Dynamic DAST/WAF Integration

Presented by:

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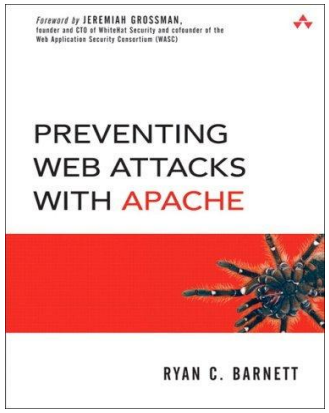
Senior Security Researcher

OWASP ModSecurity CRS Leader

Ryan Barnett - Background

- Trustwave
  - Senior Security Researcher
  - Member of SpiderLabs Research
  - Surveillance Team Lead
    - IDS/IPS
    - MailMax
    - WAF
  - Web Application Defense
  - ModSecurity Project Leader

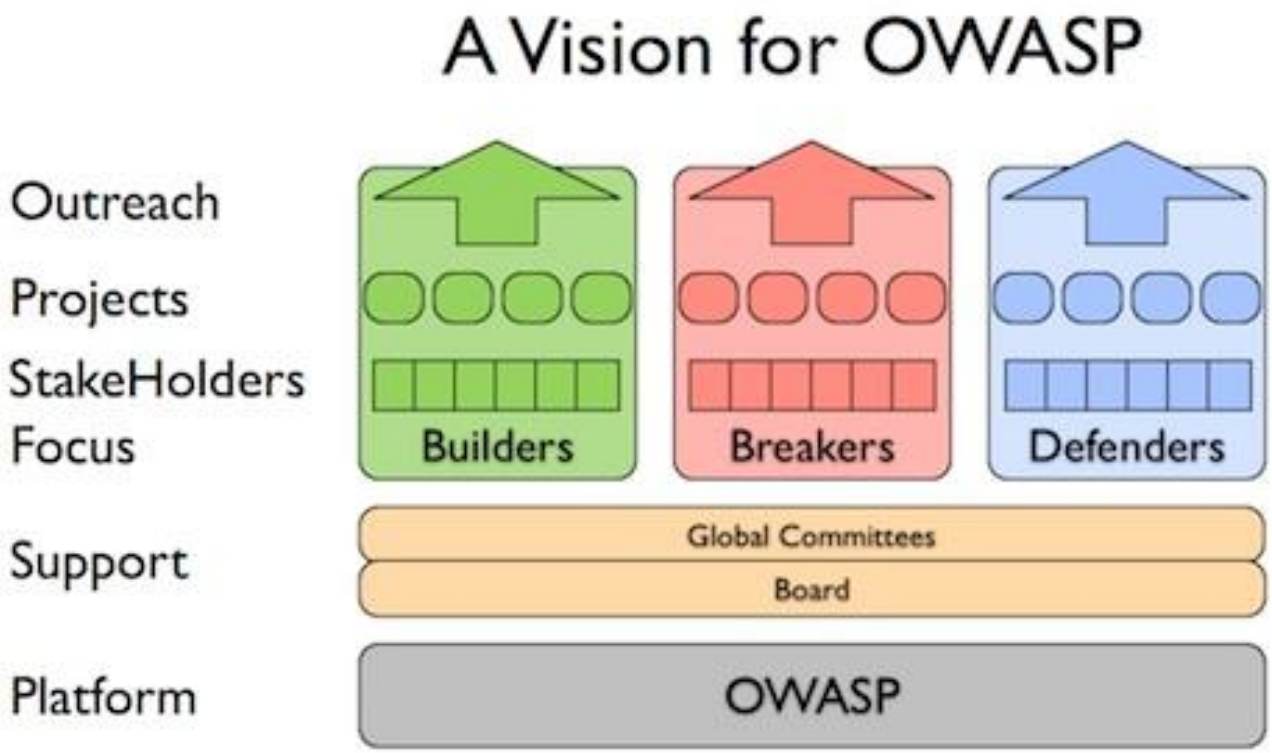
- Author
  - "Preventing Web Attacks with Apache"
    - Pearson Publishing - 2006
  - "The Web Application Defenders' Cookbook"
    - Wiley Publishing – (Due end of 2012)



Agenda

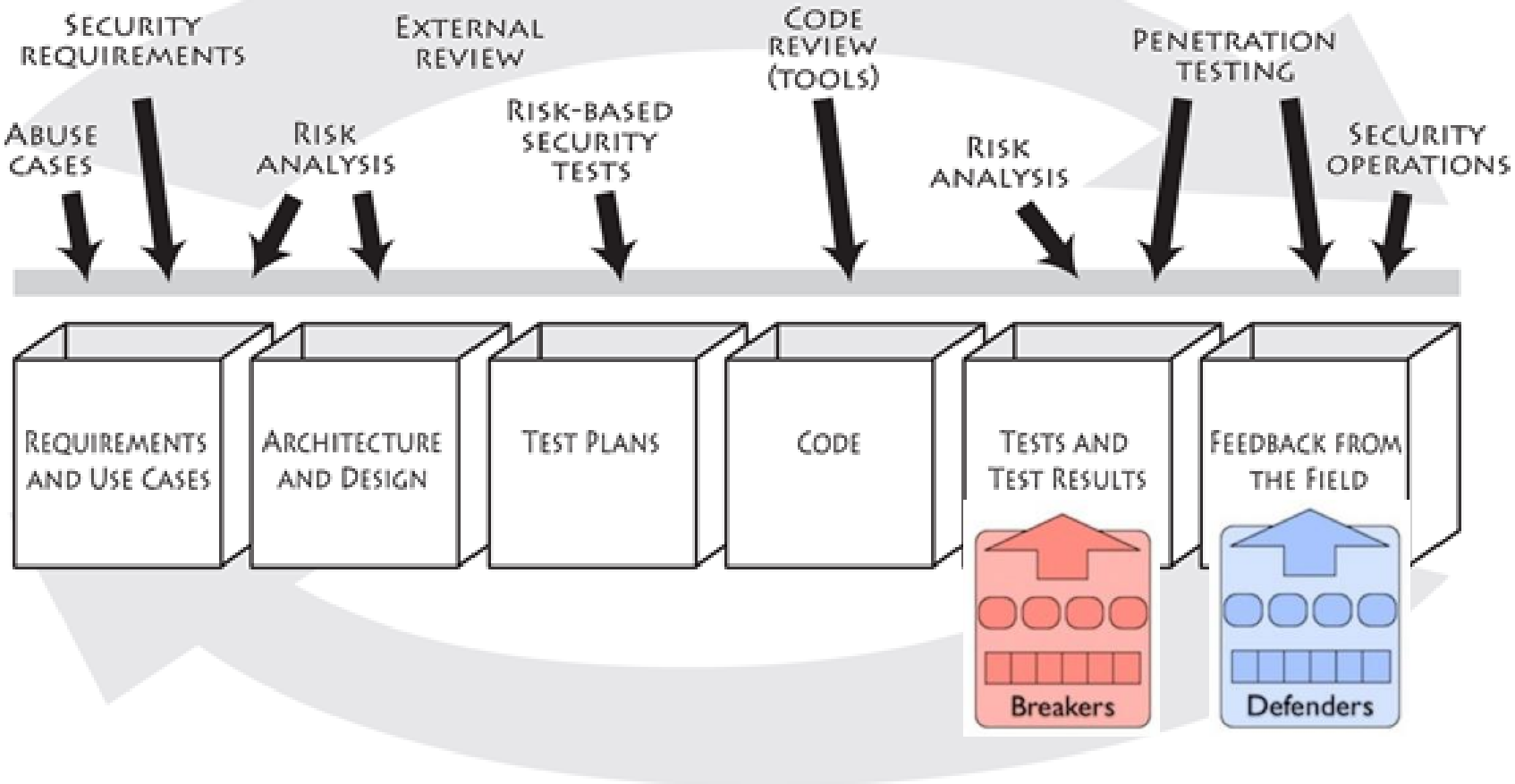
- Virtual Patching
  - Time-to-Fix
  - Attack Surface Reduction
- DAST and WAF Comparison
  - Challenges
  - Valuable Data
- Level I Integration – DAST -> WAF
  - WAF Imports/Translates DAST Data for Virtual Patches
- Level II Integration – DAST <-> WAF
  - Full Integration between WAF/DAST
  - Reducing Time-to-Fix Metrics
- Conclusion
  - Development Plans
  - Call for participation

Target Audience: Defender/Breaker Communities



https://www.owasp.org/index.php/Defenders

Defending Live Web Applications



http://www.swsec.com/resources/touchpoints/

Virtual Patching:
Theory

What is Virtual Patching?

- Definition
  - *A security policy enforcement layer which prevents the exploitation of a **known** vulnerability.*
- Method
  - A reactive, remediation-oriented, tactical response that relies upon other processes to identify vulnerabilities.
- Process
  - The virtual patch logic analyzes HTTP transactions and intercepts attacks in transit so that malicious traffic never reaches the web application.
- Result
  - While application flaws still exist, attackers are unable to exploit them.

How is this different from WAF?

- There has to be a known vulnerability that you are protecting.
- With a known vulnerability, a WAF can then become more aggressive with blocking options when attacks are identified in the vulnerable location.

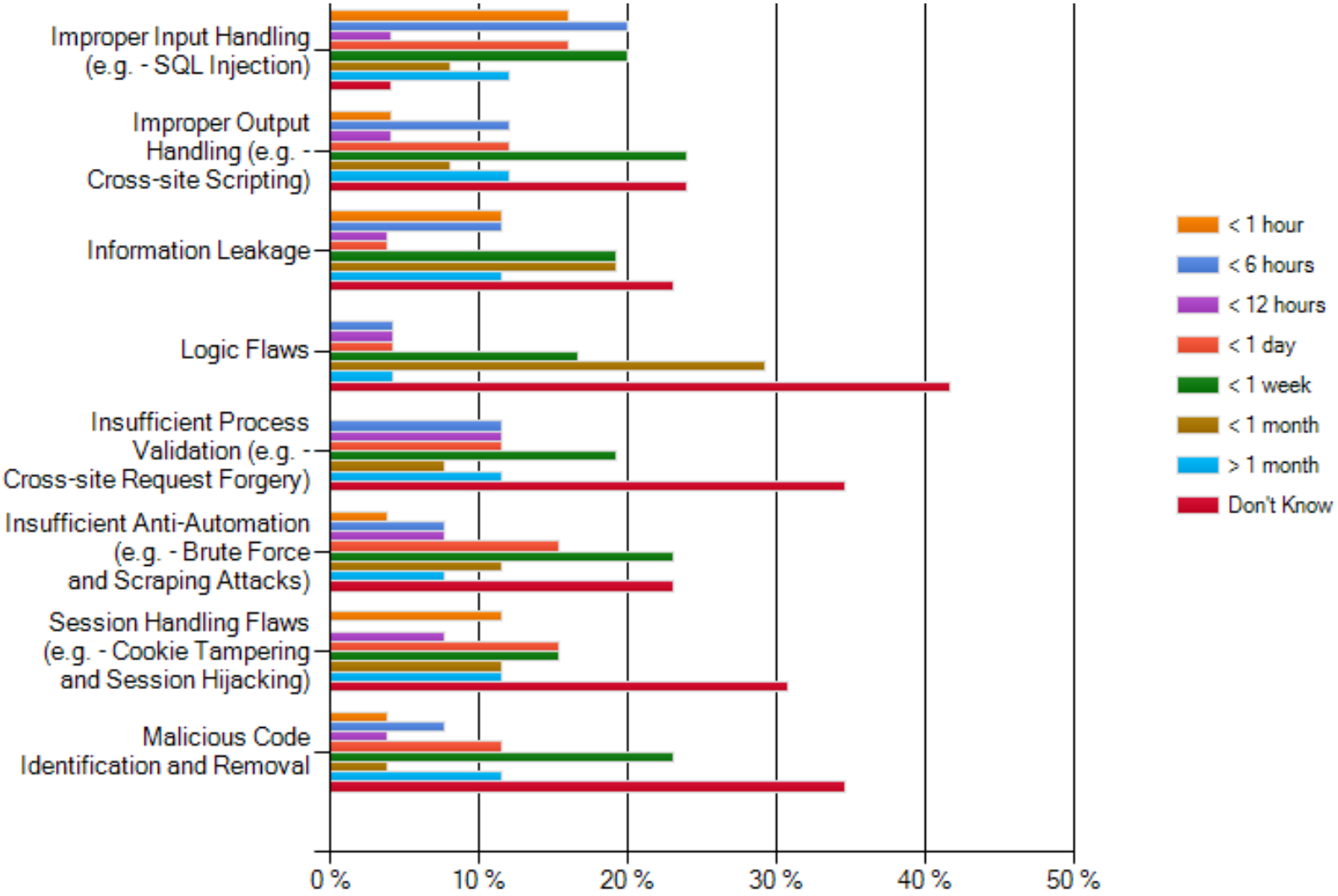
Strategic vs. Tactical Remediation

- Organizations need to utilize both ***Strategic*** and ***Tactical*** remediation efforts to address vulnerabilities

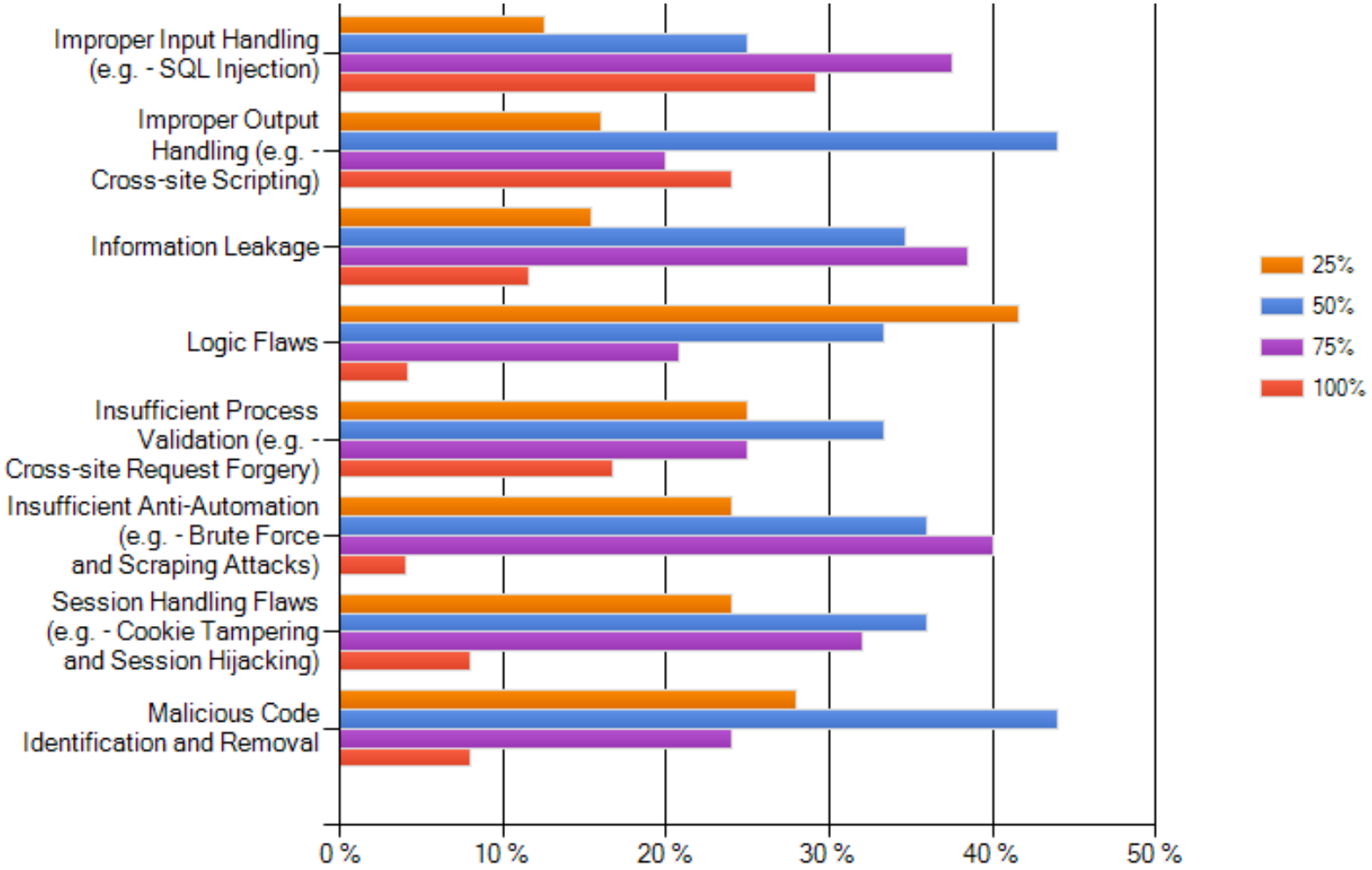
- **Strategic Initiatives**
  - Ownership is application developers
  - Focus on ***root-causes of vulnerabilities*** for web applications that must be fixed within the application code itself
  - Ideal for applications that are in the Design phase of the SDLC
  - Examples include adding in OWASP Enterprise Security API (ESAPI) components
  - Keep in mind that this takes ***TIME***

- **Tactical Responses (Virtual Patching)**
  - Ownership is operations security staff
  - Focus on web applications that are ***already in production*** and exposed to attacks
  - ***Attack Surface Reduction***
  - ***Minimize the Time-to-Fix exposures***

Virtual Patching: Time-to-Fix



Virtual Patching: Attack Surface Reduction



OWASP Virtual Patching Survey 2012

Trustwave SpiderLabs

Trustwave

DAST and WAF Comparison:
Challenges

Trustwave SpiderLabs

Trustwave

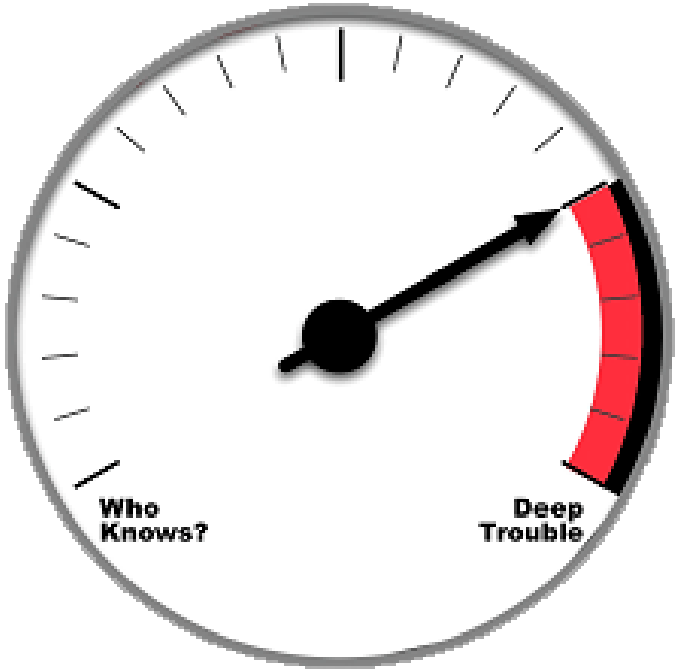
DAST and WAF Comparison

- Different Purposes
  - DAST - Identify vulnerabilities on live web applications
  - WAF – Prevent the exploitation of vulnerabilities within live web applications
- Different Perspectives
  - DAST – Acts as an HTTP client, sends simulated malicious requests and inspects responses
  - WAF – Acts as a middle-man and inspects requests and responses looking for signs of malicious behavior
- Different Teams
  - DAST – Information Security
  - WAF – Operational Security

DAST Challenges

DAST Challenges: Vulnerability Existence

- Black-box Scanning or dynamic testing of web applications works well to confirm the ***existence*** of vulnerabilities but not the ***total absence*** of them.

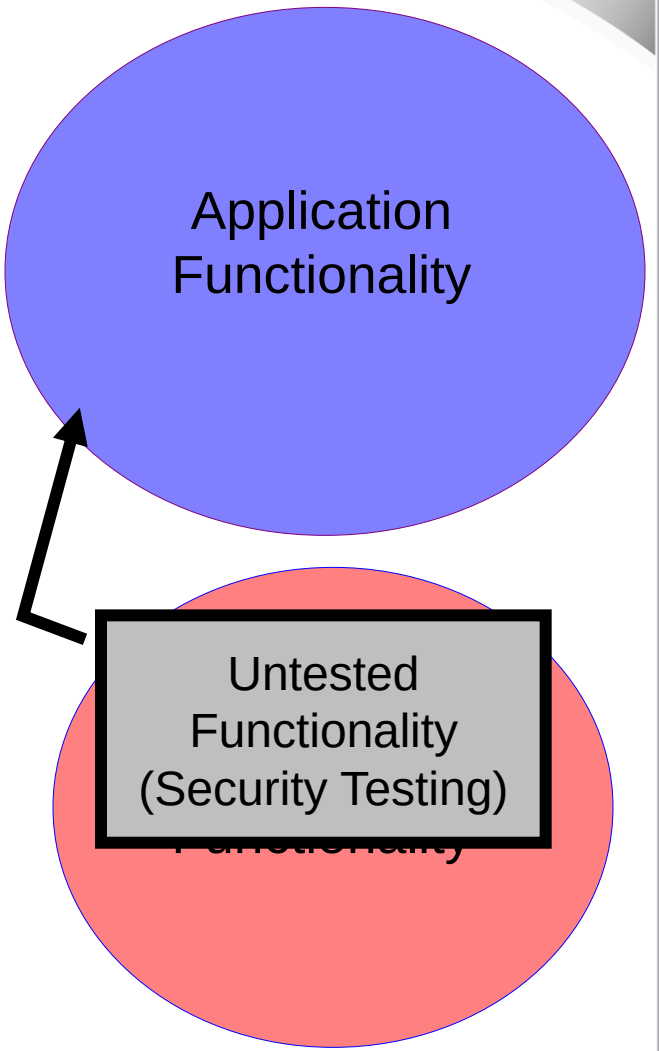


DAST Challenges: Rules of Engagement Restrictions

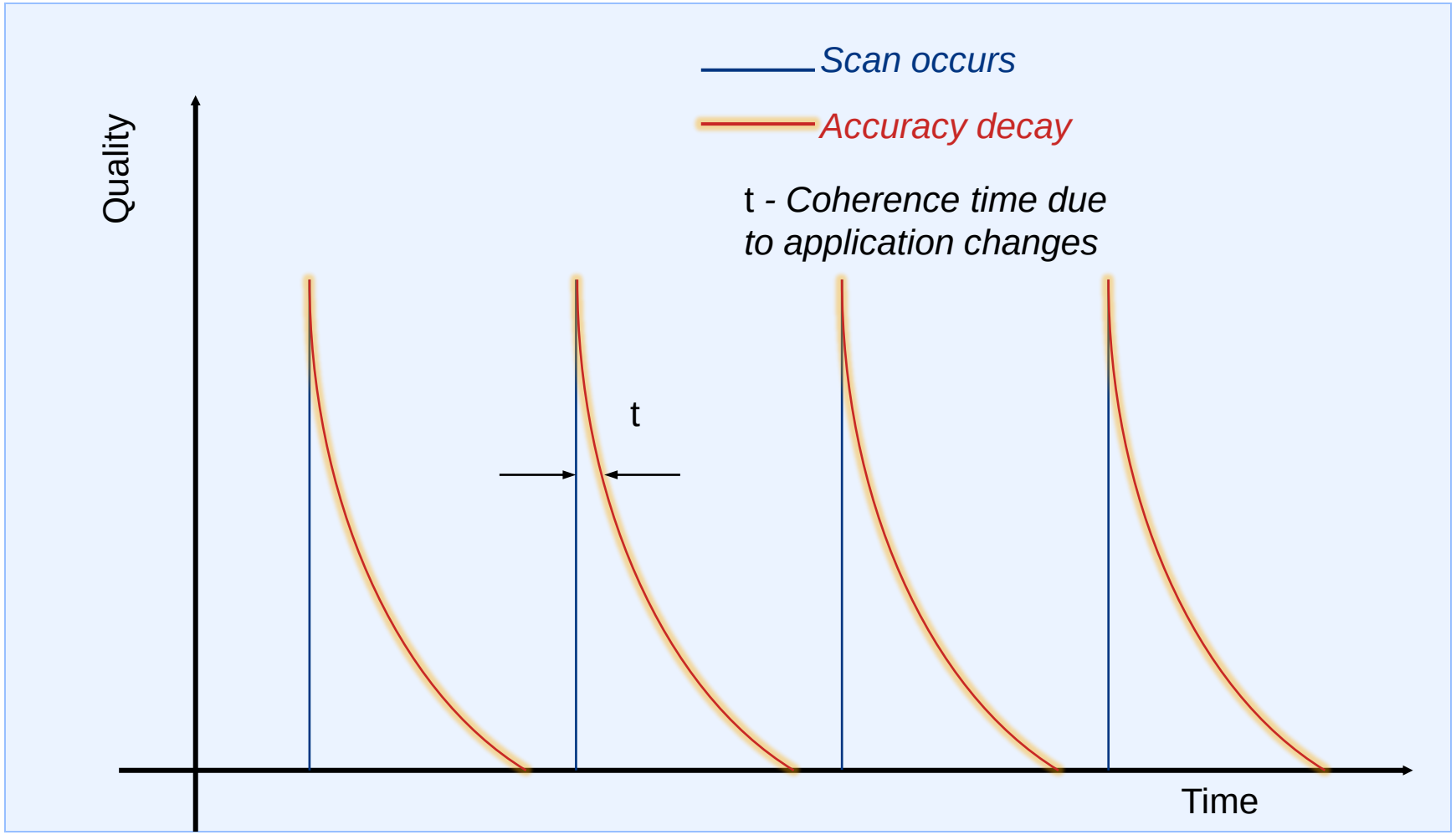
- Active scanning can be “harmful” to some applications
- Rules of Engagement
  - Restrictive controls around who, what, where, when and how web applications may be actively scanned
  - Normally exclude mission-critical, sensitive systems
  - Often exclude testing subcategories such as Denial of Service or Brute Force attacks
- ***Result is a decreased scope of testing***

DAST Challenges: Time Restrictions

- Testing is often ***time restricted***
  - *Test for N days*
- Scanners perform a breadth-first traversal of a web site for links to map a site and identify areas of user input
  - These crawls are usually only a few levels deep and miss large portions of the application
  - Credentialed vs. Anonymous access
  - Unless properly configured, scanners can miss possible navigation options (pull-down, user fields) or multi-step business flows
  - Handling client-side code such as AJAX



DAST Challenges: Scan Accuracy Decay



Two Biggest Questions: DAST

- When should I scan?
  - Have I scanned the entire site?
  - When are there new code pushes?

- What should I scan?
  - What are the URLs?
  - What are the Parameters?
  - What are the Cookies?

WAF Challenges

WAF Challenges: Lack of Vulnerability Data

- Most WAFs are run as "Attack Detection Systems"
  - Lack knowledge of vulnerability information.
- Many vulnerabilities can not be identified passively
  - You must act as a client and send stimulus and review responses to confirm vulnerabilities

WAF Challenges: Alert Prioritization and Blocking

- Security analysts have a difficult time with security event prioritization.
  - App without any SQL Injection Vulnerabilities
    - SQL Injection Alert for Site A -> URL1 -> Param:foo = **Notice**
  - App with confirmed SQL Injection Vulnerabilities
    - SQL Injection Alert for Site B -> URL2 -> Param:bar = **Critical**

- Users are hesitant to utilize disruptive actions without confirmation of a vulnerability
  - Fear of false positive blocking causing business disruption

Biggest Questions: WAF

- What are the vulnerabilities?
  - What vulnerability type?
- What are the injection points?
  - What are the URLs?
  - What are the Parameters?
  - What are the Cookies?

DAST/WAF:
Valuable Data

Valuable Data

- DAST
  - Vulnerability Intelligence
  - Injection Points
    - URL
    - Parameter/Cookie Name
    - Vulnerability Type (SQLi, XSS, etc…)
- WAF
  - Site Tree Data (URLs and Parameters)
  - Application Credentials (Cookies)
  - ***Gathered from Live Application Users***
- Wouldn't it be great if we could share data?

AppSec Wisdom from Reese's

- *Hey, you got your DAST in my WAF!*
- *No, you got your WAF in my DAST!*
- *Mmmm, Delicious!*
- **DAST <-> WAF Integration, two great tastes, that taste great together ☺**

Level I Integration:
DAST -> WAF

DAST XML -> WAF Virtual Patch

Welcome to the Vicnum Game

HELP

The computer will think of a three digit number with unique digits. After you attempt to guess the number, the computer will tell you how many of your digits match and how many are in the right position. Keeping on submitting three digit numbers until you have guessed the computer's number.

Enter your name and the click on the PLAY button to begin playing Vicnum !

PLAY

Click here to see those who may have played a perfect game.
Or here to see those who have clearly hacked the game.
Or here to see those who have hacked the game and the database.

You can search for your favorite Vicnum player by entering the player's name below and then clicking on the SEARCH button.

Vicnum Player: test SEARCH

The Vicnum project was developed for educational purposes to demonstrate common web vulnerabilities. For comments

OWASP Zed Attack Proxy (ZAP)

Sites

- Sites
  - http://192.168.168.1
    - vicnum
      - POST:vicnum5.

Request | Response | Break

Header: Text | Body: Text

```
POST http://192.168.168.128/vicnum/vicnum5.php HTTP/1.1
Host: 192.168.168.128
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10.6; rv:11.0) Gecko/20100101 Firefox/11.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-us,en;q=0.5
DNT: 1
Proxy-Connection: keep-alive
Referer: http://192.168.168.128/vicnum/
Cookie: acopendivids=phpbb2,redmine; acgroupswithpersist=nada
Cache-Control: max-age=0
Content-Type: application/x-www-form-urlencoded
Content-Length: 11
```

```
player=test
```

History | Search | Break Points | Alerts | Active Scan | Spider

Filter:OFF

1	POST	http://192.168.168.128/vicnum/vicnum5.php	200 OK	9ms

https://www.owasp.org/index.php/OWASP_Zed_Attack_Proxy_Project

OWASP Zed Attack Proxy (ZAP)

Sites
Sites
http://192.168.168.1
vicnum
POST:vicnum5.

Attack
Exclude from
Run application
Delete
Break...
Resend...
New Alert...
Show in History tab
Open URL in Browser
Refresh Sites tree
Save Raw

Spider site
Brute Force site
Port Scan host
Active Scan site
Active Scan node

Request | Response | Break

Header: Text | Body: Text

```
POST http://192.168.168.128/vicnum/vicnum5.php HTTP/1.1
Host: 192.168.168.128
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10.6; rv:11.0) Gecko/20100101 Firefox/11.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
DNT: 1
Proxy-Connection: keep-alive
Referer: http://192.168.168.128/vicnum/
Cookie: PHPSESSID=...; acgroupswithpersist=nada
Cache-Control: max-age=0
Content-Type: application/x-www-form-urlencoded
Content-Length: 11
```

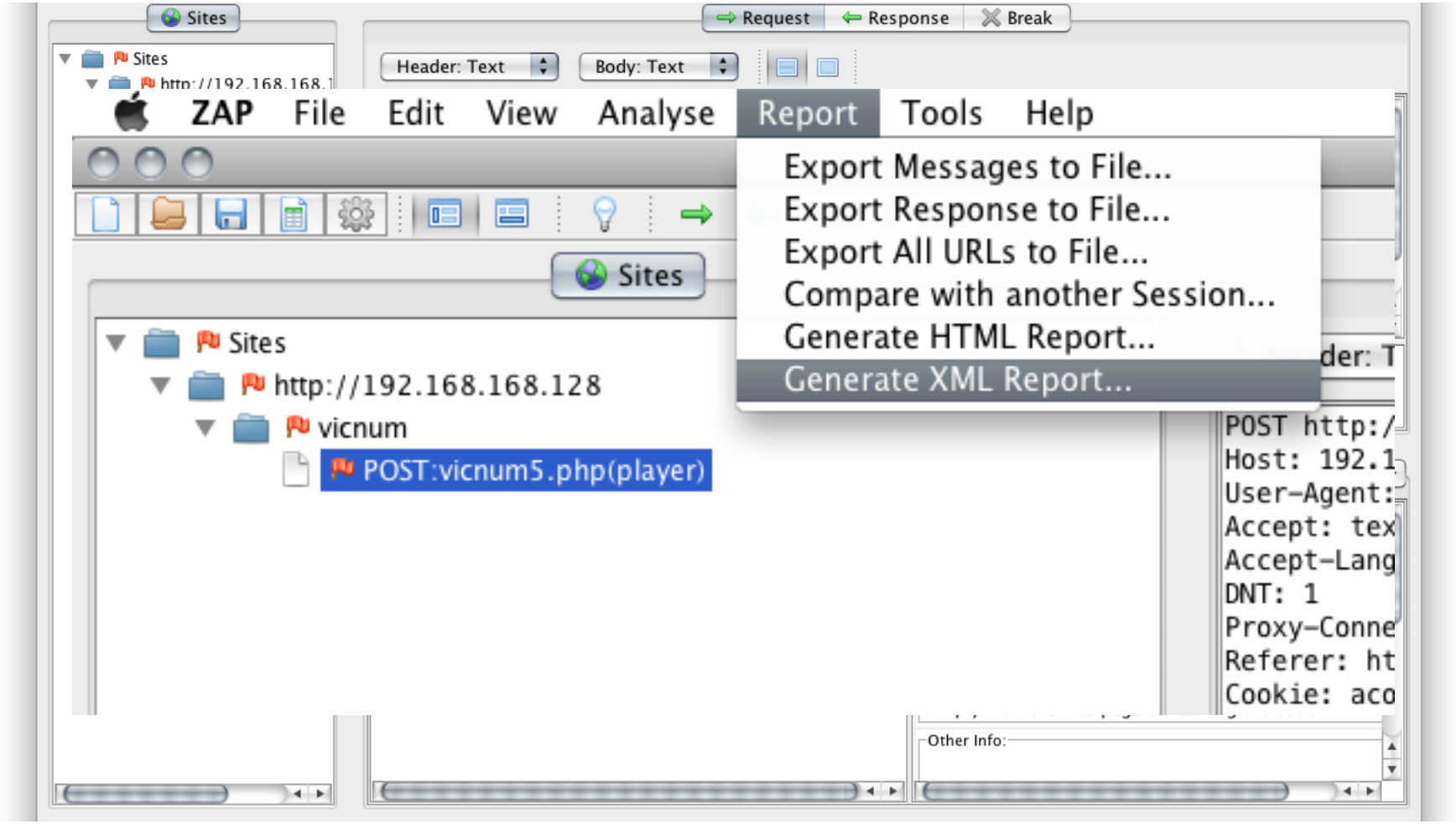
History | Search | Break Points | Alerts | Active Scan | Spider

Filter:OFF

1	POST	http://192.168.168.128/vicnum/vicnum5.php	200 OK	9ms

https://www.owasp.org/index.php/OWASP_Zed_Attack_Proxy_Project

OWASP Zed Attack Proxy (ZAP)



https://www.owasp.org/index.php/OWASP_Zed_Attack_Proxy_Project

ZAP (v 1.4) XML Report Data


```
<alertitem>
  <pluginid>40005</pluginid>
  <alert>SQL Injection</alert>
  <riskcode>3</riskcode>
  <reliability>1</reliability>
  <riskdesc>High (Suspicious)</riskdesc>
  <desc>SQL injection is possible.  User parameters submitted will be formulated into a SQL query for database processing.  If the query is built by simple 'string concatenation', it is possible to modify the meaning of the query by carefully crafting the parameters.  Depending on the access right and type of database used, tampered query can be used to retrieve sensitive information from the database or execute arbitrary code.  MS SQL and PostGreSQL, which supports multiple statements, may be exploited if the database access right is more powerful.
        This can occur in URL query strings, POST paramters or even cookies.  Currently check on cookie is not supported by Paros.  You should check SQL injection manually as well as some blind SQL injection areas cannot be discovered by this check.
        </desc>
  <uri>http://192.168.168.128/vicnum/vicnum5.php</uri>
  <param>player</param>
  <attack>test%27INJECTED_PARAM'INJECTED_PARAM</attack>
--CUT--
</alertitem>
```

OWASP ModSecurity Core Rule Set Project

OWASP Defenders

This project is part of the OWASP Defenders community.
Feel free to browse other projects within the Defenders, Builders, and Breakers communities.

Home | Download | Bug Tracker | Demo | Installation | Documentation | Presentations and Whitepapers | Related Projects | Latest News and Mail List | Contributors, Users and Adopters | Project About

Overview

ModSecurity™ is a web application firewall engine that provides very little protection on its own. In order to become useful, ModSecurity™ must be configured with rules. In order to enable users to take full advantage of ModSecurity™ out of the box, Trustwave's SpiderLabs is providing a free certified rule set for ModSecurity™ 2.x. Unlike intrusion detection and prevention systems, which rely on signatures specific to known vulnerabilities, the Core Rules provide generic protection from unknown vulnerabilities often found in web applications, which are in most cases custom coded. The Core Rules are heavily commented to allow it to be used as a step-by-step deployment guide for ModSecurity™.

Core Rules Content

In order to provide generic web applications protection, the Core Rules use the following techniques:

- **HTTP Protection** - detecting violations of the HTTP protocol and a locally defined usage policy.
- **Real-time Blacklist Lookups** - utilizes 3rd Party IP Reputation
- **Web-based Malware Detection** - identifies malicious web content by check against the Google Safe Browsing API.
- **HTTP Denial of Service Protections** - defense against HTTP Flooding and Slow HTTP DoS Attacks.
- **Common Web Attacks Protection** - detecting common web application security attack.
- **Automation Detection** - Detecting bots, crawlers, scanners and other surface malicious activity.
- **Integration with AV Scanning for File Uploads** - detects malicious files uploaded through the web application.
- **Tracking Sensitive Data** - Tracks Credit Card usage and blocks leakages.
- **Trojan Protection** - Detecting access to Trojans horses.
- **Identification of Application Defects** - alerts on application misconfigurations.
- **Error Detection and Hiding** - Disguising error messages sent by the server.

GET MOD

Trustwave SpiderLabs

Auto-Convert DAST XML to ModSecurity

File ▲	Rev.	Age	Author	Last log entry
Parent Directory				
regression_tests/	1787	10 months	rcbarnett	- Created new INSTALL file outlining quick config setup - Added a new rule regre…
runAV/	1571	15 months	rcbarnett	Improvements: - Added Experimental Lua Converter script to normalize payloads. B…
README	1518	22 months	rcbarnett	Improvements: - Added CSRF Protection Ruleset which will use Content Injection t…
arachni2modsec.pl	1828	7 months	rcbarnett	- Added example script to the /util directory to convert Arachni DAST scanner …
httpd-guardian.pl	1337	2 years	b1v1r	Move CRS to its own structure.
rules-updater-example.conf	1764	11 months	rcbarnett	- Changed Licensing from GPLv2 to Apache Software License v2 (ASLv2) http://ww…
rules-updater.pl	1527	19 months	rcbarnett	Improvements: - Updated the PHPIDS filters - Updated the SQL Injection filters t…
rules-updater.pl.in	1518	22 months	rcbarnett	Improvements: - Added CSRF Protection Ruleset which will use Content Injection t…
runav.pl	1571	15 months	rcbarnett	Improvements: - Added Experimental Lua Converter script to normalize payloads. B…
zap2modsec.pl	1911	8 days	rcbarnett	- Added the zap2modsec.pl script to the /util directory which converts OWASP Z…

http://mod-security.svn.sourceforge.net/viewvc/mod-security/crs/trunk/util/

Script Usage

```
$ ./zap2modsec.pl
Flag:

      -f:  path to ZAP xml report file
Usage:

     ./zap2modsec.pl -f ./zap_report.xml
```

Script Usage

```
$ ./zap2modsec.pl -f zap-vicnum.xml
==============================================================
Vulnerability[3] -  Type: SQL Injection
Found a SQL Injection vulnerability.
Validating URL: http://192.168.168.128/vicnum/vicnum5.php
URL is well-formed
Continuing Rule Generation
Current vulnerable Param(s): player
SQL Injection (uricontent and param) rule successfully generated and
saved in ./modsecurity_crs_48_virtual_patches.conf.
==============================================================
--CUT--

************ END OF SCRIPT RESULTS *****************
Number of Vulnerabilities Processed:    5
Number of ModSecurity rules generated:   2
Number of Unsupported vulns skipped:     2
Number of bad URLs (rules not gen):      0
****************************************************
```

New Virtual Patches

```
#
# OWASP ZAP Virtual Patch Details:
# ID: 13
# Type: SQL Injection
# Vulnerable URL: vicnum/vicnum5.php
# Vulnerable Parameter: player
#
SecRule REQUEST_FILENAME "vicnum/vicnum5.php"
"chain,phase:2,t:none,block,msg:'Virtual Patch for SQL
Injection',id:'13',tag:'WEB_ATTACK/SQL_INJECTION',tag:'WASCT
C/WASC-
19',tag:'OWASP_TOP_10/A1',tag:'OWASP_AppSensor/CIE1',tag:'PC
I/6.5.2',logdata:'%{matched_var_name}',severity:'2'"
        SecRule &TX:'/SQL_INJECTION.*ARGS:player/' "@gt 0"
"setvar:'tx.msg=%{rule.msg}',setvar:tx.sql_injection_score=+
%{tx.critical_anomaly_score},setvar:tx.anomaly_score=+%{tx.c
ritical_anomaly_score}"
```

Denim Group's ThreadFix App

Firefox

DG mod_security | ThreadFix

localhost https://localhost:8443/threadfix/wafs/2?nonce=DF6B390

Google

100015 - fired 0 times

WAF Rules:

```
SecRule REQUEST_URI "^\/demo\/EvalInjection2\.php""phase:2,chain,deny,msg:'SQL Injection attempt: /demo/EvalInjection
SecRule ARGS:command "'|\%27|\"|\%22|--|\%2D\%2D"

SecRule REQUEST_URI "^\/demo\/LDAPInjection2\.php""phase:2,chain,deny,msg:'SQL Injection attempt: /demo/LDAPInjection
SecRule ARGS:username "'|\%27|\"|\%22|--|\%2D\%2D"

SecRule REQUEST_URI "^\/demo\/SQLI2\.php""phase:2,chain,deny,msg:'SQL Injection attempt: /demo/SQLI2.php [username]',
SecRule ARGS:username "'|\%27|\"|\%22|--|\%2D\%2D"

SecRule REQUEST_URI "^\/demo\/PathTraversal\.php""phase:2,chain,deny,msg:'Path Traversal attempt: /demo/PathTraversal
SecRule ARGS:action ".|\%2e"

SecRule REQUEST_URI "^\/demo\/OSCommandInjection2\.php""phase:2,chain,deny,msg:'OS Command Injection attempt: /demo/C
SecRule ARGS:fileName "&|\||;|\%7C|\%26|\%3B"

SecRule REQUEST_URI "^\/demo\/XSS-cookie\.php""phase:2,chain,deny,msg:'Cross-site Scripting attempt: /demo/XSS-cookie
SecRule ARGS:cookie "<|\%3C|>|\%3E"

SecRule REQUEST_URI "^\/demo\/XSS-reflected2\.php""phase:2,chain,deny,msg:'Cross-site Scripting attempt: /demo/XSS-re
SecRule ARGS:username "<|\%3C|>|\%3E"

SecRule REQUEST_URI "^\/demo\/LDAPInjection2\.php""phase:2,chain,deny,msg:'LDAP Injection attempt: /demo/LDAPInjectio
SecRule ARGS:username "\\|\(|\)|\*|\%5c|\%2a|\%28|\%29"

SecRule REQUEST_URI "^\/demo\/EvalInjection2\.php""phase:2,chain,deny,msg:'Eval Injection attempt: /demo/EvalInjectio
SecRule ARGS:command ";|\%3b"

SecRule REQUEST_URI "^\/demo\/DirectoryIndexing\/( |\%20|\n|$|\?|\/\?|\/\n|\/$|\/ |\/\%20)""phase:2,deny,msg:'Directory

SecRule REQUEST_URI "^\/demo\/EvalInjection2\.php""phase:2,chain,deny,msg:'Cross-site Scripting attempt: /demo/EvalIn
SecRule ARGS:command "<|\%3C|>|\%3E"

SecRule REQUEST_URI "^\/demo\/FormatString2\.php""phase:2,chain,deny,msg:'Format String Injection attempt: /demo/Form
SecRule ARGS:name "\%|\%25"

SecRule REQUEST_URI "^\/demo\/XPathInjection2\.php""phase:2,chain,deny,msg:'XPath Injection attempt: /demo/XPathInjec
SecRule ARGS:username "'|\%27|\"|\%22"

SecRule REQUEST_URI "^\/demo\/XPathInjection2\.php""phase:2,chain,deny,msg:'XPath Injection attempt: /demo/XPathInjec
SecRule ARGS:password "'|\%27|\"|\%22"

SecRule REQUEST_URI "^\/demo\/PredictableResource\.php\.bak( |\%20|\n|$|\?|\/\?|\/\n|\/$|\/ |\/\%20)""phase:2,deny,msg:
```

https://code.google.com/p/threadfix/

Level II Integration:
DAST <-> WAF

Current Limitations

- Manual Process is slow
  - Spidering the entire site
  - Scanning the entire site
  - Exporting XML Reports
  - Converting XML Data into Virtual Patches
  - Implementing Virtual Patches

Search

Search

SpiderLabs Services

- 360 Application Security
- App Code Review
- App PenTesting
- Incident Response
- Net PenTesting
- ModSecurity Rules
- Physical Security

Resources

- Advisories
- Papers
- Projects
- Security Tools

Categories

[Honeypot Alert] Advisories
Application Security
Conferences Global Security

« ModSecurity Advanced Topic of the Week: Application Logout Response Actions | Main | Announcing Release of ModSecurity v2.6.1-RC1 »

22 June 2011

Announcing the ModSecurity SQL Injection Challenge

The ModSecurity Project Team is happy to announce our first community hacking challenge!

This is a **SQL Injection and Filter Evasion Challenge**. We have setup ModSecurity to proxy to the following 4 commercial vuln scanner demo sites:

- IBM (AppScan) - demo.testfire.net site
- Cenzic (HailStorm) - CrackMe Bank site
- HP (WebInspect) - Free Bank site
- Acunetix (Acunetix) - Acuart site

Challenge Details

To successfully complete the challenge, participants must do the following:

1. Identify a SQL Injection vector within one of the demo websites listed above.
2. Successfully enumerate the following information about the database:
    - DB User(s) - provide request data.
    - DB Name(s) - provide request data.
    - Table Name(s) - provide request data.
    - Column Name(s) - provide request data.

Challenge Submission

Please send challenge submissions to security@modsecurity.org with the details from above.

Time-to-Hack Metrics

Time-to-Hack Metric	Speed Hacking	Filter Evasion
Avg. # of Requests	170	433
Avg. Duration (Time)	5 hrs 23 mins	72 hrs
Shortest # of Requests	36	118
Shortest Duration (Time)	46 mins	10 hrs

http://blog.spiderlabs.com/2011/06/announcing-the-modsecurity-sql-injection-challenge.html

Level II Goal: Integration/Automation

- To decrease the Time-to-Fix metrics for web application vulnerabilities.
  - We must beat the Time-to-Hack metric for attackers
- Use Automation for Integration
  - Attackers use automation – so should we!
  - Use WAF to initiate DAST scans of individual resources
  - DAST Scans Resource and generates report
  - WAF pulls report and extracts vulnerability data
  - WAF correlates vulnerability data for protection

Challenge #1: DAST Service API

- In order to integrate DAST/WAF, the scanner needs to be run as a service
  - Not as a client desktop app
  - Need an API Service
- Using Arachni Scanner
  - Written by Tasos Laskos (@Zap0tek)
  - Developed in Ruby
  - RPC service

Starting the Arachni RPC Service

```
# arachni_rpcd --address=192.168.168.128
Arachni - Web Application Security Scanner Framework
       Author: Tasos "Zapotek" Laskos <tasos.laskos@gmail.com>
                                      <zapotek@segfault.gr>
               (With the support of the community and the Arachni Team.)

       Website:       http://github.com/Zapotek/arachni
       Documentation: http://github.com/Zapotek/arachni/wiki


Arachni - Web Application Security Scanner Framework v0.4.1 [0.2.5]
       Author: Tasos "Zapotek" Laskos <tasos.laskos@gmail.com>
                                      <zapotek@segfault.gr>
               (With the support of the community and the Arachni Team.)

       Website:       http://github.com/Zapotek/arachni
       Documentation: http://github.com/Zapotek/arachni/wiki


I, [2012-04-05T11:11:35.605542 #2985]  INFO -- System: RPC Server started.
I, [2012-04-05T11:11:35.605931 #2985]  INFO -- System: Listening on
192.168.168.128:39127
```

Arachni RPC Lua Client

arachni-rpc-lua /

name	age	message	history
examples	a month ago	moved examples under examples/ dir and added a vectorfeed demo [Zapotek]	
README.md	a month ago	upated readme [Zapotek]	
client.lua	a month ago	moved examples under examples/ dir and added a vectorfeed demo [Zapotek]	
connection.lua	a month ago	fixed payload packing [Zapotek]	

README.md

Arachni-RPC Lua Client

Simple Arachni-RPC client written in Lua, not a big deal and still under dev.

Example

See the *examples/* directory.

Requirements

- LuaSec -- SSL binding for Lua
- yaml -- YAML binding for Lua.

Trustwave SpiderLabs

https://github.com/Arachni/arachni-rpc-lua

Trustwave

Example Process Flow

Vicnum results from the database

Vicnum results from the database

192.168.168.128/vicnum/vicnum5.php

Google

Vicnum **HELP**

Search Results

You have requested results for Vicnum player test : but no entries were found.

Play Again

The Vicnum project was developed for educational purposes to demonstrate common web vulnerabilities.

For comments please visit the OWASP project page.

ModSecurity Rules

- Initiate an Arachni Scan

```
SecRule &RESOURCE:ARACHNI_SCAN_COMPLETED "@eq 0"
"chain,phase:5,t:none,log,pass"
     SecRule &ARGS "@gt 0"
"exec:/etc/apache2/modsecurity-
crs/base_rules/arachni_integration.lua"
```

- Disable ModScurity for Arachni Scanning

```
SecRule REMOTE_ADDR "@ipMatch 192.168.168.128"
"chain,phase:1,t:none,nolog,pass"
     SecRule REQUEST_HEADERS:User-Agent
"@beginsWith Arachni/" "ctl:ruleEngine=Off"
```

Scanning Script Initiated

```
Lua: Executing script: /etc/apache2/modsecurity-
crs/base_rules/arachni_integration.lua
Arachni: Host: 192.168.168.128
Arachni: Filename: /vicnum/vicnum5.php
Arachni: URL to scan is: http://192.168.168.128/vicnum/vicnum5.php
Arachni: Request Method is: POST
Arachni: Arg Name: player and Value: test.
Arachni: Updated ARGS table is: ---
player: test

Arachni: Updated Cookies table is: --- {}

Arachni: Yaml output of vectors is: ---
- inputs:
    player: test
  type: form
  method: POST
  action: http://192.168.168.128/vicnum/vicnum5.php
```

Arachni RPC Service

```
I, [2012-04-05T11:33:32.006918 #3771]  INFO -- System: RPC Server started.
I, [2012-04-05T11:33:32.007164 #3771]  INFO -- System: Listening on
192.168.168.128:44604
I, [2012-04-05T11:35:47.390623 #3746]  INFO -- Call: dispatcher.dispatch
[192.168.168.128]
I, [2012-04-05T11:35:47.419363 #3748]  INFO -- Call: modules.load [192.168.168.128]
Arachni - Web Application Security Scanner Framework v0.4.1 [0.2.5]
       Author: Tasos "Zapotek" Laskos <tasos.laskos@gmail.com>
                                      <zapotek@segfault.gr>
               (With the support of the community and the Arachni Team.)

       Website:       http://github.com/Zapotek/arachni
       Documentation: http://github.com/Zapotek/arachni/wiki


I, [2012-04-05T11:35:47.451187 #3748]  INFO -- Call: plugins.load [192.168.168.128]
I, [2012-04-05T11:35:47.447358 #3837]  INFO -- System: RPC Server started.
I, [2012-04-05T11:35:47.453383 #3837]  INFO -- System: Listening on
192.168.168.128:61420
I, [2012-04-05T11:35:47.459832 #3748]  INFO -- Call: opts.set [192.168.168.128]
I, [2012-04-05T11:35:47.487119 #3748]  INFO -- Call: framework.run [192.168.168.128]
```

ModSecurity's RESOURCE Collection

```
Re-retrieving collection prior to store: resource
Wrote variable: name "__expire_KEY", value "1333644233".
Wrote variable: name "KEY", value "192.168.168.128_/vicnum/vicnum5.php".
Wrote variable: name "TIMEOUT", value "3600".
Wrote variable: name "__key", value "192.168.168.128_/vicnum/vicnum5.php".
Wrote variable: name "__name", value "resource".
Wrote variable: name "CREATE_TIME", value "1333640632".
Wrote variable: name "UPDATE_COUNTER", value "1".
Wrote variable: name "min_pattern_threshold", value "50".
Wrote variable: name "min_traffic_threshold", value "100".
Wrote variable: name "arachni_scan_initiated", value "1".
Wrote variable: name "arachni_instance_info_port", value "30118".
Wrote variable: name "arachni_instance_info_token", value
"c5ab2feb9072ed8e7737f7d526e7b254".
Wrote variable: name "traffic_counter", value "1".
Wrote variable: name "request_method_counter_POST", value "1".
Wrote variable: name "NumOfArgs_counter_1", value "1".
Wrote variable: name "args_names_counter_player", value "1".
Wrote variable: name "ARGS:player_length_4_counter", value "1".
Wrote variable: name "ARGS:player_alpha_counter", value "1".
Wrote variable: name "LAST_UPDATE_TIME", value "1333640633".
Persisted collection (name "resource", key "192.168.168.128_/vicnum/vicnum5.php").
```

Apache Access Log

1. 192.168.168.1 - - [05/Apr/2012:11:35:47 -0400] "POST /vicnum/vicnum5.php HTTP/1.1" 200 1022 "http://192.168.168.128/vicnum/" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10.6; rv:11.0) Gecko/20100101 Firefox/11.0”
2. 192.168.168.128 - - [05/Apr/2012:11:35:48 -0400] "POST /vicnum/vicnum5.php HTTP/1.1" 200 1107 "-" "Arachni/0.4.1"
3. 192.168.168.128 - - [05/Apr/2012:11:35:48 -0400] "POST /vicnum/vicnum5.php HTTP/1.1" 200 1022 "-" "Arachni/0.4.1”
4. 192.168.168.128 - - [05/Apr/2012:11:35:48 -0400] "POST /vicnum/vicnum5.php HTTP/1.1" 200 1022 "-" "Arachni/0.4.1"
5. 192.168.168.128 - - [05/Apr/2012:11:35:48 -0400] "POST /vicnum/vicnum5.php HTTP/1.1" 200 1116 "-" "Arachni/0.4.1”
6. 192.168.168.128 - - [05/Apr/2012:11:35:48 -0400] "POST /vicnum/vicnum5.php HTTP/1.1" 200 1100 "-" "Arachni/0.4.1"
7. 192.168.168.128 - - [05/Apr/2012:11:35:48 -0400] "POST /vicnum/vicnum5.php HTTP/1.1" 200 1081 "-" "Arachni/0.4.1”
8. 192.168.168.128 - - [05/Apr/2012:11:35:48 -0400] "POST /vicnum/vicnum5.php HTTP/1.1" 200 1082 "-" "Arachni/0.4.1”
9. …

Pulling Arachni Report

```
Arachni: Previous scan was initiated, checking scan status.
Arachni: Port info: 30118 and Token info: c5ab2feb9072ed8e7737f7d526e7b254
Arachni: Scan completed - calling for report.
Arachni: Yaml Results: ---
- cwe: '79'
  description: "Client-side code (like JavaScript) can\n                    be
injected
    into the web application which is then returned to the user's browser.\n
This
    can lead to a compromise of the client's system or serve as a pivoting point for
    other attacks."
  references:
    ha.ckers: http://ha.ckers.org/xss.html
    Secunia: http://secunia.com/advisories/9716/
  variations: []
  _hash: d241855ec9dd4694f6eaf28e28a0913f
  mod_name: XSS
  var: player
  elem: form
  url: http://192.168.168.128/vicnum/vicnum5.php
  cvssv2: '9.0'
  method: POST
```

Updated RESOURCE Data

```
Wrote variable: name "min_pattern_threshold", value "50".
Wrote variable: name "min_traffic_threshold", value "100".
Wrote variable: name "arachni_scan_initiated", value "1".
Wrote variable: name "arachni_instance_info_port", value "30118".
Wrote variable: name "arachni_instance_info_token", value
"c5ab2feb9072ed8e7737f7d526e7b254".
Wrote variable: name "traffic_counter", value "2".
Wrote variable: name "request_method_counter_POST", value "2".
Wrote variable: name "NumOfArgs_counter_1", value "2".
Wrote variable: name "args_names_counter_player", value "2".
Wrote variable: name "ARGS:player_length_4_counter", value "2".
Wrote variable: name "ARGS:player_alpha_counter", value "2".
Wrote variable: name "LAST_UPDATE_TIME", value "1333640642".
Wrote variable: name "xss_vulnerable_params", value "player".
Wrote variable: name "sqli_vulnerable_params", value "player".
Wrote variable: name "arachni_scan_completed", value "1".
Persisted collection (name "resource", key
"192.168.168.128_/vicnum/vicnum5.php").
```

ModSecurity Correlation Rules

```
SecRule TX:/XSS-ARGS:/ ".*"
"id:'999003',chain,phase:2,t:none,msg:'XSS Attack Against
Known Vulnerable Parameter.',logdata:'%{matched_var}'"
        SecRule MATCHED_VARS_NAMES "-ARGS:(.*)$"
"chain,capture"
                SecRule TX:1 "@within
%{resource.xss_vulnerable_params}"
```

```
SecRule TX:/SQL_INJECTION-ARGS:/ ".*"
"id:'999004',chain,phase:2,t:none,msg:'SQLi Attack Against
Known Vulnerable Parameter.',logdata:'%{matched_var}'"
        SecRule MATCHED_VARS_NAMES "-ARGS:(.*)$"
"chain,capture"
                SecRule TX:1 "@within
%{resource.sqli_vulnerable_params}"
```

Malicious Client Attempts SQLi Attack

Welcome to the Vicnum Game

HELP

The computer will think of a three digit number with unique digits. After you attempt to guess the number, the computer will tell you how many of your digits match and how many are in the right position. Keeping on submitting three digit numbers until you have guessed the computer's number.

Enter your name and the click on the PLAY button to begin playing Vicnum !

PLAY

Click here to see those who may have played a perfect game.
Or here to see those who have clearly hacked the game.
Or here to see those who have hacked the game and the database.

You can search for your favorite Vicnum player by entering the player's name below and then clicking on the SEARCH button.

Vicnum Player: test' or "1" < "5";--

SEARCH

The Vicnum project was developed for educational purposes to demonstrate common web vulnerabilities. For comments

ModSecurity Alerts

```
[Thu Apr 05 11:44:39 2012] [error] [client 192.168.168.1] ModSecurity:
Warning. Pattern match
"(?i:(?:(\\"|'|`|\\xc2\\xb4|\\xe2\\x80\\x99|\\xe2\\x80\\x98)\\\\s*\\\\*.
+(?:x?or|div|like|between|and|id)\\\\W*(\\"|'|`|\\xc2\\xb4|\\xe2\\x80\\x
99|\\xe2\\x80\\x98)\\\\d)|(?:\\\\^(\\"|'|`|\\xc2\\xb4|\\xe2\\x80\\x99|\\
xe2\\x80\\x98))|(?:^[\\\\w\\\\s(\\"|'|`|\\xc2\\xb4|\\xe2\\x80\\x99|\\xe2
\\x80\\x98)-]+( ..." at ARGS:player. [file "/etc/apache2/modsecurity-
crs/base_rules/modsecurity_crs_41_sql_injection_attacks.conf"] [line
"573"] [id "981243"] [msg "Detects classic SQL injection probings 2/2"]
[data "' or"] [severity "CRITICAL"] [tag "WEB_ATTACK/SQLI"] [tag
"WEB_ATTACK/ID"] [tag "WEB_ATTACK/LFI"] [hostname "192.168.168.128"]
[uri "/vicnum/vicnum5.php"] [unique_id "T329538AAQEAAA-3DtwAAAAJ"]

[Thu Apr 05 11:44:39 2012] [error] [client 192.168.168.1] ModSecurity:
Warning. String match within "player" at TX:1. [file
"/etc/apache2/modsecurity-
crs/base_rules/modsecurity_crs_46_known_vulns.conf"] [line "5"] [id
"999004"] [msg "SQLi Attack Against Known Vulnerable Parameter."] [data
"player"] [hostname "192.168.168.128"] [uri "/vicnum/vicnum5.php"]
[unique_id "T329538AAQEAAA-3DtwAAAAJ"]
```

Time-to-Fix Metric

- On-Demand Arachni Scan Initiated

```
192.168.168.128 - - [05/Apr/2012:11:43:54 -
0400] "POST /vicnum/vicnum5.php HTTP/1.1" 200
1022 "-" "Arachni/0.4.1"
```

- Report Pulled and Vulnerability Data Identified

```
[05/Apr/2012:11:44:02 --0400]
[192.168.168.128/sid#b819f888][rid#b98cf7f8][
/vicnum/vicnum5.php][9] Set variable
"RESOURCE.sqli_vulnerable_params" to
"player".
```

- Time-to-Fix
  - **8 seconds** ☺

Trustwave SpiderLabs

Trustwave

Conclusion

Development Plans/Call for Assistance

- This proof of concept will eventually be put into the OWASP ModSecurity CRS
- Need to account for Changed Resources
- Need to incorporate more vulnerability classes
  - Currently handle
    - SQL Injection
    - Cross-site Scripting
    - Directory Traversals
- Integration with other DAST tools
  - Zed Attack Proxy API

Call for Assistance

- Need more testing
  - Performance Testing against live users
- If you would like to help with testing, please contact me and I will provide you access to the Lua scripts.

ModSecurity T-Shirt Giveaway

- What was the average "Time-to-Evasion" from Level II?
- 72 hrs.

Contact/Resources

- Email
  - OWASP: ryan.barnett@owasp.org
  - Trustwave: rbarnett@trustwave.com
- Twitter
  - @ryancbarnett
  - @ModSecurity
  - @SpiderLabs
- Blog
  - http://tacticalwebappsec.blogspot.com
  - http://blog.spiderlabs.com