Web Application Firewalls: What the vendors do NOT want you to know

and

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- PT Consultant at Trustwave's SpiderLabs.
- Over 7 years in the security industry.
- Vulnerability discovery Webmails, AP, Citrix, etc.
- Spoke in YSTS 2.0, Defcon 16, H2HC and others.
- Affiliated to Hackaholic team.

$ whois SandroGauci

- Founder and CSO EnableSecurity.
- VOIPPACK (CANVAS addon).
- Security research papers.
- SIPVicious and SurfJack.
- Over 9 years in the security industry.

Introduction

- WAF - Web Application Firewall.
- Can be identified, detected.
- Security software is not necessarily secure.

What is WAF

- WAFs are often called 'Deep Packet Inspection Firewall'.
- Some WAFs look for attack signatures while others look for abnormal behavior.
- WAFs products: software or hardware appliance.

What is WAF

- 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.

Who uses WAF?

- Many banks around the world.
- Companies which need high protection.
- 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 recognize attacks by relying on a database of expected 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 know good requests.

<u>Example:</u>

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

Common Weaknesses

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

Detection

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

demo

Detection

- 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).

  <u>Example:</u>

  Connection might be changed to Cneonction or nnCoection.

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Detection

- 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.

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Detection

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

  <u>Example:</u>

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

Detection

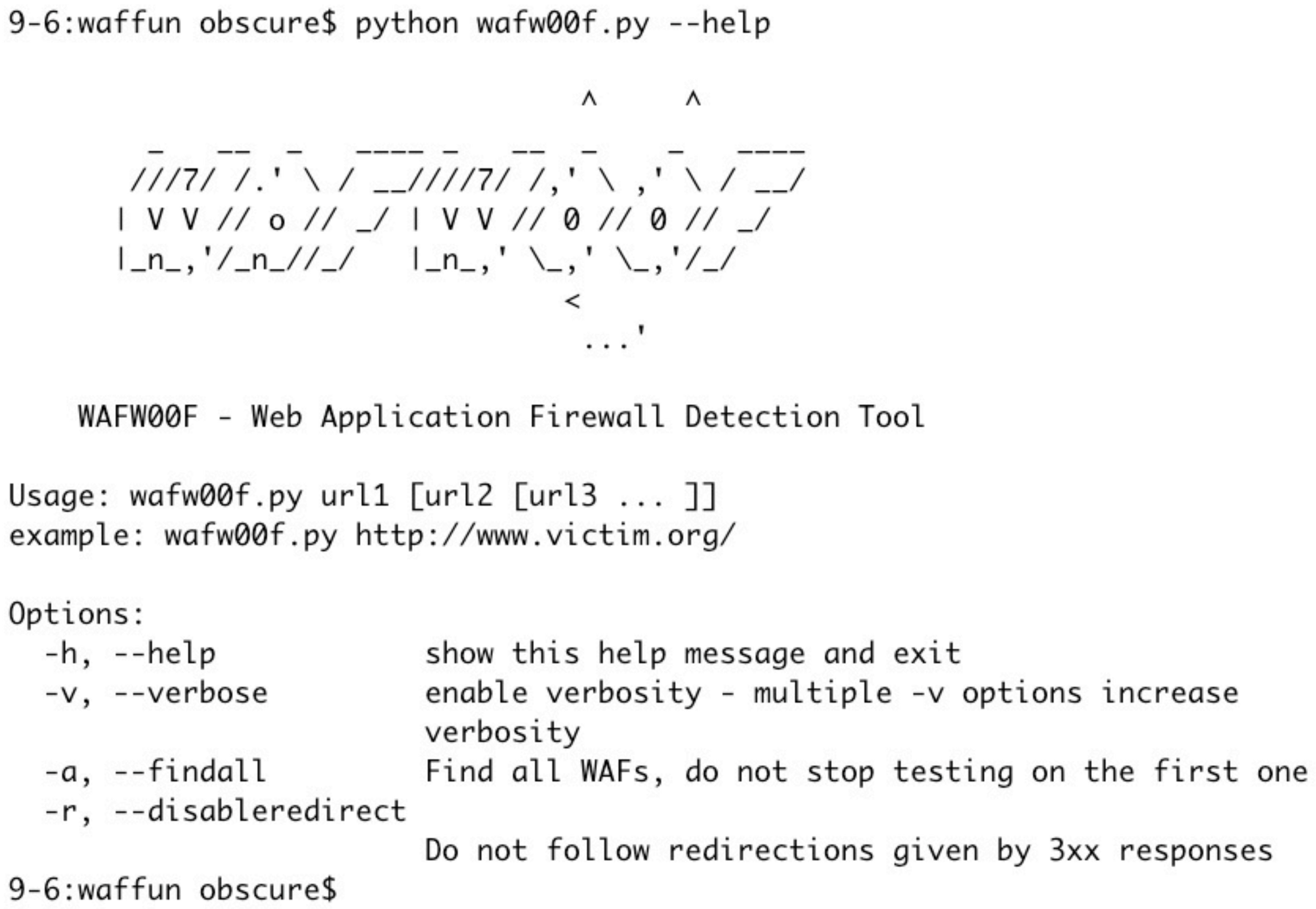
- WAF systems leave several signs which permit us to detect them, one of them are Pre Built-in Rules:
- Pre Built-in Rules: All (at least all that we know) WAF systems have a built-in group of rules in negative mode, these rules are different in each products, this can help us to detect them.

Detection

- You should be thinking…
- It’s so boring.
- We have to know a lot of products to identify them correctly.
- What about create a tool for that?

WAFW00F

- That’s our answer for your prays:
- Detect over 20 different WAF products.
- Do not stop at the first WAF system found.
- Follow HTTP redirects to identify more systems.
- Much more coming soon.



```
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$
```

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Bypassing

- WAF systems can be bypassed by changing the attack to do not match the rules:
- Detect allowed / denied strings.
- Detect sequences of good and bad strings together.
- Modify your attack to match the good rules.

Bypassing

- WAF systems allow us to bypass them in different ways, one of them are using old tricks like encoding and language support:

- Spaces, comments, case sensitive mutation, Unicode, etc.

- The web server can parse, decode and interpret and HTTP request differently from the WAF.

Bypassing

- WAF systems allow us to bypass them in different ways, one of them are using the flexibility of the web languages:

- HTML and JS is very flexible.

<u>Example:</u>

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?

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Bypassing

- You should be thinking…
- It’s time consuming.
- The are so much different techniques to remember.
- There are so many specific techniques product dependent.
- What about a tool for that?

WAFFUN

- That’s our answer for your prays:
- Test the target and point weakness in the WAF system.
- Use with WAFW00F for better results.
- Working in Windows and Unix.
- Beta version! We need the community help.

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Other Vulnerabilities

- XSS (in the own WAF system?)
- Overflows
- DoS

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Thank you!

- Do you have ideas / resources to improve our tools?

- Do you just don’t have with who talk?

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