The Truth about Web Application Firewalls: What the vendors do NOT want you to know.

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Over 7 years in the security industry.

Vulnerability discovery Webmails, AP, Citrix, etc.

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VOIPPACK (CANVAS addon).

Security research papers.

SIPVicious and SurfJack.

Introduction

• Web Application Firewalls (WAFs) are quickly taking their place to protect web applications.

• Today WAF systems are considered the next generation product to protect websites against web hacking attacks.

• During this presentation we will show WAF systems can be identified, detected and we will introduce new attacks.

• We will show how WAF systems can be vulnerable to the same vulnerabilities that they try to protect Web Applications from.

What is WAF

• WAFs are often called 'Deep Packet Inspection Firewall'.

• Some WAFs look certain 'attack signature' while others look for abnormal behavior.

• WAFs can be either software or hardware appliance.

What is WAF

• Modern WAF systems work both with attack signature and abnormal behavior.

• WAFs can be installed as a reverse proxy, embedded or connected in a switch (SPAN or RAP).

• Nowadays many WAF products detect both inbound and outbound attacks.

Vendors

f5®

BREACH™ SECURITY LABS

eEye Digital Security®

CiTRIX®

iMPERVA®

FORTIFY® SOFTWARE

AppliCure Technologies

port80 software

armorlogic

webScurity inc.

art of defence

Who uses WAF?

- Many banks around the world.
- Companies that are very security conscious.
- Many companies in compliance with PCI DSS (Payment Card Industry - Data Security Standard).

Operation Modes:

- Negative model (blacklist based).
- Positive model (whitelist based).
- Mixed / Hybrid (mix negative and positive model protection).

Operation Mode: Negative

A negative security model detects attacks by relying on a database of attack signatures.

Example:

Do not allow in any page, any argument value (user input) which match potential XSS strings like <script>, </script>, String.fromCharCode, etc.

Operation Mode: Positive

A positive security model enforces positive behavior by learning the application logic and then building a security policy of valid known good requests.

Example:

Page news.jsp, the field "id" only accept numbers [0-9] and starting at 0 to 65535.

Common Weaknesses Brief

- Bad rules.
- Bad design.
- Bad implementation.
- Vulnerable to the same flaws they intend to protect.

Detection

WAF systems leave several signs which permit us to detect them, one of them are cookies:

Cookies: Some WAF products add their own cookie in the HTTP communication.

DEMO

Detection

WAF leave several traces that permit us to detect them, one of them are Header Rewrite:

Header Rewrite: Some WAF products allow the rewriting of HTTP headers. The most common field is "Server", this is used to try to deceive the attackers (server cloaking).

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Detection

Some WAF systems change the return codes:

• Different 404 error codes for hostile and non existent pages.

• Different error codes (404, 400, 401, 403, 501, etc) for hostile parameters (even non existent ones) in valid pages.

DEMO

Detection

Other WAF systems will simply drop the connection:

Drop Action: Immediately initiate a "connection close" action to tear down the TCP connection by sending a FIN packet.

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Detection

WAF systems leave several signs which permit us to detect them, one of them are Pre Built-in Rules:

Pre Built-in Rules: All (at least all that we know) WAF systems have a built-in group of rules in negative mode, these rules are different in each products, this can help us to detect them.

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Detection

You should be thinking…

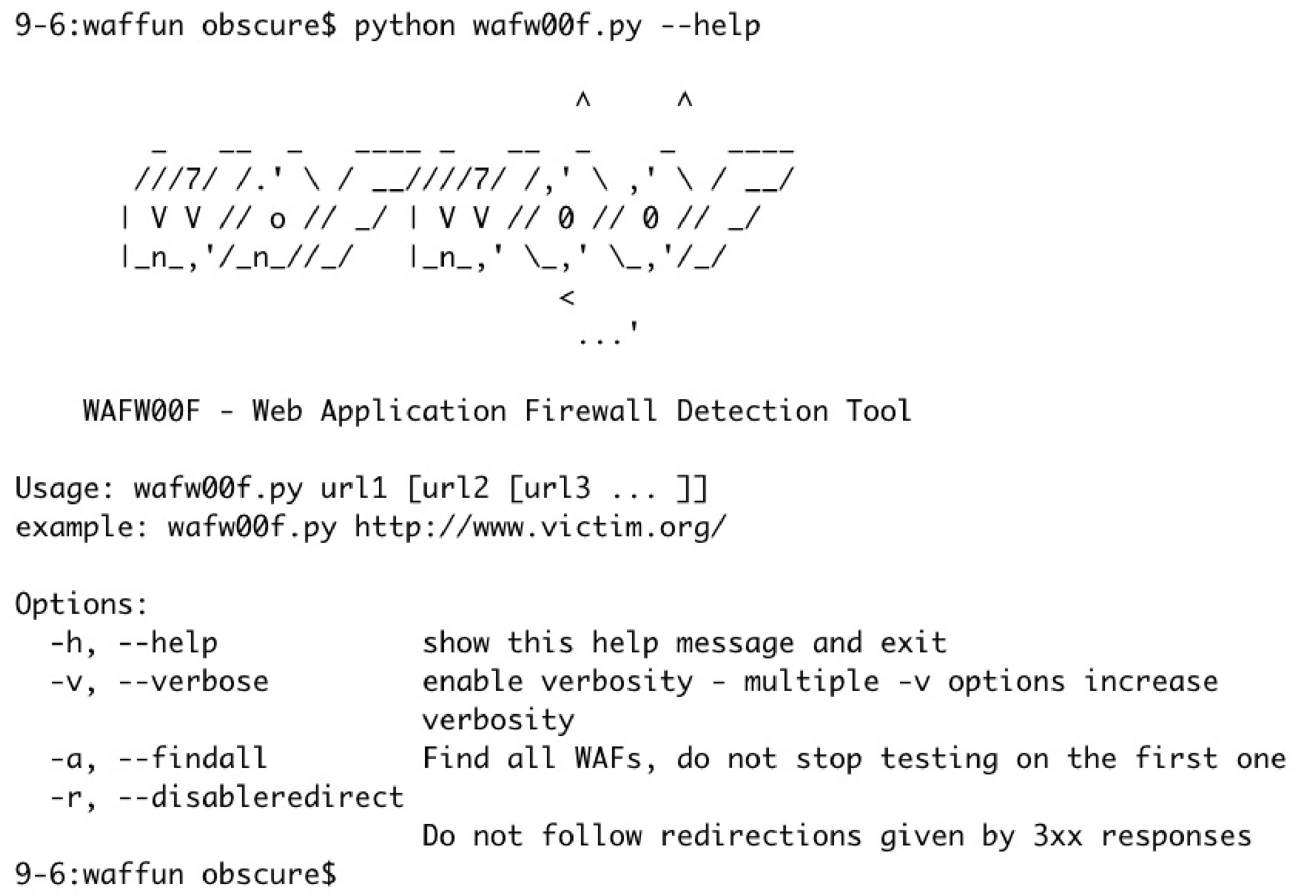
- It’s so boring.
- We have to have good knowledge of various products to identify them correctly.
- What about a tool that does all this?

WAFW00F

That’s our answer for your prayers:

- Detect 10 different WAF products.
- Generic detection.
- Supports Windows and Unix.
- Much more coming soon.

WAFW00F



```
9-6:waffun obscure$ python wafw00f.py --help

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    WAFW00F - Web Application Firewall Detection Tool

Usage: wafw00f.py url1 [url2 [url3 ... ]]
example: wafw00f.py http://www.victim.org/

Options:
  -h, --help            show this help message and exit
  -v, --verbose         enable verbosity - multiple -v options increase
                        verbosity
  -a, --findall         Find all WAFs, do not stop testing on the first one
  -r, --disableredirect
                        Do not follow redirections given by 3xx responses
9-6:waffun obscure$
```

WAFW00F

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Bypassing

WAF systems can be bypassed in various ways. We can modify our attack to still be effective and not match the WAF rules:

- Detect allowed / good strings.
- Detect denied / bad strings.
- Detect sequences of good and bad strings together.
- Modify your attack to match the good rules.

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Bypassing

WAF systems can be bypassed in various ways. Another way is to use encoding and language support:

- Unicode.
- Homographic attacks.

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Bypassing

WAF systems can be bypassed in various ways. Web languages are very flexible:

- HTML and JS is very flexible.
- XSS Case.

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Bypassing

WAIT!

- What about positive model?
- They are really secure?
- If we find a positive model we should give up?

DEMO

Bypassing

There are many other ways to bypass WAF systems…

Coming soon!

Bypassing

You should be thinking…

- It’s so boring.
- It’s time consuming.
- The are so many different techniques to remember.
- There are so many specific techniques that are product dependent.
- How about a tool which does all of the above?

WAFFUN

That's our answer for your prayers:

- Test the target and point weakness in the WAF system.
- Use with WAFW00F for better results.
- Supports Windows and Unix.
- Alpha version! We need the community help!
- Much more coming soon.

WAFFUN

DEMO

Show Time: 0day

DEMOS

WAF - Other problems

- Backdoors.
- DoS.
- Overflows.

Thank you!

Do you have access to a commercial WAF system?
Do you have ideas to improve our tools?
Don't have anyone to talk to?

Contact us!

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