HTTP Fingerprinting

Table of Contents

Introduction

Fingerprinting Web Servers

Every company with a web presence opens TCP Port 80/HTTP on their firewalls to the Internet for web-based applications. Web servers can leak useful bits of information that attackers can use to refine their attack plan. Information like what version of web server (IIS, Apache, etc...) you're running, operating system, patch levels, and names and versions of web applications (PHP, SSL, SQL) your site may be utilizing.

Since security vulnerabilities are dependent on software vendor and version, blindly attacking may lead to detection, denial of request/service or in severe cases systems being temporarily taken off line.

Knowing a web server's version and operating system details can greatly increase the probability and efficiency of an attack. If an attacker can accurately use available exploits, the chances of successful exploitation increase significantly. For an attacker to be able to accurately identify the version of your web server opens yourself to attacks both manual and automated (worms).

Learn Security Online

HTTP Headers

Server Tag

From RFC 2616 Section 14.38

http://www.w3.org/Protocols/rfc2616/rfc2616.html

The Server response-header field contains information about the software used by the origin server to handle the request. The field can contain multiple product tokens and comments identifying the server and any significant sub products. The product tokens are listed in order of their significance for identifying the application.

```
Server          = "Server" ":" 1*( product | comment )
```

Server Tags

Examples:

Server: Microsoft-IIS/5.0
Server: Apache/1.3.33 (Unix) PHP/4.3.10
Server: Sun-ONE-Web-Server/6.1
Server: Oracle-Application-Server-10g OracleAS-Web-Cache-10g/9.0.4.1.0

If the response is being forwarded through a proxy, the proxy application MUST NOT modify the Server response-header. Instead, it SHOULD include a Via field.

```
Note: Revealing the specific software version of the server might
      allow the server machine to become more vulnerable to attacks
      against software that is known to contain security holes. Server
      implementers are encouraged to make this field a configurable
      option.
```

Cookie Values

From RFC 2109 http://rfc.net/rfc2109.html

A piece of information sent by a Web server to a user's browser. Cookies may include information such as login or registration identification, user preferences, online "shopping cart" information, etc. The browser saves the information, and sends it back to the Web server whenever the browser returns to the Web site.

Fingerprint from Cookie Values

Examples :

ASPSESSIONIDSQARBSCA=FOBNKJPCIMOOLECFLOFLFGKD
JSPSESSIONID=XXXXXXXXX

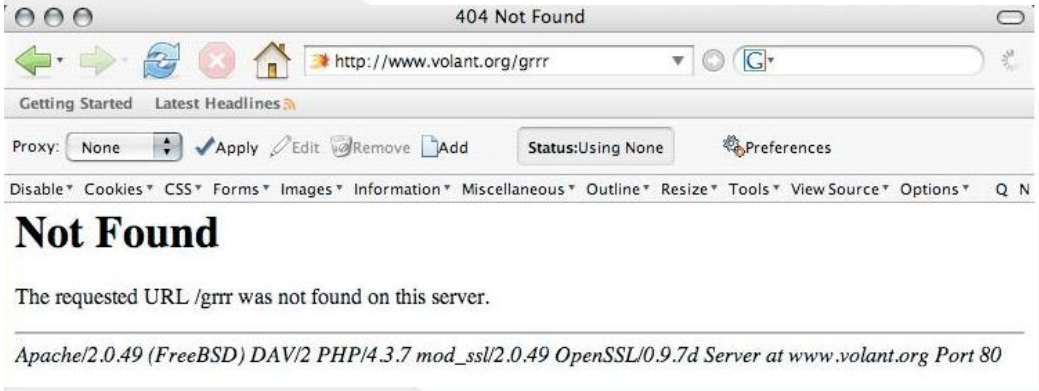
A cookie with ASP is a dead giveaway we are on some sort of a Windows Box
Where a cookie with JSP tells us that some sort of Java is at work.

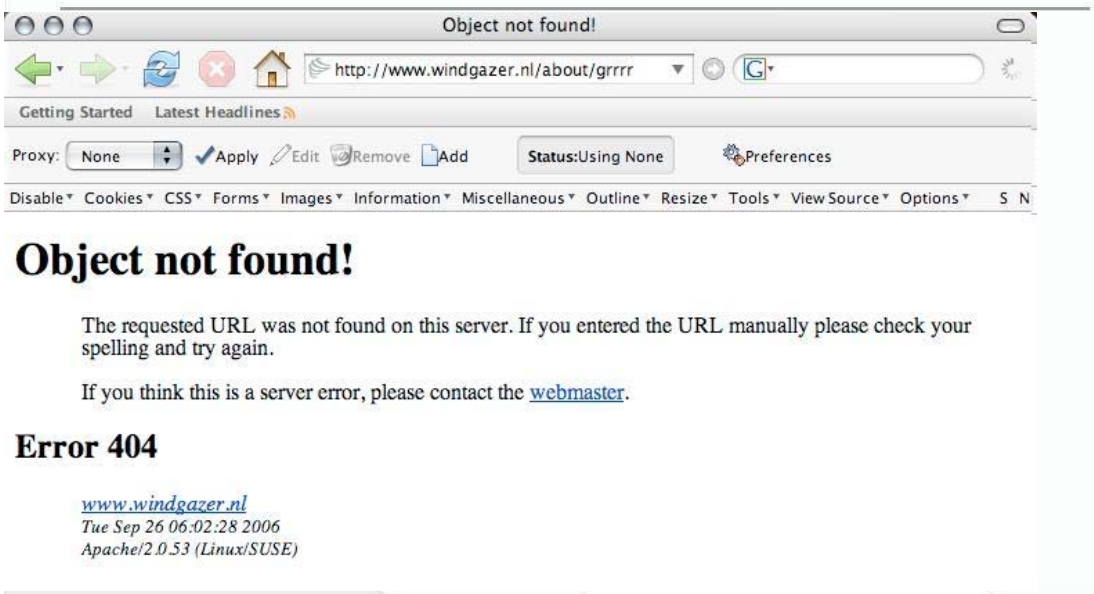
Error Pages

If a malformed request is send to the server, it may reply back with an Error Code and Software version and information. So even if you have fixed your header information, calling a non-existent page may give you an error message with useful information. Using netcat or telnet to call nonexistent pages can give you information as well.

400 - Bad Request
401 - Unauthorized Request
403 - Forbidden
404 - Not Found
500 - Internal error
503 - Service Unavailable

Apache Server
When Apache Server encounters an error, it displays a designated error message that's prebuilt into the server. For example, if you request a page that Apache can't find or that doesn't exist. Apache returns a 404 (*page not found*) error and provides a Web page that indicates the error.

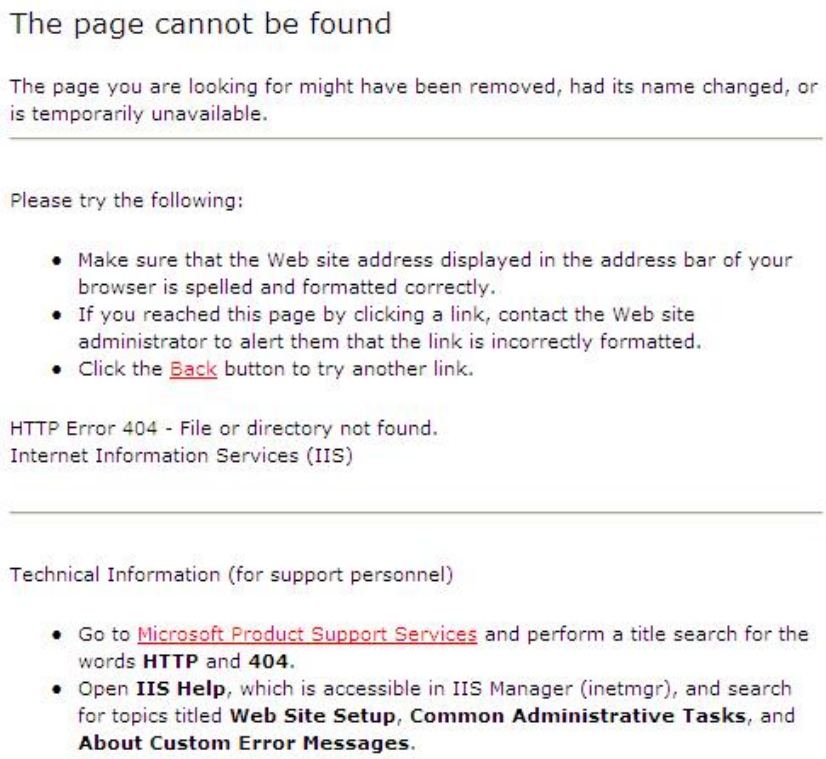




Apache Error Page revealing its software version information

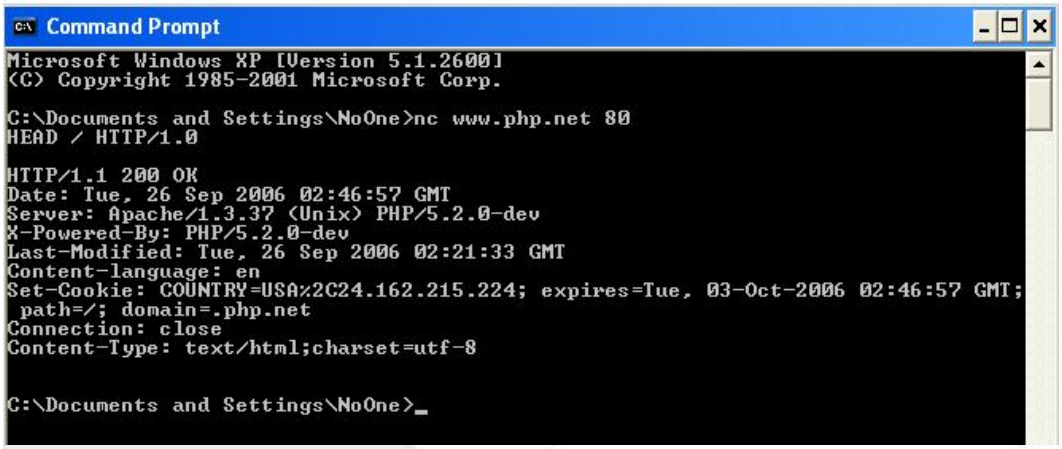
Apache draws this information from the data stored in the httpd.conf configuration file.

IIS Error Page



X-Powered By

ASP.net and PHP adds its own banner to your server tags "X-Powered by." This allows an attacker to fingerprint what version of PHP you are running.



X-Powered-By server tag

Examples :

X-Powered-By: PHP/4.3.10
X-Powered-By: ASP.NET
X-Powered-By: JSP/2.0

Turning the "X-Powered-By" tag off:

Locate in **php.ini** the variable **expose_php** and turn it **off**. In your php.ini (based on your Linux distribution this can be found in various places, like /etc/php.ini, /etc/php5/apache2/php.ini, etc.) locate the line containing *"expose_php On"* and set it to **Off**.

Page Names

.asp/aspx - Microsoft ASP http://www.microsoft.com/

Example:
`microsoft.com/technet/security/bulletin/`**`FQ05-010.asp`**

Microsoft Active Server Pages (ASP) is a server-side scripting environment that you can use to create and run dynamic, interactive Web server applications. With ASP, you can combine HTML pages, script commands, and COM components to create interactive Web pages and powerful Web-based applications that are easy to develop and modify.

.jsp - Sun JSP http://java.sun.com/products/jsp/

Example:
`java.sun.com/`**`index.jsp`**

JavaServer Pages (JSP) technology enables Web developers and designers to rapidly develop and easily maintain, information-rich, dynamic Web pages that leverage existing business systems. As part of the Java technology family, JSP technology enables rapid development of Web-based applications that are platform independent. JSP technology separates the user interface from content generation, enabling designers to change the overall page layout without altering the underlying dynamic content.

.php http://www.php.net

Example:
`www.lso.com/`**`index.php`**`?id=1`
PHP is an HTML-embedded scripting language. Much of its syntax is borrowed from C, Java and Perl with a couple of unique PHP-specific features thrown in. The goal of the language is to allow web developers to write dynamically generated pages quickly.

.cfm - Macromedia Cold Fusion Server http://www.macromedia.com/software/coldfusion

Example:
`macromedia.com/cfusion/resource/`**`rc_driver.cfm`**`?pagename=cfmx%20updater`

ColdFusion MX makes Internet application development and deployment faster and easier than any other solution available today. Easily extend or integrate with Java or .NET applications, connect to enterprise data and applications, create or consume web services, or interface with SMS on mobile devices or instant messaging clients. Add powerful application services for business reporting, rich-forms generation, printable document generation, full-text search, and graphing and charting.

.asmx

This is part of .Net/J2EE frameworks resource for web services and web services can be developed/deployed using this type of resource. Hence, by just glancing at the set of characters containing the **.asmx** extension we can fingerprint this resource to .Net.

.jws

Java Web Services runs with **.jws** extension on a few platforms. By looking at this extension we can guess about the underlying backend technologies. Axis integrated with tomcat can be identified because of the **.jws** extension.

.wsdl extension and query string

WSDL(web services definition language) is the file in which web services' access information resides.

Banner Grabbing

The simplest and most basic form of identifying HTTP servers is to look at the Server field in the HTTP response header. Using a TCP client like **netcat** or even **telnet**, it is possible to send an HTTP request to return the HTTP response header of the server, as shown below:

```
$ nc 192.168.0.56 80
HEAD / HTTP/1.0

HTTP/1.1 200 OK
Date: Mon, 16 Jun 2003 02:53:29 GMT
Server: Apache/1.3.3 (Unix)  (Red Hat/Linux)
Last-Modified: Wed, 07 Oct 1998 11:18:14 GMT
ETag: "1813-49b-361b4df6"
Accept-Ranges: bytes
Content-Length: 1179
Connection: close
Content-Type: text/html
$
```

Example 1: Apache 1.3.3 on Red Hat Linux

```
HTTP/1.1 200 OK
Date: Sun, 15 Jun 2003 17:10:49 GMT
Server: Apache/1.3.23
Last-Modified: Thu, 27 Feb 2003 03:48:19 GMT
ETag: "32417-c4-3e5d8a83"
Accept-Ranges: bytes
Content-Length: 196
Connection: close
Content-Type: text/html
```

Example 2: Apache 1.3.23

```
HTTP/1.1 200 OK
Server: Microsoft-IIS/5.0
Expires: Tue, 17 Jun 2003 01:41:33 GMT
Date: Mon, 16 Jun 2003 01:41:33 GMT
Content-Type: text/html
Accept-Ranges: bytes
Last-Modified: Wed, 28 May 2003 15:32:21 GMT
ETag: "b0aac0542e25c31:89d"
Content-Length: 7369
```

Example 3: IIS 5.0


```
HTTP/1.1 200 OK
Server: Netscape-Enterprise/4.1
Date: Mon, 16 Jun 2003 06:19:04 GMT
Content-type: text/html
Last-modified: Wed, 31 Jul 2002 15:37:56 GMT
Content-length: 57
Accept-ranges: bytes
Connection: close
```

Example 4: Netscape Enterprise 4.1

```
$nc www.microsoft.com 80
HEAD / HTTP/1.0

HTTP/1.1 200 OK
Connection: close
Date: Tue, 26 Sep 2006 03:19:57 GMT
Server: Microsoft-IIS/6.0
P3P: CP="ALL IND DSP COR ADM CONo CUR CUSo IVAo IVDo PSA PSD TAI TELo OUR SAMo
C
NT COM INT NAV ONL PHY PRE PUR UNI"
X-Powered-By: ASP.NET
X-AspNet-Version: 2.0.50727
Cache-Control: private
Content-Type: text/html; charset=utf-8
Content-Length: 30606
```

Example 4: IIS 6.0

```
$nc www.sun.com 80
HEAD / HTTP/1.0

HTTP/1.1 200 OK
Server: Sun-Java-System-Web-Server/6.1
Date: Tue, 26 Sep 2006 03:17:09 GMT
Content-type: text/html;charset=UTF-8
P3p: policyref="http://www.sun.com/p3p/Sun_P3P_Policy.xml", CP="CAO DSP COR CUR
ADMa DEVa TAIa PSAa PSDa CONi TELi OUR  SAMi PUBi IND PHY ONL PUR COM NAV INT
DE
M CNT STA POL PRE GOV"
X-powered-by: Servlet/2.4,JSP/2.0
Connection: close
Set-cookie: Starload=star-fep2; Path=/
Set-cookie: JSESSIONID=e8203f5cc16a34547426b9d909c5; Path=/
Set-cookie: JROUTE=V6Yg; Path=/
```

Example 5: Sun One Web server

```
HTTP/1.1 302 Found
Location: http://www.oracle.com/index.html
Content-Type: text/html; charset=iso-8859-1
Server: Oracle-Application-Server-10g OracleAS-Web-Cache-10g/10.1.2.0.2
(N;ecid=
216174166961840885,0)
Date: Thu, 28 Sep 2006 14:11:36 GMT
Connection: Keep-Alive
```

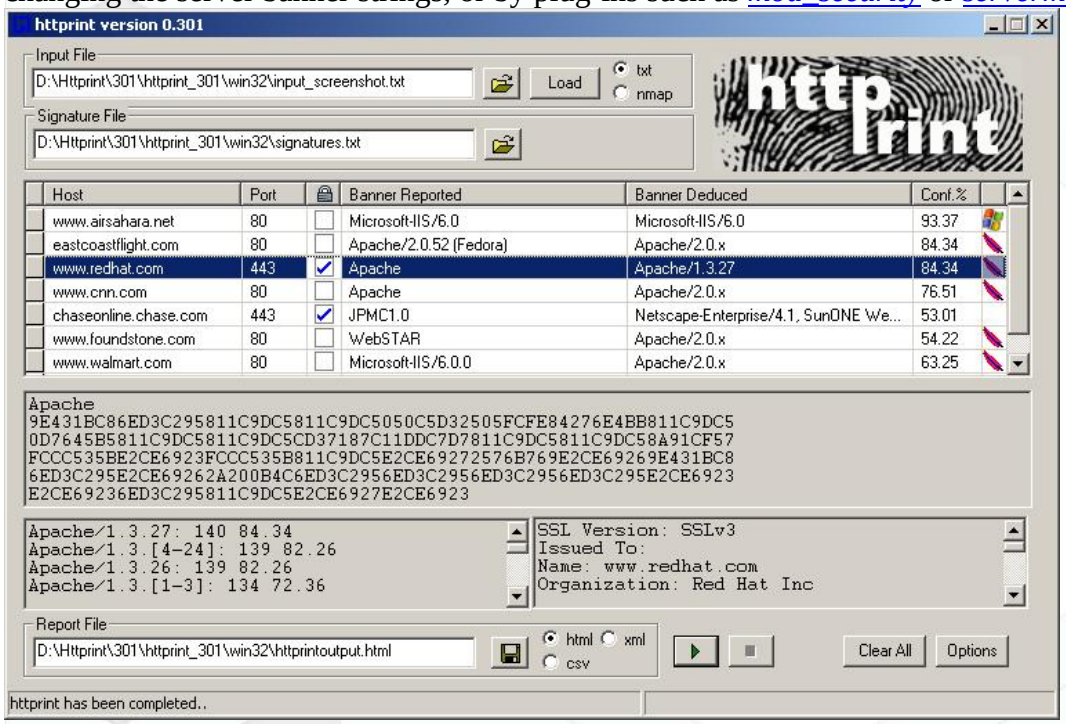
```
Set-Cookie: BIGipServerwoc_prod_pool_10g=2198704781.24862.0000; expires=Thu,
28-
Sep-2006 14:16:36 GMT; path=/
```

Example 6: Oracle Application Server

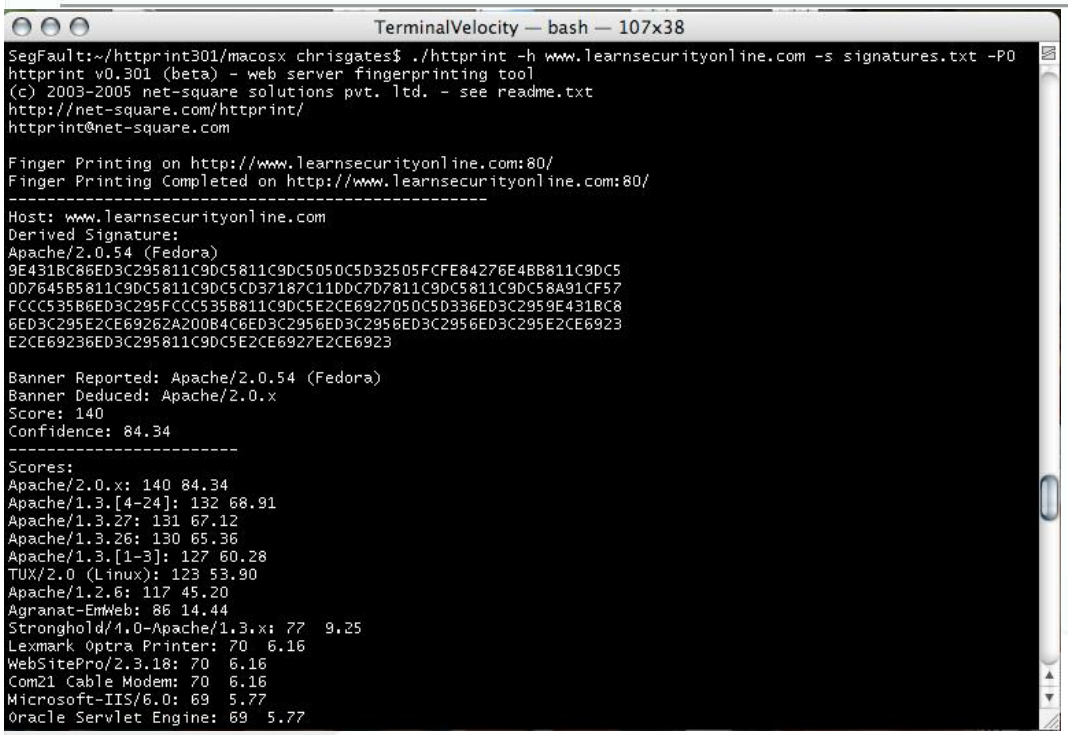
Fingerprinting tools

httprint http://net-square.com/httprint/

httprint is a web server fingerprinting tool. It relies on web server characteristics to accurately identify web servers, despite the fact that they may have been obfuscated by changing the server banner strings, or by plug-ins such as *mod_security* or *servermask*.



httprint GUI



httprint Command Line

httprint can also be used to detect web enabled devices which do not have a server banner string, such as wireless access points, routers, switches, and cable modems. httprint uses text signature strings and it is very easy to add signatures to the signature database.

Example httprint Signature Strings:

```
# 30/07/03
Microsoft-IIS/5.0
CD2698FD6ED3C295E4B1653082C10D64050C5D2594DF1BD04276E4BB811C9DC5
0D7645B5811C9DC52A200B4C9D69031D6014C217811C9DC5811C9DC52655F350
FCCC535BE2CE6923E2CE69232FCD861AE2CE69272576B769E2CE6926CD2698FD
6ED3C295E2CE692009DB9B3E811C9DC5811C9DC56ED3C2956ED3C295E2CE6923
6ED3C2956ED3C295811C9DC5E2CE69276ED3C295
icon: iis4_5.gif

# 30/07/03 - unverified
SunONE WebServer 6.0
811C9DC568D17AAE811C9DC5811C9DC5811C9DC594DF1BD0811C9DC5C184CB92
7FC8D095811C9DC52A200B4C4D0ACB9C811C9DC5811C9DC5811C9DC52655F350
FCCC535B811C9DC5FCCC535B811C9DC568D17AAE811C9DC568D17AAE811C9DC5
E2CE692768D17AAE811C9DC5811C9DC5811C9DC568D17AAE68D17AAEE2CE6923
E2CE6923FCCC535F811C9DC568D17AAEE2CE6920
icon: sun.gif
```

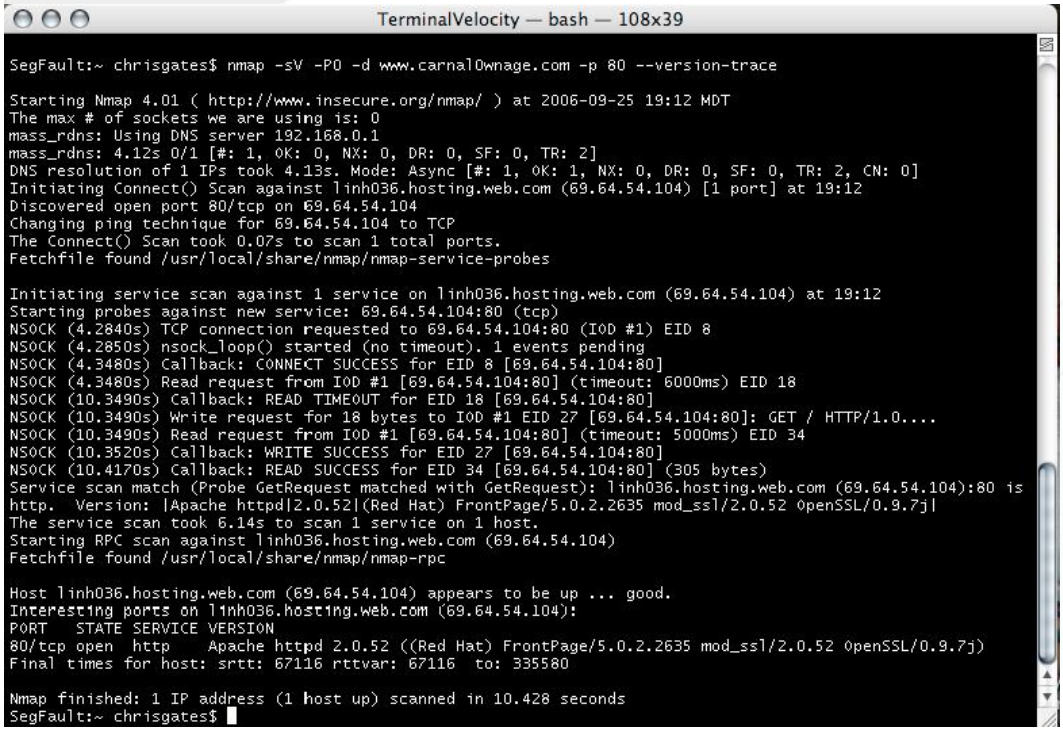
To get more information on how httprint works read the paper here:

http://net-square.com/httprint/httprint_paper.html

Nmap (-sV Version Scan) http://insecure.org/nmap/

Nmap Version Scan

Nmap tries to determine the service protocol (e.g. ftp, ssh, telnet, http), the application name (e.g. ISC Bind, Apache httpd, Solaris telnetd), the version number, and sometimes miscellaneous details like whether an X server is open to connections or the SSH protocol version). If Nmap was compiled with OpenSSL support, it will connect to SSL servers to deduce the service listening behind the encryption.

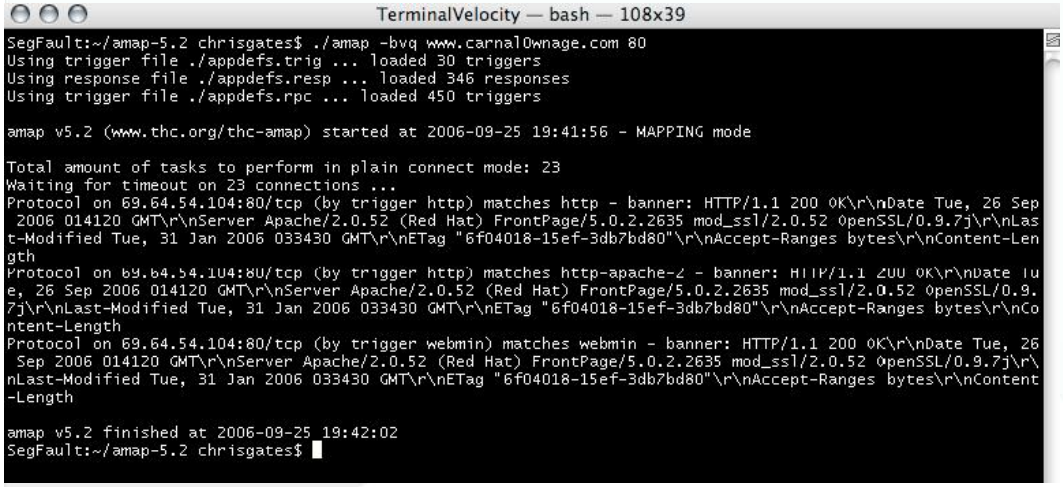


Nmap –version-trace –d options

For more information read the Nmap Man page:

http://insecure.org/nmap/man/
http://insecure.org/nmap/man/man-version-detection.html
http://insecure.org/nmap/vscan/

THC amap http://thc.org.segfault.net/thc-amap/

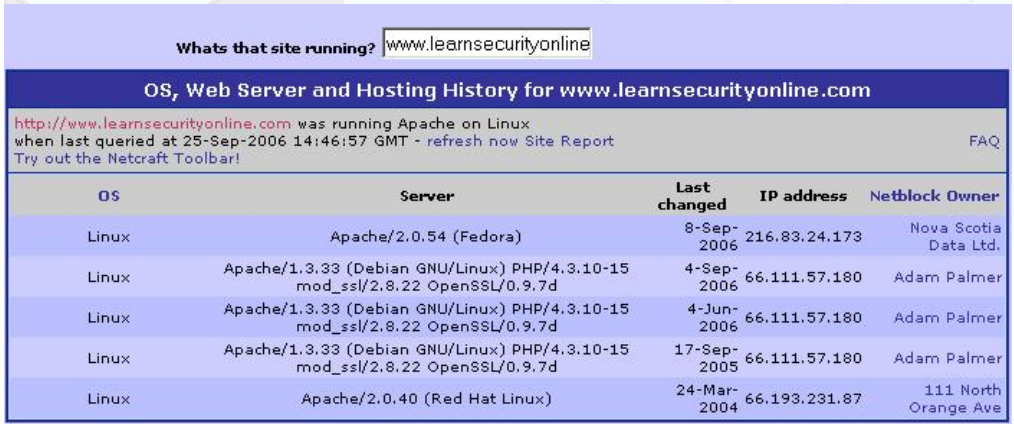


amap in action

Amap (application map) is a next-generation scanning tool for pen testers. It attempts to identify applications even if they are running on a different port than normal. It also identifies non-ascii based applications. This is achieved by sending trigger packets, and looking up the responses in a list of response strings.

NetCraft http://www.netcraft.com/

Netcraft will report a site's operating system, web server, and netblock owner together with, if available, a graphical view of the time since last reboot for each of the computers serving the site.


Whats that site running? www.learnsecurityonline

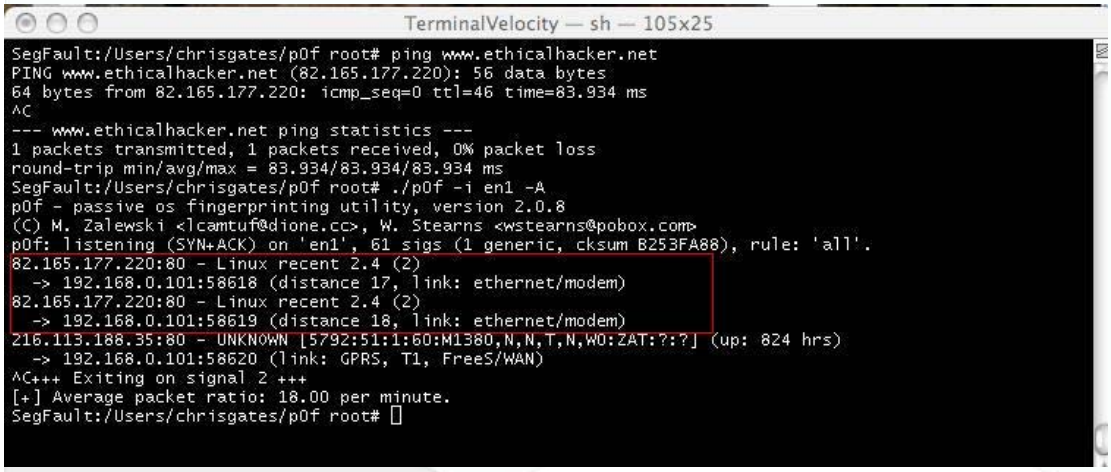
OS, Web Server and Hosting History for www.learnsecurityonline.com

http://www.learnsecurityonline.com was running Apache on Linux when last queried at 25-Sep-2006 14:46:57 GMT - refresh now Site Report FAQ
Try out the Netcraft Toolbar!

OS	Server	Last changed	IP address	Netblock Owner
Linux	Apache/2.0.54 (Fedora)	8-Sep-2006	216.83.24.173	Nova Scotia Data Ltd.
Linux	Apache/1.3.33 (Debian GNU/Linux) PHP/4.3.10-15 mod_ssl/2.8.22 OpenSSL/0.9.7d	4-Sep-2006	66.111.57.180	Adam Palmer
Linux	Apache/1.3.33 (Debian GNU/Linux) PHP/4.3.10-15 mod_ssl/2.8.22 OpenSSL/0.9.7d	4-Jun-2006	66.111.57.180	Adam Palmer
Linux	Apache/1.3.33 (Debian GNU/Linux) PHP/4.3.10-15 mod_ssl/2.8.22 OpenSSL/0.9.7d	17-Sep-2005	66.111.57.180	Adam Palmer
Linux	Apache/2.0.40 (Red Hat Linux)	24-Mar-2004	66.193.231.87	111 North Orange Ave

Passive Fingerprint using p0f http://lcamtuf.coredump.cx/p0f.shtml

P0f usage



Passive Fingerprinting Using Google http://www.google.com

If you want to locate “types” of web servers, you can use google and “googleprint”

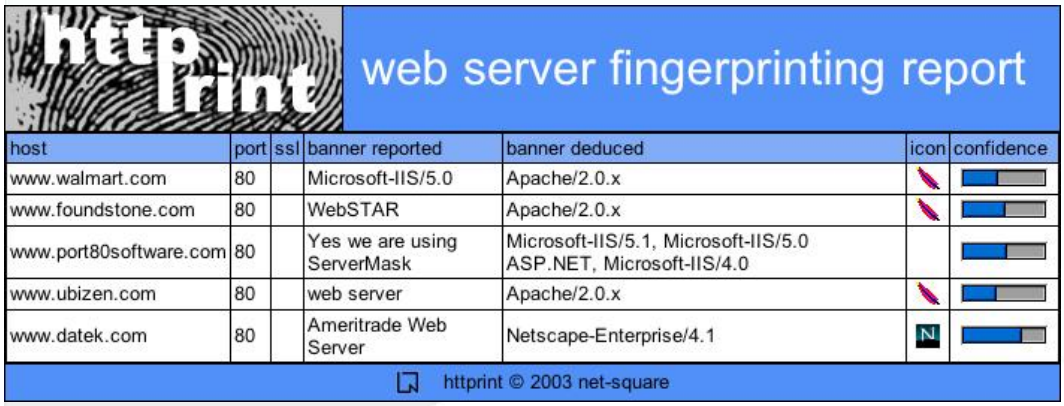
```
site:netcraft.com intitle:That.Site.Running Apache
site:netcraft.com intitle:That.Site.Running "Windows 98"
site:netcraft.com intitle:That.Site.Running "Windows NT"
site:netcraft.com intitle:That.Site.Running "Windows 2000"
site:netcraft.com intitle:That.Site.Running "Windows Server 2003"
site:netcraft.com intitle:That.Site.Running "Sun One"
site:netcraft.com intitle:That.Site.Running "Netscape-Enterprise/3.6"
site:netcraft.com intitle:That.Site.Running Apache Freebsd
site:netcraft.com intitle:That.Site.Running Apache Linux

“intitle:Under.Construction "Disabling Dynamic" shows IIS 6.0 on W2K3
```

We can take the information that netcraft stores and use Google to query that information to look for certain types of web servers.

Preventing Fingerprinting

Banner String Obfuscation

Banner String Obfuscation is simply changing the string that the server returns for the "Server: " value. We'll cover how to do this for Apache and IIS below.



host	port	ssl	banner reported	banner deduced	icon	confidence
www.walmart.com	80		Microsoft-IIS/5.0	Apache/2.0.x		
www.foundstone.com	80		WebSTAR	Apache/2.0.x		
www.port80software.com	80		Yes we are using ServerMask	Microsoft-IIS/5.1, Microsoft-IIS/5.0 ASP.NET, Microsoft-IIS/4.0		
www.ubizen.com	80		web server	Apache/2.0.x		
www.datek.com	80		Ameritrade Web Server	Netscape-Enterprise/4.1		

httprint © 2003 net-square

IIS

Urlscan http://www.microsoft.com/technet/security/tools/urlscan.mspx

Installing & Using: http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnnetsec/html/HT_URLScan.asp

URLScan is an ISAPI filter that allows Web site administrators to restrict the kind of HTTP requests that the server will process. By blocking specific HTTP requests, the URLScan filter prevents potentially harmful requests from reaching the server and causing damage.

IIS Lockdown http://www.microsoft.com/technet/security/tools/locktool.mspx

Installing & Using: http://support.microsoft.com/kb/325864/

The IIS Lockdown Tool functions by turning off unnecessary features, thereby reducing attack surface available to attackers**.**

ISAPI Filters

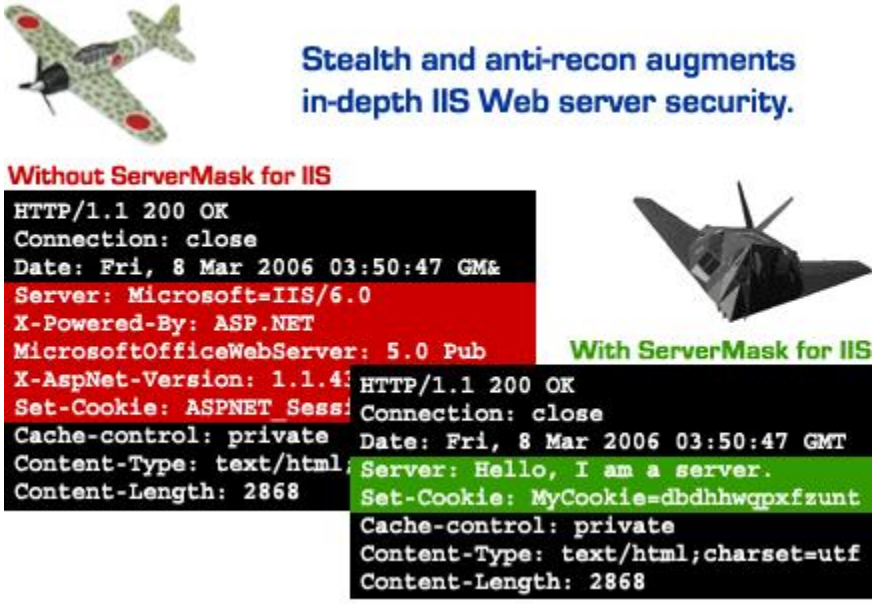
If your Kung Fu is good or just paranoid, you can create a custom Internet Server Application Program (ISAPI) filter or a dynamic link library (DLL) your IIS server calls each time it responds to a client request. The filter application sits between the network connection to the client and the HTTP server, allowing administrators to control the data

exchange 9 the way headers are composed in HTTP responses) between the IIS and the client to help stop attackers from fingerprinting the server.

You might also choose to change the application mappings on your server to hide the file extensions which reveal your server is IIS. Wayne Berry explains how to map .asp extensions to .html http://www.asp101.com/articles/wayne/pryingeyes/default.asp

Server mask http://www.port80software.com/products/servermask

Server Mask modifies your Web server's "finger print" by removing unnecessary HTTP response data, modifying cookie values and adjusting other response information thus obscuring the identity of your server. Successful obfuscation can confuse hackers and make it more likely they try the wrong exploits first and thus are identified by an intrusion detection system.



Apache

Source modifications

Apache Source Altering

`Include/httpd.h`

```
Define SERVER_BASEVENDOR “Apache Group”     ←Change these values
Define SERVER_PRODUCTVENDOR “Apache”        ←Change these values
Define SERVER_BASEVERSION “1.3.26”          ←Change these values
```

Limit Directive Method Restrictions

`Apache httpd.conf`


```
ServerSignatures Off
ServerTokens Prod
```

mod_headers http://httpd.apache.org/docs/mod/mod_headers.html

http://httpd.apache.org/docs/2.2/mod/mod_headers.html

The Apache Mod_Headers.c module provides directives to control and modify HTTP request and response headers. Headers can be merged, replaced or removed.

mod_security http://www.modsecurity.org/

ModSecurity(TM) is an open source intrusion detection and prevention engine for web applications. It can also be called a web application firewall. It operates embedded into the web server, acting as a powerful umbrella, shielding applications from attacks.

ModSecurity integrates with the web server, increasing your power to deal with web attacks. Some of its features worth mentioning are:

- Request filtering; incoming requests are analyzed as they come in, and before they get handled by the web server or other modules. (Strictly speaking, some processing is done on the request before it reaches ModSecurity but that is unavoidable in the embedded mode of operation.)
- Anti-evasion techniques; paths and parameters are normalized before analysis takes place in order to fight evasion techniques.
- Understanding of the HTTP protocol; since the engine understands HTTP, it performs very specific and fine granulated filtering. For example, it is possible to look at individual parameters, or named cookie values.
- POST payload analysis; the engine will intercept the contents transmitted using the POST method, too.
- Audit logging; full details of every request (including POST) can be logged for forensic analysis later.
- HTTPS filtering; since the engine is embedded in the web server, it gets access to request data after decryption takes place.
- Compressed content filtering; same as above, the security engine has access to request data after decompression takes place.

References and Resources

httprint: http://net-square.com/httprint/httprint_paper.html
servermask: http://www.port80software.com/support/articles/maskyourwebserver
johnnyihackstuff.com: http://johnny.ihackstuff.com/index.php?module=prodreviews
URLscan: http://support.microsoft.com/kb/307608
Article on Securing IIS: http://articles.techrepublic.com.com/5100-1035_11-5080599.html#
Mapping asp to html article:
http://www.asp101.com/articles/wayne/pryingeyes/default.asp
Writing and ISAPI Filter: http://www.graphcomp.com/info/specs/ms/httpfilt.htm