



OWASP Top Ten (2010) Tools and Tactics Russ McRee






Welcome

- **Director, Security Analytics for Microsoft Online Services Security & Compliance**
 - Writer (toolsmith), researcher (holisticinfosec), presenter (Defcon, Black Hat, RSA), SANS GSE and ISC handler
- **We see MANY web application security flaws**
 - 50,000 unique MS-related domains
- **These tools and tactics help us assess and defend too**





OWASP Top Ten Tools and Tactics

- The Open Web Application Security Project
 - All attack and defense content is drawn directly from the OWASP Top 10 Wiki* 
- A tool for each of the Top Ten to aid in discovering and remediating each of the OWASP Top 10
- We'll try to demo as many of these tools as time allows

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Lessons from WhiteHat Security report

- **Lesson 1:**

- Software will always have bugs and by extension, security vulnerabilities. Therefore, a practical goal for a secure software development lifecycle (SDLC) should be to reduce, not necessarily eliminate, the number of vulnerabilities introduced and the severity of those that remain.*





Lessons from WhiteHat Security report

- **Lesson 2:**

- Exploitation of just one website vulnerability is enough to significantly disrupt online business, cause data loss, shake customer confidence, and more. Therefore, the earlier vulnerabilities are identified and the faster they are remediated the shorter the window of opportunity for an attacker to maliciously exploit them.*





OWASP Top Ten Web Application Security Risks

- **A1: Injection:**

- Injection flaws, such as SQL, OS, and LDAP injection, occur when untrusted data is sent to an interpreter as part of a command or query.

- **A2: Cross-Site Scripting (XSS)**

- XSS flaws occur whenever an application takes untrusted data and sends it to a web browser without proper validation and escaping.

- **A3: Broken Authentication and Session Management**

- Application functions related to authentication and session management are often not implemented correctly, allowing attackers to compromise passwords, keys, session tokens, or exploit other implementation flaws to assume other users' identities.

- **A4: Insecure Direct Object References**

- A direct object reference occurs when a developer exposes a reference to an internal implementation object, such as a file, directory, or database key.

- **A5: Cross-Site Request Forgery (CSRF)**

- A CSRF attack forces a logged-on victim's browser to send a forged HTTP request, including the victim's session cookie and any other automatically included authentication information, to a vulnerable web application.





OWASP Top Ten Web Application Security Risks

- **A6: Security Misconfiguration**

- Good security requires having a secure configuration defined and deployed for the application, frameworks, application server, web server, database server, and platform.

- **A7: Insecure Cryptographic Storage**

- Many web applications do not properly protect sensitive data, such as credit cards, SSNs, and authentication credentials, with appropriate encryption or hashing.

- **A8: Failure to Restrict URL Access**

- Many web applications check URL access rights before rendering protected links and buttons.

- **A9: Insufficient Transport Layer Protection**

- Applications frequently fail to authenticate, encrypt, and protect the confidentiality and integrity of sensitive network traffic.

- **A10: Unvalidated Redirects and Forwards**

- Web applications frequently redirect and forward users to other pages and websites, and use untrusted data to determine the destination pages.





OWASP Top Ten Tools

- A1: Injection –
- A2: Cross-Site Scripting (XSS) -
- A3: Broken Authentication and Session Management -
- A4: Insecure Direct Object References -
- A5: Cross-Site Request Forgery (CSRF) –
- A6: Security Misconfiguration –
- A7: Insecure Cryptographic Storage
- A8: Failure to Restrict URL Access -
- A9: Insufficient Transport Layer Protection -
- A10: Unvalidated Redirects and Forwards –

ZAP

BeEF

HackBar

Burp Suite

Tamper Data

Watobo

N/A

Nikto/Wikto

Calomel

Watcher





A1: Injection – ZAP (Zed Attack Proxy)

- **Attack:**
 - The attacker's hostile data can trick the interpreter into executing unintended commands or accessing unauthorized data
- **Defense:**
 - Prepared Statements (Parameterized Queries)
 - Use of Stored Procedures
 - Escaping all User Supplied Input

The screenshot shows the OWASP ZAP interface. The top menu includes File, Edit, View, Analyse, Report, Tools, and Help. The main window is titled 'Untitled Session - OWASP ZAP'. On the left, a 'Sites' tree shows a site at 'http://192.168.140.135:8080' with various resources like 'GET:favicon.ico', 'GET:zapwave', and 'WebGoat'. The main pane shows a 'Raw View' of a POST request to 'http://192.168.140.135:8080/WebGoat/attack?Screen=227&menu=1200'. The request body contains 'station=101&SUBMIT=Go%2521%27INJECTED_PARAM'. At the bottom, an 'Alerts' pane shows a warning for 'SQL Injection Fingerprinting (4)' with a risk level of 'High'. The alert description states 'SQL injection may be possible'.

- 2011 Toolsmith Tool of the Year





A2: Cross-Site Scripting (XSS) - BeEF

- **Attack:**
 - Allows attackers to execute scripts in victim's browser, can hijack user sessions, deface web sites, or redirect user to malicious sites
- **Defense:**
 - Escape all untrusted data based on the HTML context
 - Positive or "whitelist" input validation
 - Current browser, NoScript

Browser Exploitation Framework - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://192.168.140.136/beef/ui?url_str=http%3A%2F%2Fwww.issa.org%2F

Proxy: None Apply Edit Remove Add Status: Using None Preferences

OWASP ZAP WAVE - Index Browser Exploitation Framew...

View Zombies Standard Modules Browser Modules Network Modules Options Help Wade Alcorn (<http://www.bindshell.net>)

Browser Exploitation Framework

BeEF

Autorun
Disabled

Zombies
192.168.140.1

About

BeEF is a browser exploitation framework. Its purpose in life is to provide an easily integratable framework to demonstrate the impact of browser and Cross-site Scripting issues in real-time. The modular structure has allowed the development of new modules to be a simple process.

What's New

You will immediately notice the log summary on the main screen. This logs zombie details and module results. It provides access to the zombie pane by clicking on the date. There are two other logs - the zombie log and the raw log. The raw log contains more information than the log summary pane. For more detail refer to the CHANGELOG file.

Log Summary

[Refresh Log] [Clear Log] [Display Raw Log]

[20/10/11 01:24:48 192.168.140.1]
Zombie connected: Firefox 7.0.1 - rv:7.0.1
Gecko/20100101 Firefox/7.0.1

[20/10/11 01:23:57 192.168.140.1]
Module Result:
Alert Clicked

[20/10/11 01:23:53 192.168.140.1]
Zombie connected: Firefox 7.0.1 - rv:7.0.1
Gecko/20100101 Firefox/7.0.1





A3: Broken Authentication & Session Management - Hackbar

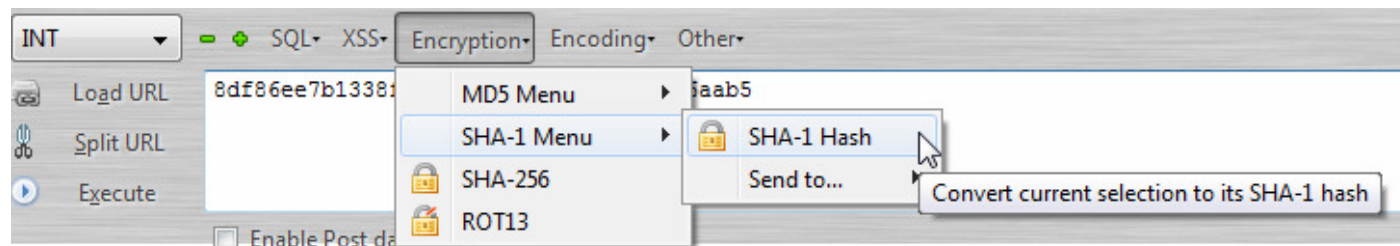
- **Attack:**

- Allows attackers to compromise passwords, keys, session tokens, or exploit other implementation flaws to assume other users' identities

- **Defense:**

- A single set of strong authentication and session management controls

- **ESAPI**



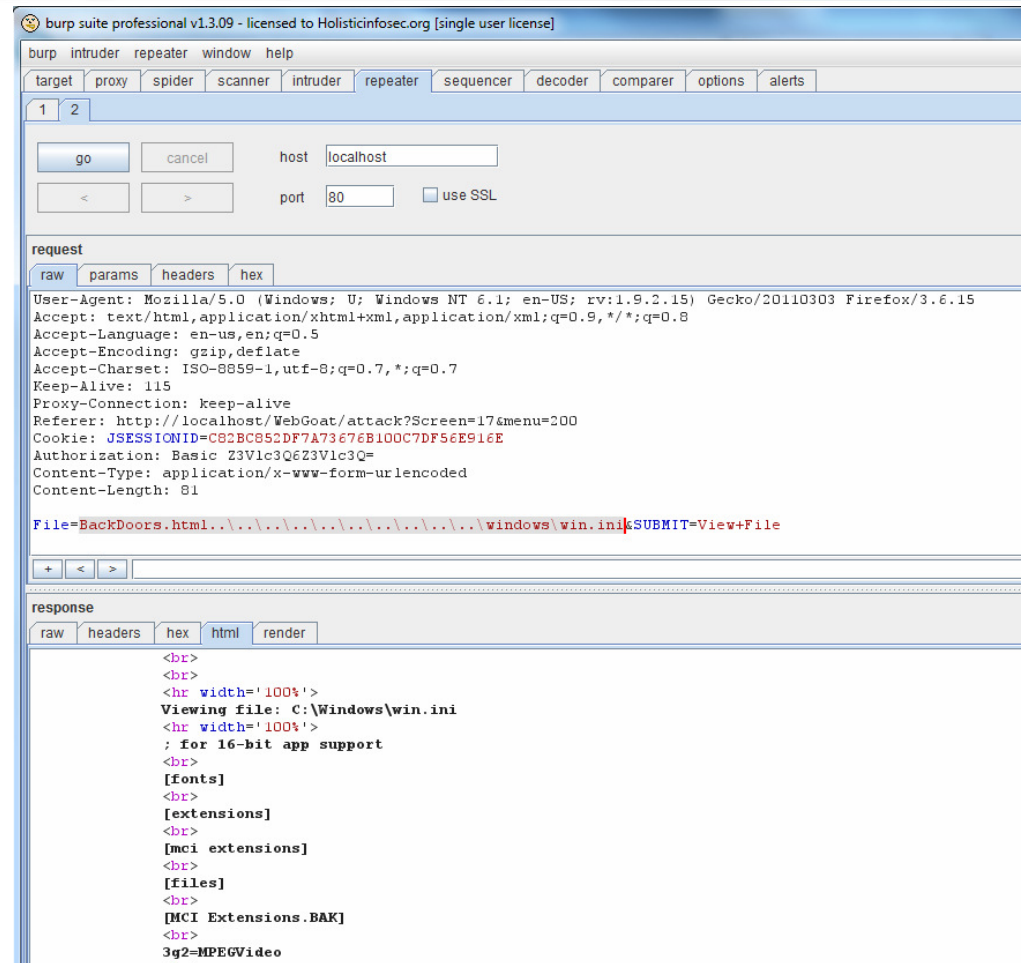
- "I implore everybody to migrate to a stronger password scrambler without undue delay."
 - MD5 developer Poul-Henning Kamp





A4: Insecure Direct Object References - Burp

- **Attack:**
 - Without an access control check or other protection, attackers can manipulate references to access unauthorized data
- **Defense:**
 - Use per user or session indirect object references
 - Check access





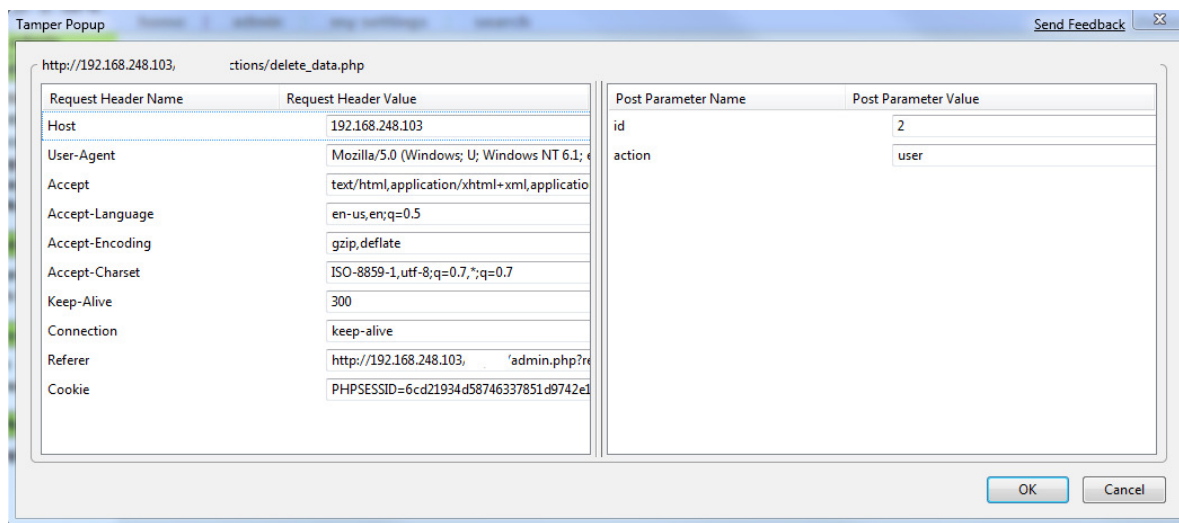
A5: Cross-Site Request Forgery (CSRF) – Tamper Data

- **Attack:**

- Allows attacker to force victim's browser to generate requests the vulnerable application thinks are legitimate requests from the victim

- **Defense:**

- Unique token in hidden field





A6: Security Misconfiguration – Watobo

- **Attack:**
 - Settings that are not defined, well implemented and maintained, or shipped with weak defaults are subject to exploit
- **Defense:**
 - Repeatable hardening process
 - Awareness and deployment of new updates and patches
 - Strong application architecture
 - Scan and audit

Finding: Directory Indexing

Module: Passive:Dirindexing

Browser-View Fuzzer Manual Request

Request:

Text Hex

Grep Highlight Reset

```
GET http://192.168.248.107/ HTTP/1.1
Host: 192.168.248.107
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 6.1; en-US; rv:1.9.2.15) Gecko/20110303 Firefox/3.6.15
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-us,en;q=0.5
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
Keep-Alive: 115
Connection: Close
Proxy-Connection: Close
Accept-Encoding: None
```

Response:

Text Tagless Hex

Grep Highlight Reset

```
HTTP/1.1 200 OK
Date: Wed, 16 Mar 2011 03:17:26 GMT
Server: Apache/2.2.16 (Ubuntu)
Vary: Accept-Encoding
Content-Length: 2833
Connection: close
Content-Type: text/html; charset=UTF-8

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2 Final//EN">
<html>
<head>
<title>Index of /</title>
```





A8: Failure to Restrict URL Access - Nikto/Wikto

- **Attack:**

- Applications must perform access control checks to protected pages each time accessed to prevent attackers from gaining unauthorized access

- **Defense:**

- RBAC
- Deny all by default
- Check workflow

```
- Nikto v2.1.3
-----
+ Target IP:      127.0.0.1
+ Target Hostname: localhost
+ Target Port:    80
+ Start Time:    2011-03-16 23:13:30
-----
+ Server: Apache/2.2.16 (Ubuntu)
+ OSVDB-3268: : Directory indexing found.
+ Allowed HTTP Methods: GET, HEAD, POST, OPTIONS
+ OSVDB-3268: ./: Directory indexing found.
+ OSVDB-3268: /?mod=node&nid=some thing&op=view: Directory indexing found.
+ OSVDB-3268: /?mod=some_thing&op=browse: Directory indexing found.
+ ./: Appending './' to a directory allows indexing
+ OSVDB-3268: //: Directory indexing found.
+ OSVDB-3268: /?Open: Directory indexing found.
+ OSVDB-3268: /?OpenServer: Directory indexing found.
+ OSVDB-3268: /%2e/: Directory indexing found.
+ OSVDB-3268: /?mod=<script>alert(document.cookie)</script>&op=browse: Directory indexing found.
+ OSVDB-3268: /?sql debug=1: Directory indexing found.
+ OSVDB-3268: ///: Directory indexing found.
+ OSVDB-3268: /doc/: Directory indexing found.
+ OSVDB-48: /doc/: The /doc/ directory is browsable. This may be /usr/doc.
+ OSVDB-3268: http://127.0.0.1:2301/ HTTP/1.0: Directory indexing found.
+ OSVDB-561: /server-status: This reveals Apache information. Comment out appropriate line in httpd.conf or restrict access to allowed hosts.
```



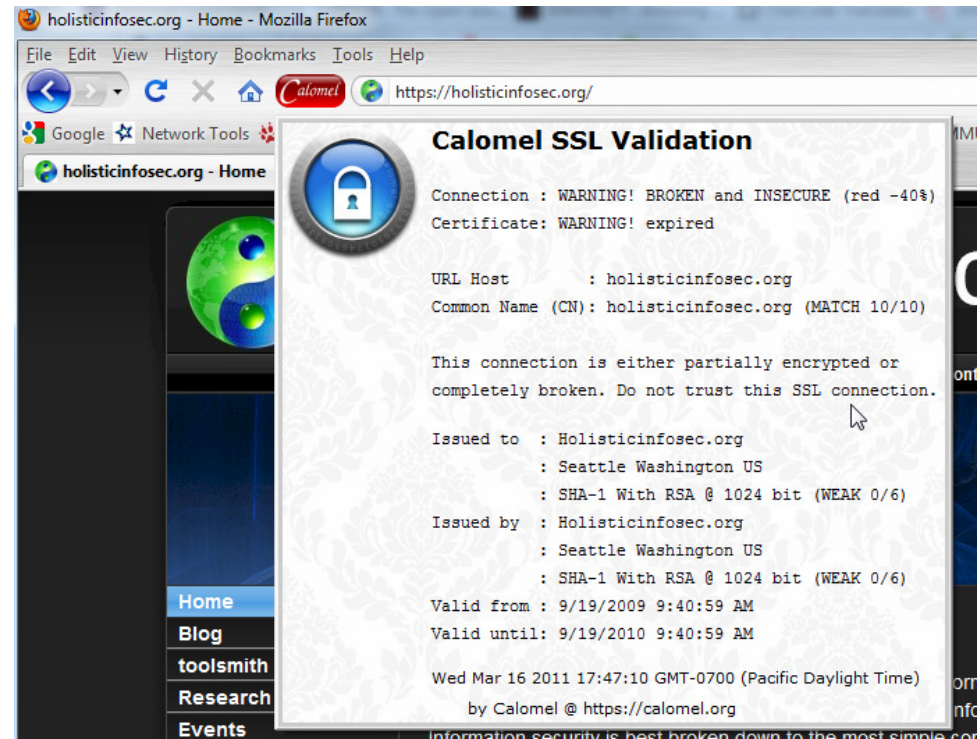
A9: Insufficient Transport Layer Protection - Calomel

- **Attack:**

- Compromise confidentiality & integrity of sensitive network traffic due to lack of auth or encrypt, weak algorithms, expired or invalid certificates, or misuse

- **Defense:**

- Require SSL (strong)
- Secure flag on cookies
- Valid certs





A10: Unvalidated Redirects and Forwards – Watcher

- **Attack:**

- Without proper validation, attackers can redirect victims to phishing or malware sites, or use forwards to access unauthorized pages

- **Defense:**

- Avoid using redirects and forwards
- Don't use parameters in calculating the destination
 - If using parameters, ensure valid values and user authorization

The screenshot shows the Watcher tool interface with a table of results. The table has columns for Severity, Session ID, Type, and URL. The results are as follows:

Severity	Session ID	Type	URL
Medium	1064	Cookie's HTTPOnly flag was not set	s1.hit.stat.pl/_1255247048815/script.js?id=bV07y)
Medium	1065	Cookie's HTTPOnly flag was not set	st.hit.gemius.pl/_1255247049361/rexdot.gif?!=11&
Informational	1098	Charset not UTF-8	/redirect.asp?url=http://
Informational	1099	Charset not UTF-8	/redirect.asp?url=http://
High	1099	User controllable location header (Open Redirect)	/redirect.asp?url=http://



Summary

- Employ SDL/SDLC practices
 - Test regularly
- Conform to uniform standards
- Work with development teams to create delivery schedules that allow security-oriented checkpoints:
 - Static code analysis
 - Development/integration deployments for testing
- Review all available resources
- Training: GWAPT, GSSP Java & .NET, **GWEB**





Resources

- ZAP Web Application Vulnerability Example
 - <http://code.google.com/p/zaproxy/downloads/detail?name=zap-wave-0.2.zip&can=2&q=>
- Tamper Data (from Firefox Add-ons)
- Fiddler
 - <http://www.fiddler2.com/fiddler2/version.asp>
- Watcher
 - <http://websecuritytool.codeplex.com/releases/view/22212>
- Damn Vulnerable Web Application
 - <http://www.dvwa.co.uk/>
- NOWASP Mutillidae
 - <http://sourceforge.net/projects/mutillidae/>





Q & A

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