntiXssOutput	True
MarkAntiXssOutputColor	🟥 Red
ProcessorType	Microsoft.Security.Application.SecurityRuntimeEngine.AntiXssModule.AntiXssPageProc

Open Configuration File

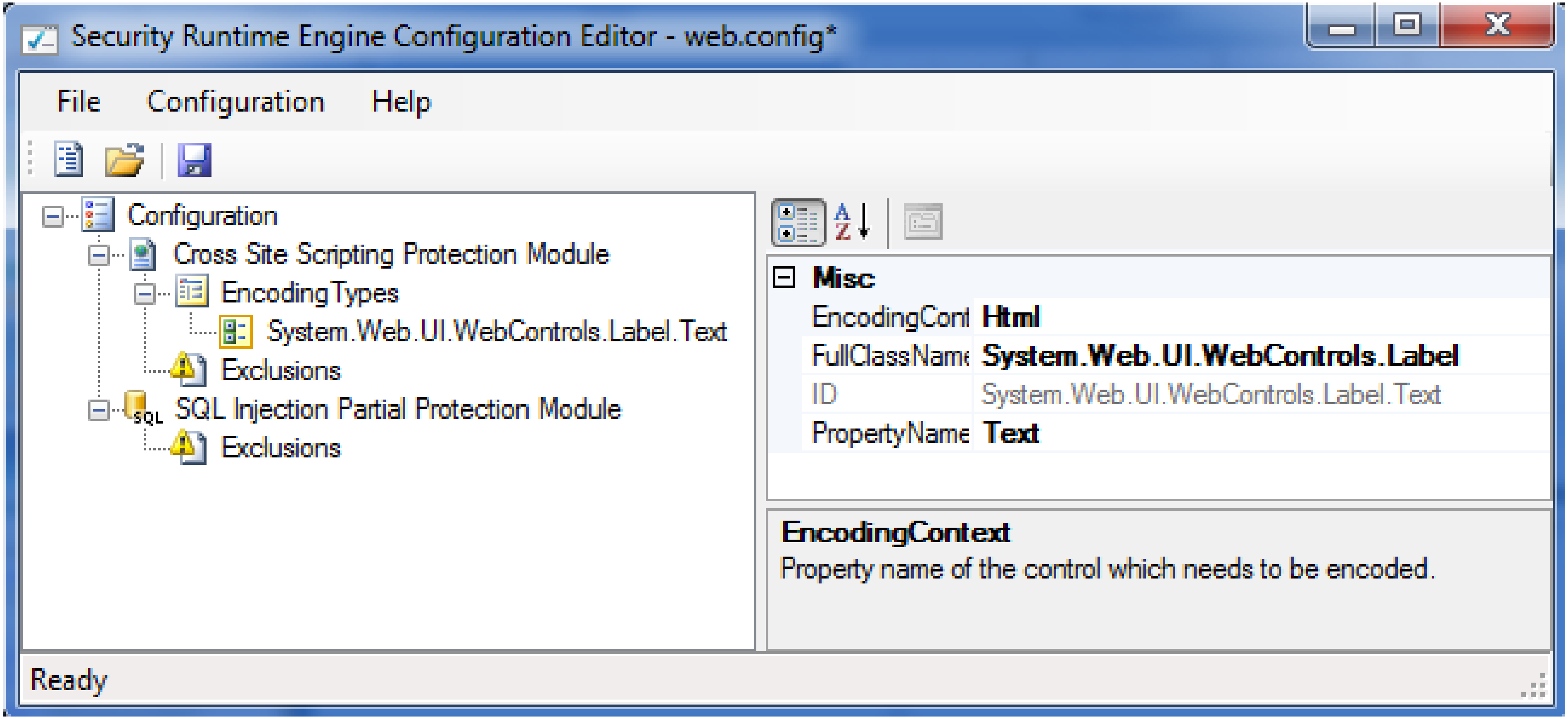
Documents library
UnsignedUnecryptedViewStateExploit

Name	Date modified	Type	Size
App_Data	2/17/2010 11:21 AM	File folder	
bin	2/17/2010 11:23 AM	File folder	
obj	2/17/2010 11:21 AM	File folder	
Properties	2/17/2010 11:21 AM	File folder	
Web.config	2/18/2010 12:46 PM	XML Configuratio...	8 KB

File name: Web.config

Configuration File (*.config)

The Security Runtime Engine (SRE)


Security Runtime Engine Configuration Editor - web.config*
File
Configuration
Help
Configuration
Cross Site Scripting Protection Module
EncodingTypes
System.Web.UI.WebControls.Label.Text
Exclusions
SQL Injection Partial Protection Module
Exclusions
Misc
Ready

EncodingCont	Html
FullClassName	System.Web.UI.WebControls.Label
ID	System.Web.UI.WebControls.Label.Text
PropertyName	Text

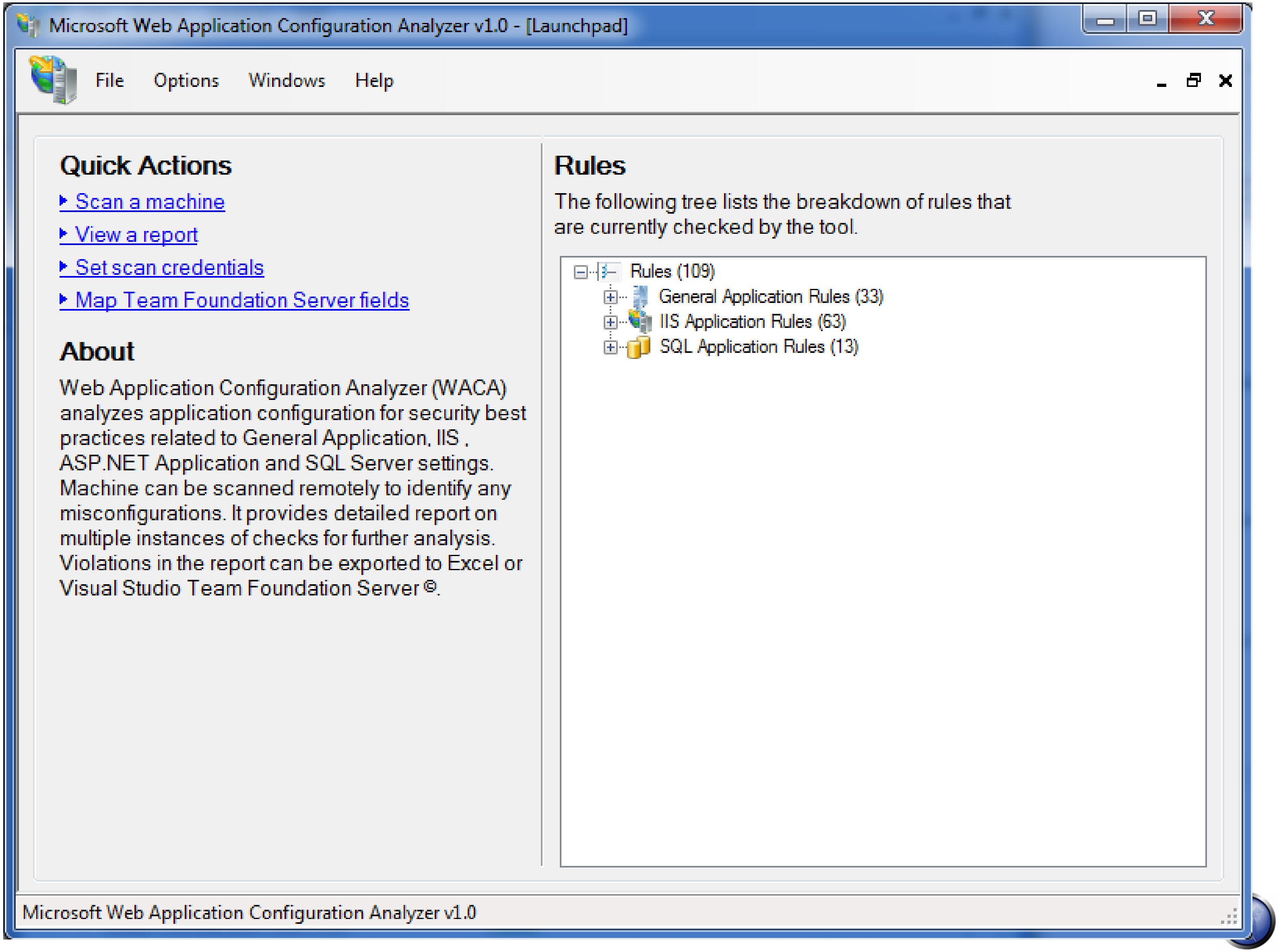
EncodingContext

Property name of the control which needs to be encoded.

Making SDL-Agile Manageable

- Deployment
  - Web Application Configuration Analyzer (WACA)
  - Microsoft Baseline Security Analyzer
  - Web.config Security Analyzer (WCSA)

Web Application Configuration Analyzer



Microsoft Web Application Configuration Analyzer v1.0 - [Launchpad]
File
Options
Windows
Help

Quick Actions

- Scan a machine
- View a report
- Set scan credentials
- Map Team Foundation Server fields

About

Web Application Configuration Analyzer (WACA) analyzes application configuration for security best practices related to General Application, IIS , ASP.NET Application and SQL Server settings. Machine can be scanned remotely to identify any misconfigurations. It provides detailed report on multiple instances of checks for further analysis. Violations in the report can be exported to Excel or Visual Studio Team Foundation Server ©.

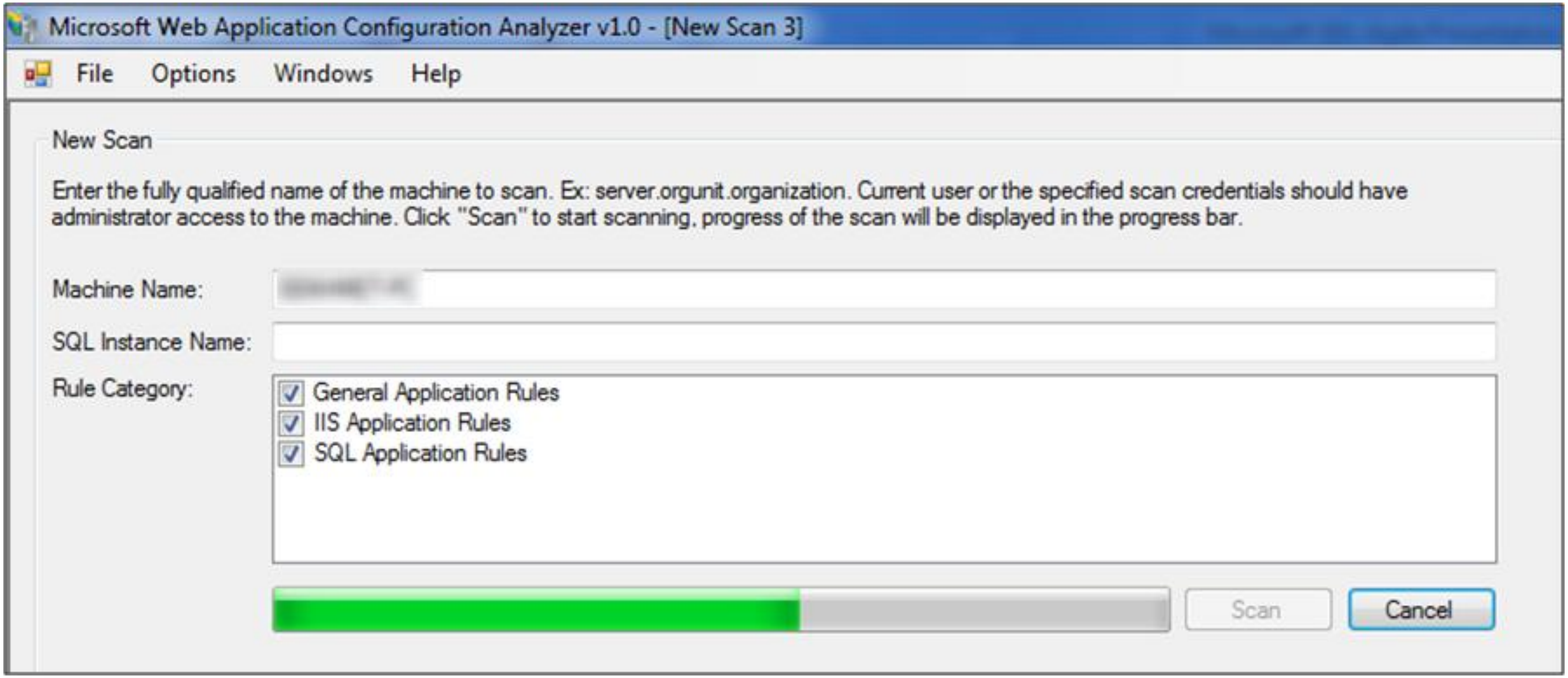
Rules

The following tree lists the breakdown of rules that are currently checked by the tool.

- Rules (109)
  - General Application Rules (33)
  - IIS Application Rules (63)
  - SQL Application Rules (13)

Microsoft Web Application Configuration Analyzer v1.0

Web Application Configuration Analyzer



Microsoft Web Application Configuration Analyzer v1.0 - [New Scan 3]

Enter the fully qualified name of the machine to scan. Ex: server.orgunit.organization. Current user or the specified scan credentials should have administrator access to the machine. Click "Scan" to start scanning, progress of the scan will be displayed in the progress bar.

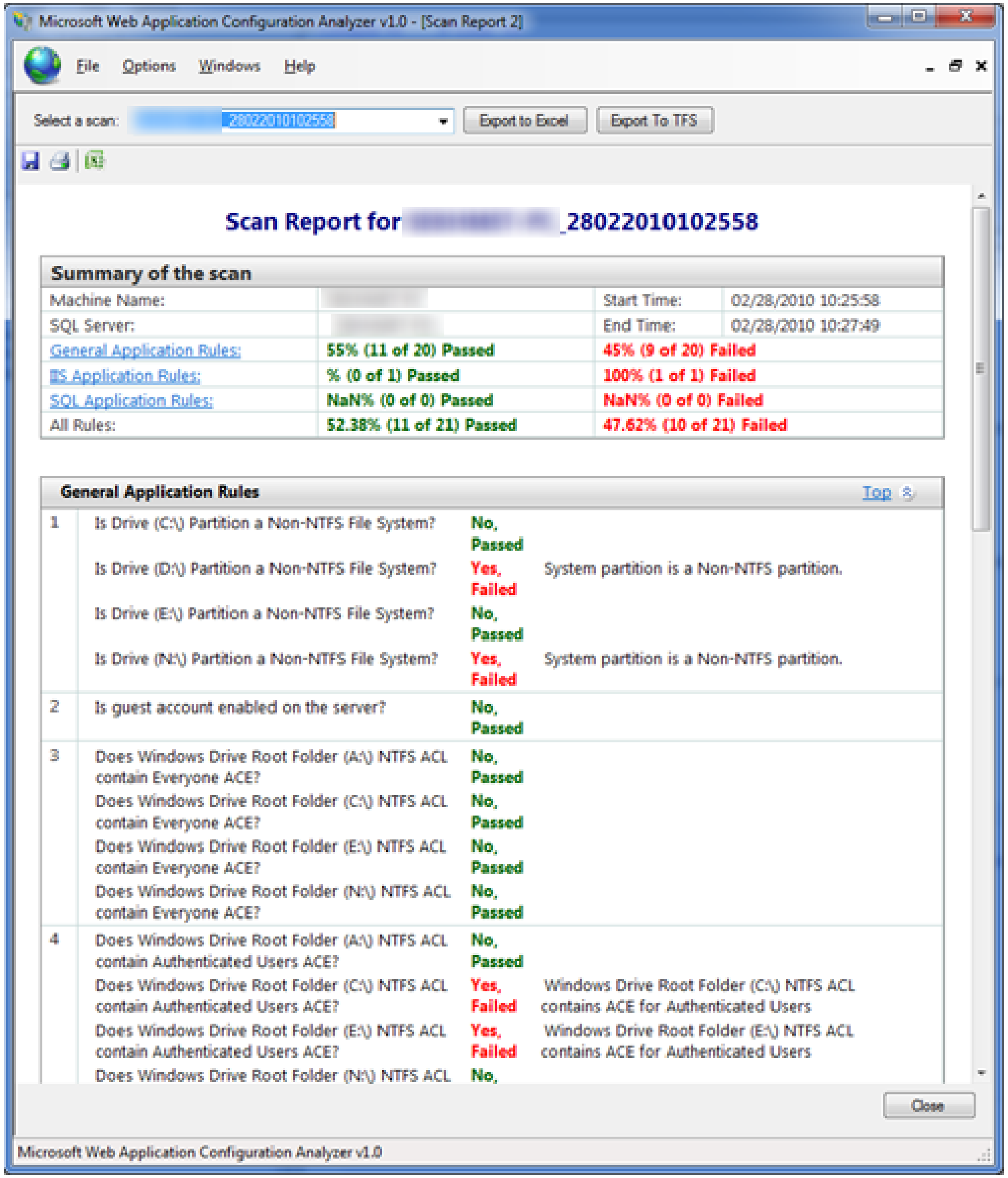
Machine Name: [redacted]

SQL Instance Name:

Rule Category:

- ☑ General Application Rules
- ☑ IIS Application Rules
- ☑ SQL Application Rules

Web Application Configuration Analyzer


Microsoft Web Application Configuration Analyzer v1.0 - [Scan Report 2]
File
Options
Windows
Help
Export to Excel
Export To TFS
Top
Close
Microsoft Web Application Configuration Analyzer v1.0

Select a scan: [redacted]28022010102558

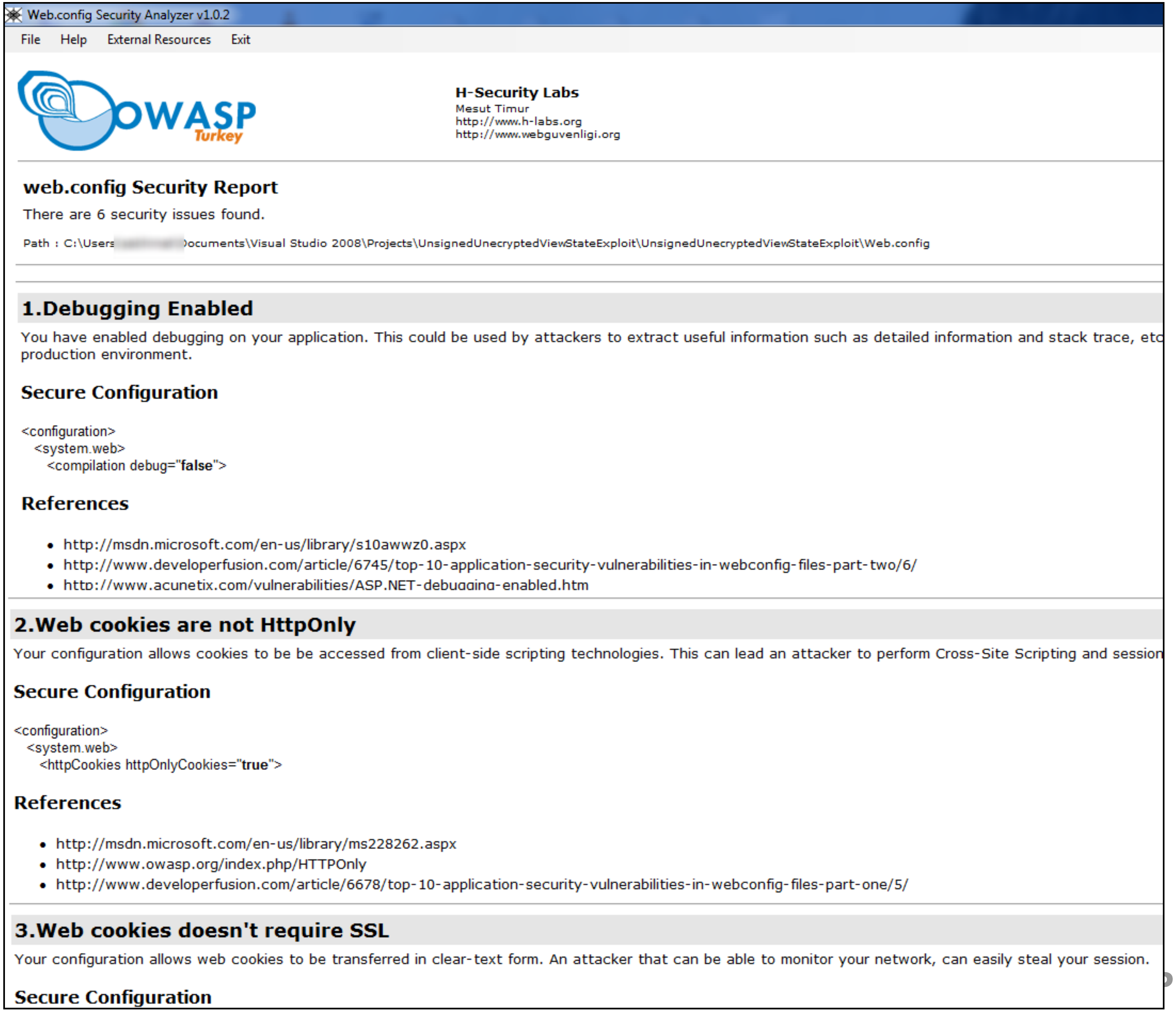
Scan Report for [redacted]_28022010102558

Summary of the scan			
Machine Name:	[redacted]	Start Time:	02/28/2010 10:25:58
SQL Server:	[redacted]	End Time:	02/28/2010 10:27:49
General Application Rules:	55% (11 of 20) Passed	45% (9 of 20) Failed	
IIS Application Rules:	% (0 of 1) Passed	100% (1 of 1) Failed	
SQL Application Rules:	NaN% (0 of 0) Passed	NaN% (0 of 0) Failed	
All Rules:	52.38% (11 of 21) Passed	47.62% (10 of 21) Failed	

General Application Rules			
1	Is Drive (C:\) Partition a Non-NTFS File System?	No, Passed	
	Is Drive (D:\) Partition a Non-NTFS File System?	Yes, Failed	System partition is a Non-NTFS partition.
	Is Drive (E:\) Partition a Non-NTFS File System?	No, Passed	
	Is Drive (N:\) Partition a Non-NTFS File System?	Yes, Failed	System partition is a Non-NTFS partition.
2	Is guest account enabled on the server?	No, Passed	
3	Does Windows Drive Root Folder (A:\) NTFS ACL contain Everyone ACE?	No, Passed	
	Does Windows Drive Root Folder (C:\) NTFS ACL contain Everyone ACE?	No, Passed	
	Does Windows Drive Root Folder (E:\) NTFS ACL contain Everyone ACE?	No, Passed	
	Does Windows Drive Root Folder (N:\) NTFS ACL contain Everyone ACE?	No, Passed	
4	Does Windows Drive Root Folder (A:\) NTFS ACL contain Authenticated Users ACE?	No, Passed	
	Does Windows Drive Root Folder (C:\) NTFS ACL contain Authenticated Users ACE?	Yes, Failed	Windows Drive Root Folder (C:\) NTFS ACL contains ACE for Authenticated Users
	Does Windows Drive Root Folder (E:\) NTFS ACL contain Authenticated Users ACE?	Yes, Failed	Windows Drive Root Folder (E:\) NTFS ACL contains ACE for Authenticated Users
	Does Windows Drive Root Folder (N:\) NTFS ACL	No,	

OWASP

Web.config Security Analyzer (WCSA)



H-Security Labs
Mesut Timur
http://www.h-labs.org
http://www.webguvenligi.org

web.config Security Report

There are 6 security issues found.

Path : C:\Users[redacted]Documents\Visual Studio 2008\Projects\UnsignedUnecryptedViewStateExploit\UnsignedUnecryptedViewStateExploit\Web.config

1.Debugging Enabled

You have enabled debugging on your application. This could be used by attackers to extract useful information such as detailed information and stack trace, etc production environment.

Secure Configuration

```
<configuration>
  <system.web>
    <compilation debug="false">
```

References

- http://msdn.microsoft.com/en-us/library/s10awwz0.aspx
- http://www.developerfusion.com/article/6745/top-10-application-security-vulnerabilities-in-webconfig-files-part-two/6/
- http://www.acunetix.com/vulnerabilities/ASP.NET-debugging-enabled.htm

2.Web cookies are not HttpOnly

Your configuration allows cookies to be be accessed from client-side scripting technologies. This can lead an attacker to perform Cross-Site Scripting and session

Secure Configuration

```
<configuration>
  <system.web>
    <httpCookies httpOnlyCookies="true">
```

References

- http://msdn.microsoft.com/en-us/library/ms228262.aspx
- http://www.owasp.org/index.php/HTTPOnly
- http://www.developerfusion.com/article/6678/top-10-application-security-vulnerabilities-in-webconfig-files-part-one/5/

3.Web cookies doesn't require SSL

Your configuration allows web cookies to be transferred in clear-text form. An attacker that can be able to monitor your network, can easily steal your session.

Secure Configuration

Making SDL-Agile Manageable

- **Education**, **secure coding standards, automation** and **tools** play a significant role in making secure Agile development efficient and economical
- Don’t forget:
  - Periodic manual security activities are also a must
  - All of this must fit within a **repeatable, mature process**

Summary and Questions

More Information:

http://www.microsoft.com/sdl

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http://www.twitter.com/sekhmetn

- Microsoft releases SDL-Agile Guidance in Nov. 2009
- Treats SDL Activities like team-prioritized User Stories
  - 3 Categories: One-time, Every-time, and Bucket
- Increased success with the implementation of training, automation, tools, and standards