Wyatt Pangerl, Kevin Tröll, Jona Monette

Overview

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The goal of our tool is to combat SQL injection attacks done using SQLmap by implementing Snort firewall rules to filter SQLmap packets from incoming network traffic. SQLmap network traffic has unique, identifiable headers and thus can be filtered out with simple firewall rules.

Link to our public code repository

Snort Rule #1 (September)

Steps we followed to create the rule:

- Created rule file in /etc/snort/rules/ (rule in the git repo)
- Added rule to /etc/snort/snort.conf to enable it
- Started a web server and collected web traffic on port 80, while running a SQLmap scan on the web server, using Wireshark (.pcap file in the git repo)
- Ingested the pcap file into snort using this command:
    - `sudo snort -r sqlmap.pcap -c /etc/snort/snort.conf`
- Examined the snort conf file to see the matched rule (screenshot in the git repo)

The Snort rule:

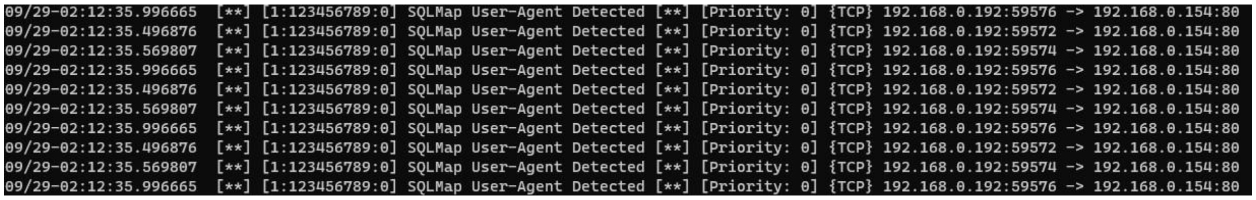
When SQLmap attempts to connect to a site, it will display "sqlmap" in the connection headers for the useragent. It will be displayed twice. Once at the beginning of the header, and towards the end of the header in a URL. This rule also looks at all ports in case an application is running on another port other than port 80.

```
alert tcp any any -> any any (msg:"SQLMap User-Agent Detected";
content:"User-Agent"; nocase; http_header; pcre:"/sqlmap/i"; sid:123456789;)
```

The rule checks for the SQLmap header and blocks the packet if it matches it.

Proof of Value #1

The following screenshot shows the snort rule detecting SQLmap traffic:



```
09/29-02:12:35.996665  [**] [1:123456789:0] SQLMap User-Agent Detected [**] [Priority: 0] {TCP} 192.168.0.192:59576 -> 192.168.0.154:80
09/29-02:12:35.496876  [**] [1:123456789:0] SQLMap User-Agent Detected [**] [Priority: 0] {TCP} 192.168.0.192:59572 -> 192.168.0.154:80
09/29-02:12:35.569807  [**] [1:123456789:0] SQLMap User-Agent Detected [**] [Priority: 0] {TCP} 192.168.0.192:59574 -> 192.168.0.154:80
09/29-02:12:35.996665  [**] [1:123456789:0] SQLMap User-Agent Detected [**] [Priority: 0] {TCP} 192.168.0.192:59576 -> 192.168.0.154:80
09/29-02:12:35.496876  [**] [1:123456789:0] SQLMap User-Agent Detected [**] [Priority: 0] {TCP} 192.168.0.192:59572 -> 192.168.0.154:80
09/29-02:12:35.569807  [**] [1:123456789:0] SQLMap User-Agent Detected [**] [Priority: 0] {TCP} 192.168.0.192:59574 -> 192.168.0.154:80
09/29-02:12:35.996665  [**] [1:123456789:0] SQLMap User-Agent Detected [**] [Priority: 0] {TCP} 192.168.0.192:59576 -> 192.168.0.154:80
09/29-02:12:35.496876  [**] [1:123456789:0] SQLMap User-Agent Detected [**] [Priority: 0] {TCP} 192.168.0.192:59572 -> 192.168.0.154:80
09/29-02:12:35.569807  [**] [1:123456789:0] SQLMap User-Agent Detected [**] [Priority: 0] {TCP} 192.168.0.192:59574 -> 192.168.0.154:80
09/29-02:12:35.996665  [**] [1:123456789:0] SQLMap User-Agent Detected [**] [Priority: 0] {TCP} 192.168.0.192:59576 -> 192.168.0.154:80
```

Snort alert breakdown:

1. Timestamp: The timestamp indicates when the alert was generated. It follows the format “MM/DD-HH:MM:SS.”

2. Alert Rule: Snort uses rules to define conditions that trigger an alert when matched. The rule is enclosed in square brackets, like ‘[1:123456789:01 SQLMap User-Agent Detected]’.

Components of the rule:

- - [1:123456789:01]: This is the rule ID, a unique identifier for the rule.
- - SQLMap: This is a message or description associated with the rule.
- - User-Agent Detected: This indicates the condition that triggered the alert.

3. Priority: Priority levels can help classify the severity of the alert.

4. Source and Destination IP and Port: The source and destination IP addresses and port numbers involved in the network communication that triggered the alert. For example:

- 192.168.0.192:59576 => 192.168.0.154:80: This represents traffic from source IP 192.168.0.192, source port 59576, going to destination IP 192.168.0.154, and destination port 80

Snort Rule #2 (October)

Steps we followed to create the rule:

- Created rule file in /etc/snort/rules/ (rule in the git repo)
- Added rule to /etc/snort/snort.conf to enable it
- Started a web server and collected web traffic on port 80, while running a SQLmap scan on the web server, using Wireshark (.pcap file in the git repo)
- Ingested the pcap file into snort using this command:
  - `sudo snort -r sqlmap.pcap -c /etc/snort/snort.conf`
- Examined the snort conf file to see the matched rule (screenshot in the git repo)

The Snort rule:

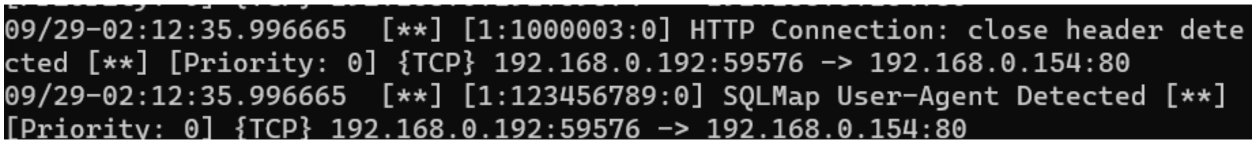
This rule behaves similarly to the previous rule. When SQLmap attempts to connect to a site, it repeats a portion of the header “`Connection:\s*close`” twice.

```
alert tcp $HOME_NET any -> $EXTERNAL_NET $HTTP_PORTS (msg:"Connection: close header detected"; flow:to_server,established; content:"Connection: close"; nocase; pcre:"/Connection:\s*close.*Connection:\s*close/i"; sid:1000001;)
```

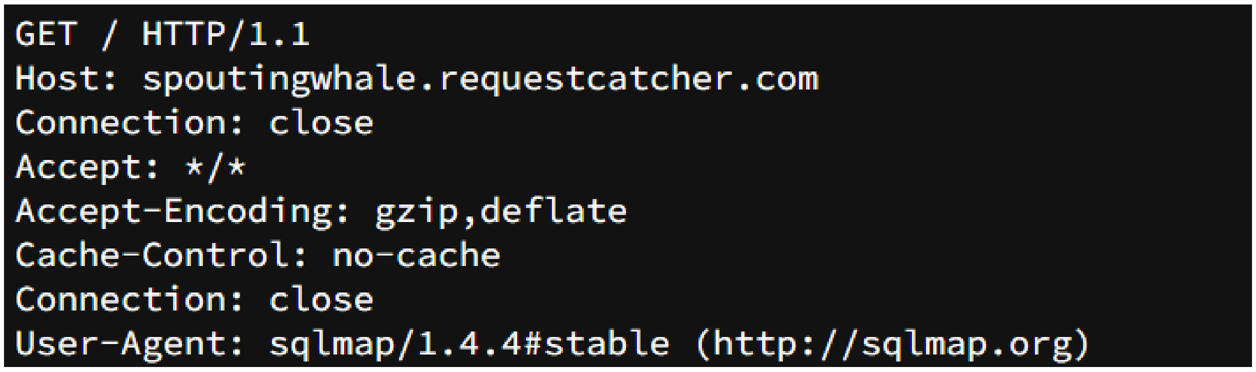
The rule checks for the repeated content in the SQLmap header and blocks the packet if it matches it.

Proof of Value #2

The below screenshots show the snort rule working on the sqlmap traffic, and the second screenshot shows what sqlmaps connection headers look like, note the 2 connection headers.



```
09/29-02:12:35.996665  [**] [1:1000003:0] HTTP Connection: close header dete
cted [**] [Priority: 0] {TCP} 192.168.0.192:59576 -> 192.168.0.154:80
09/29-02:12:35.996665  [**] [1:123456789:0] SQLMap User-Agent Detected [**]
[Priority: 0] {TCP} 192.168.0.192:59576 -> 192.168.0.154:80
```



```
GET / HTTP/1.1
Host: spoutingwhale.requestcatcher.com
Connection: close
Accept: */*
Accept-Encoding: gzip,deflate
Cache-Control: no-cache
Connection: close
User-Agent: sqlmap/1.4.4#stable (http://sqlmap.org)
```

Snort alert breakdown:
1. Timestamp: The timestamp indicates when the alert was generated. It follows the format “MM/DD-HH:MM:SS.”

2. Alert Rule: Snort uses rules to define conditions that trigger an alert when matched. The rule is enclosed in square brackets, like ‘[1:1000003:0 HTTP Connection: close header detected]’.

Components of the rule:
- - [[1:1000003:0]: This is the rule ID, a unique identifier for the rule.
- - HTTP Connection: This is a message or description associated with the rule.
- - close header Detected: This indicates the condition that triggered the alert.

3. Priority: Priority levels can help classify the severity of the alert.

4. Source and Destination IP and Port: The source and destination IP addresses and port numbers involved in the network communication that triggered the alert. For example:

- 192.168.0.192:59576 => 192.168.0.154:80: This represents traffic from source IP 192.168.0.192, source port 59576, going to destination IP 192.168.0.154, and destination port 80