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Investigating with Splunk Workshop

Ethan Gardiner | Global Security Strategist

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Agenda

- Introduction
- Why Investigating?
- Scenario Review
- Investigating an APT
- Investigating Ransomware
- Conclusion

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#whoami

Ethan Gardiner
Global Security Strategist
Splunk

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Investigate (Thanks, Google!)

in·ves·ti·gate

/inˈvestəˌgāt/

verb

verb: **investigate**; 3rd person present: **investigates**; past tense: **investigated**; past participle: **investigated**; gerund or present participle: **investigating**

carry out a systematic or formal inquiry to discover and examine the facts of (an incident, allegation, etc.) so as to establish the truth.
"police are investigating the alleged beating"
synonyms: inquire into, look into, go into, probe, explore, scrutinize, conduct an investigation into, make inquiries about; More

- carry out research or study into (a subject, typically one in a scientific or academic field) so as to discover facts or information.
  "future studies will investigate whether long-term use of the drugs could prevent cancer"
  synonyms: inquire into, look into, go into, probe, explore, scrutinize, conduct an investigation into, make inquiries about; More
- make inquiries as to the character, activities, or background of (someone).
  "everyone with a possible interest in your brother's death must be thoroughly investigated"
  synonyms: inquire into, look into, go into, probe, explore, scrutinize, conduct an investigation into, make inquiries about; More
- make a check to find out something.
  "when you didn't turn up, I thought I'd better come back to investigate"

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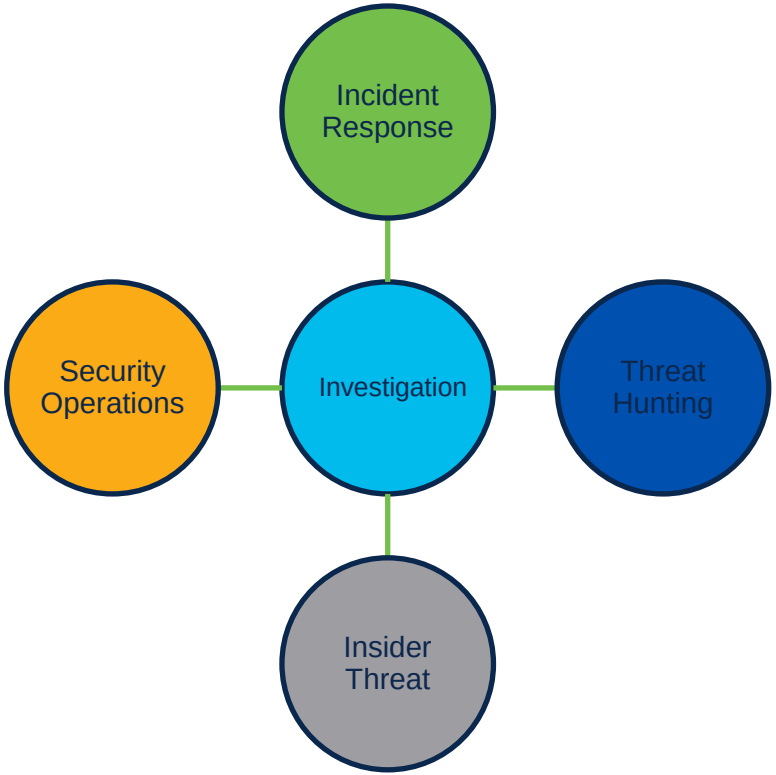
Investigating is a core competency

- When something is detected, we want to figure out what happened
- Who, what, where, when, why, how?
- Investigating can be reactive or proactive



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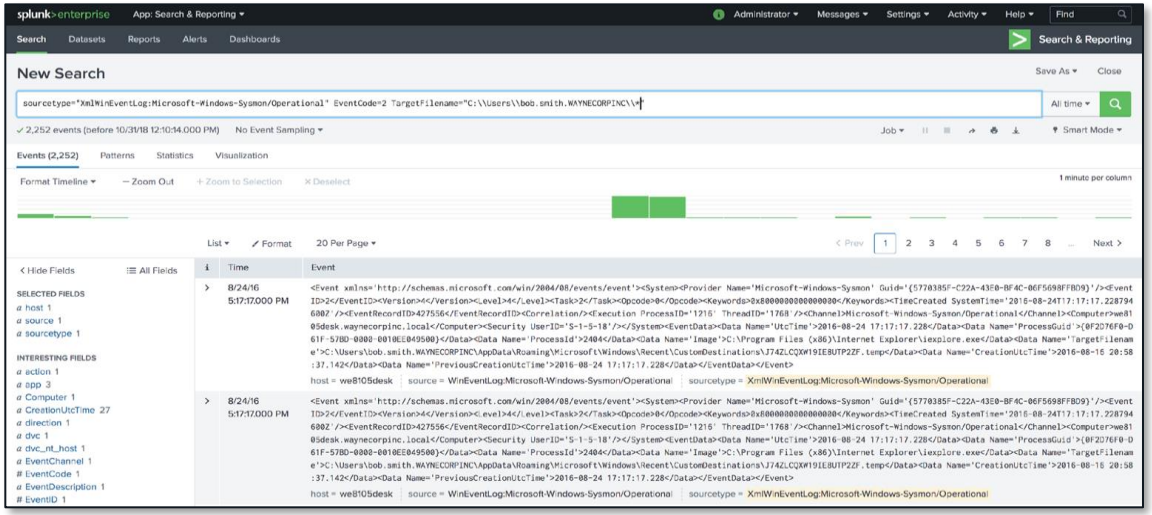
Luckily everything is captured in Splunk

- Microsoft Sysmon
- Windows Events
- Windows Registry
- IIS
- Splunk Stream (wire data)
- Suricata
- Fortigate (NGFW)



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Splunk commands used

metadata

stats – distinct count, count, values, average, AS

eval – lower, length, round

table

AND OR NOT

sort

reverse

head

transaction

rex

search

inputlookup

outputlookup

fields

lookup

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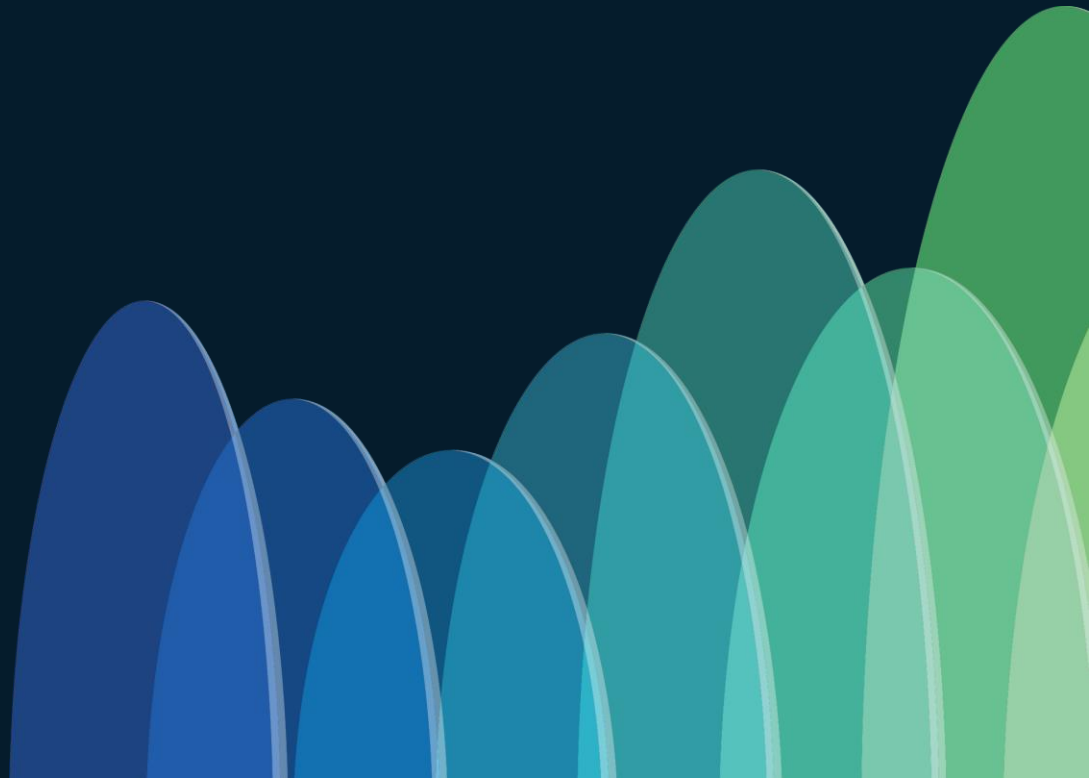
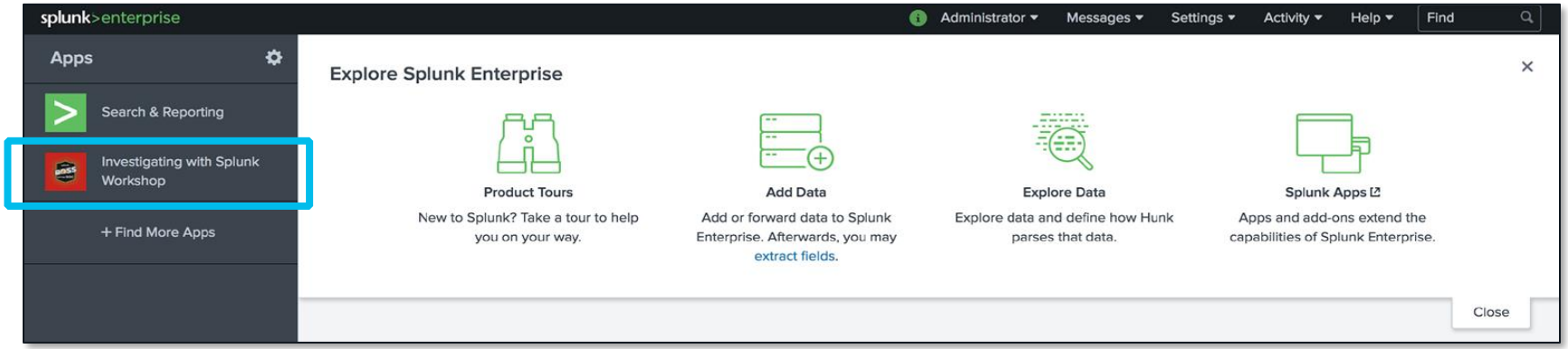
Let’s Investigate



Starting point

Please make sure you are logged in and seeing this window



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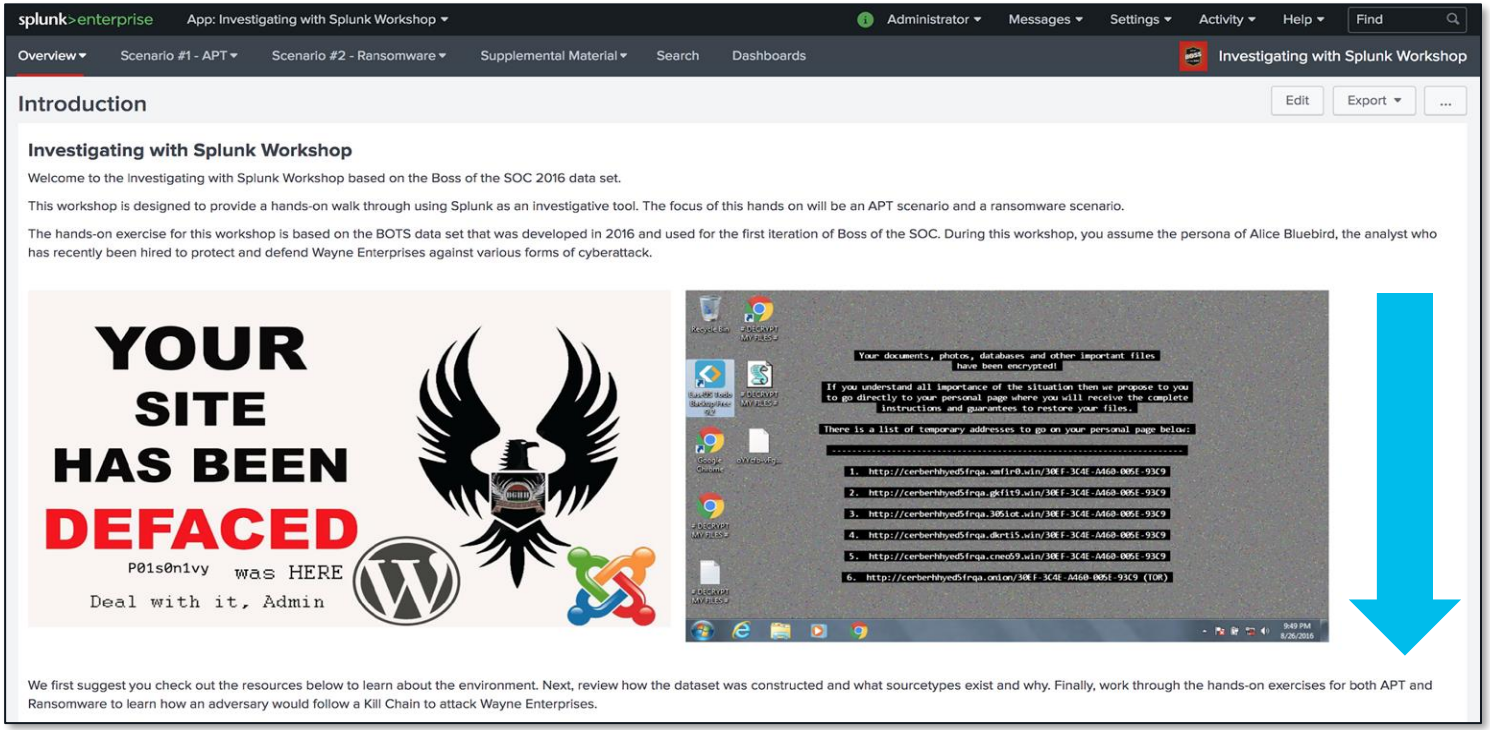
Quick intro to the app



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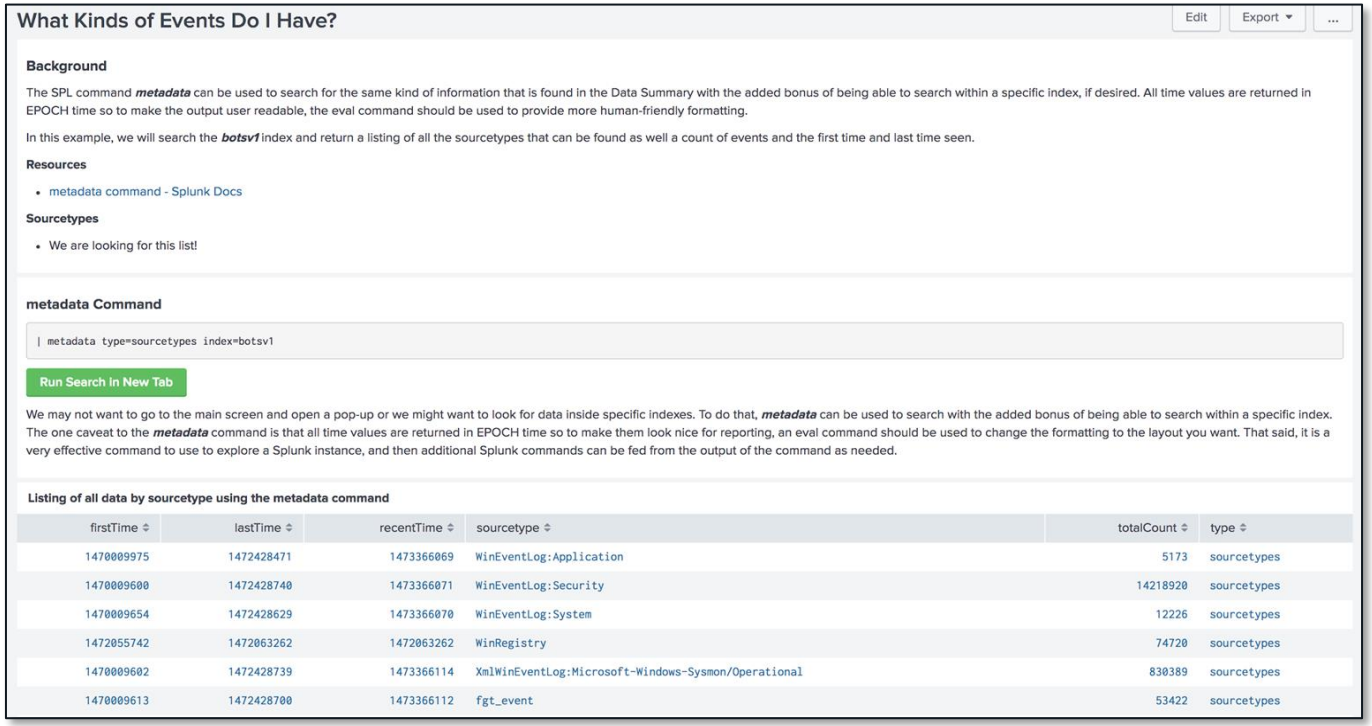
Screen layout



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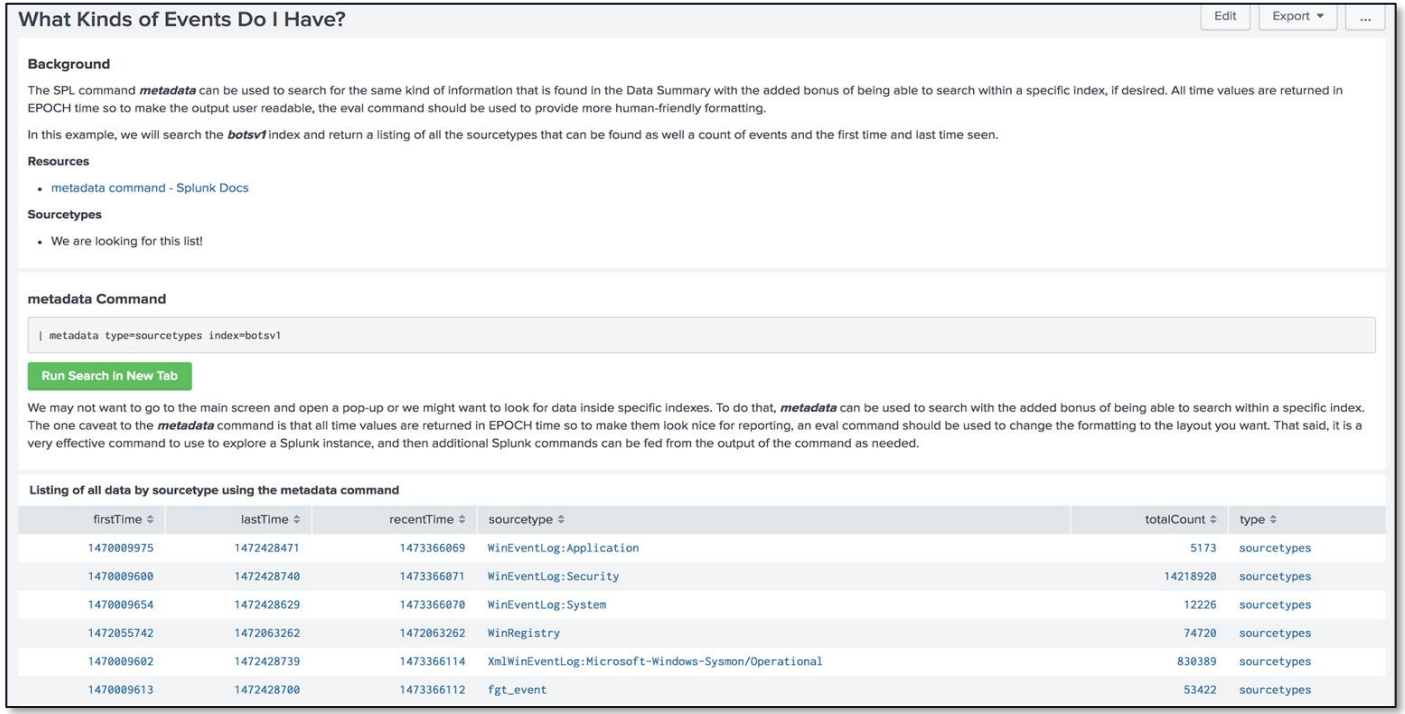
What kinds of events do I have?



What Kinds of Events Do I Have?

Edit | Export | ...

Background

The SPL command ***metadata*** can be used to search for the same kind of information that is found in the Data Summary with the added bonus of being able to search within a specific index, if desired. All time values are returned in EPOCH time so to make the output user readable, the eval command should be used to provide more human-friendly formatting.

In this example, we will search the ***botsv1*** index and return a listing of all the sourcetypes that can be found as well a count of events and the first time and last time seen.

Resources

- metadata command - Splunk Docs

Sourcetypes

- We are looking for this list!

metadata Command

```
| metadata type=sourcetypes index=botsv1
```

Run Search in New Tab

We may not want to go to the main screen and open a pop-up or we might want to look for data inside specific indexes. To do that, ***metadata*** can be used to search with the added bonus of being able to search within a specific index. The one caveat to the ***metadata*** command is that all time values are returned in EPOCH time so to make them look nice for reporting, an eval command should be used to change the formatting to the layout you want. That said, it is a very effective command to use to explore a Splunk instance, and then additional Splunk commands can be fed from the output of the command as needed.

Listing of all data by sourcetype using the metadata command

firstTime	lastTime	recentTime	sourcetype	totalCount	type
1470009975	1472428471	1473366069	WinEventLog:Application	5173	sourcetypes
1470009600	1472428740	1473366071	WinEventLog:Security	14218920	sourcetypes
1470009654	1472428629	1473366070	WinEventLog:System	12226	sourcetypes
1472055742	1472063262	1472063262	WinRegistry	74720	sourcetypes
1470009602	1472428739	1473366114	XmlWinEventLog:Microsoft-Windows-Sysmon/Operational	830389	sourcetypes
1470009613	1472428700	1473366112	fgt_event	53422	sourcetypes

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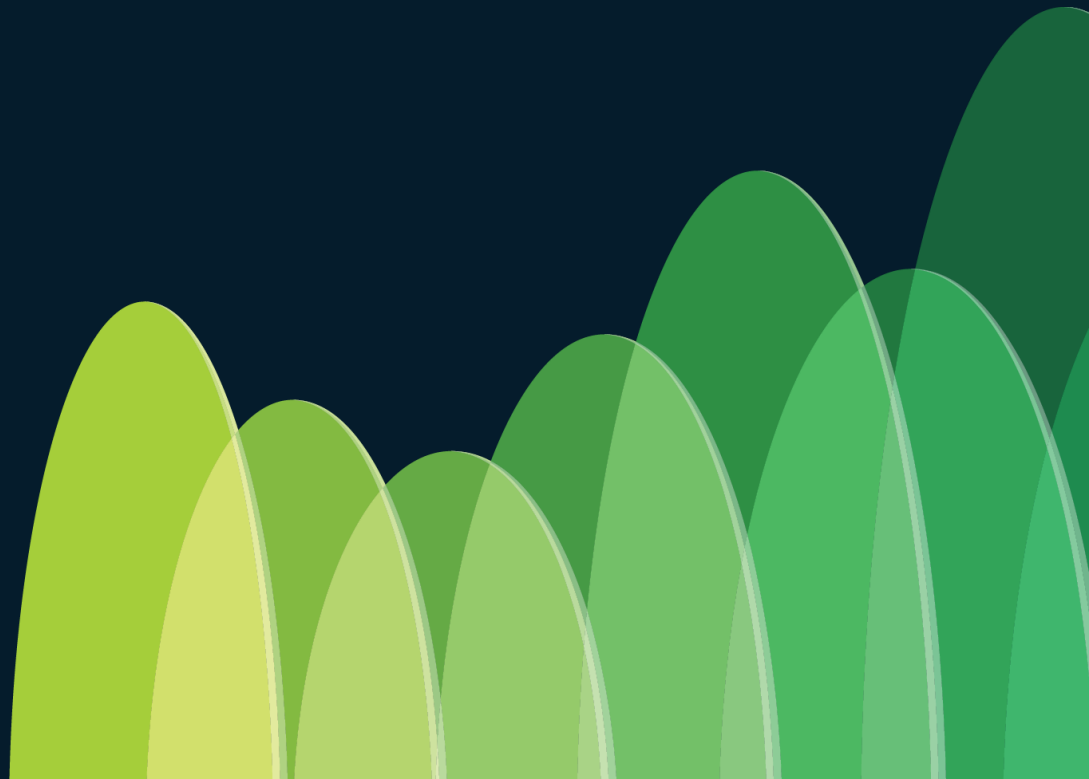
APT Scenario

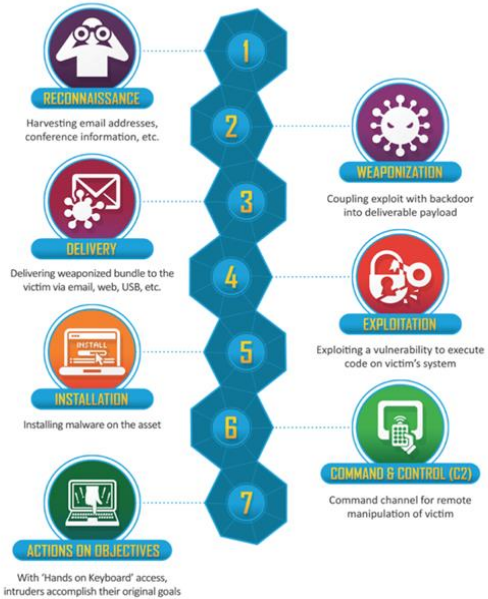


APT Prologue

Edit | Export | ...

Scenario #1 - APT

In this scenario, reports of the below graphic come in from your user community when they visit the Wayne Enterprises website, and some of the reports reference "P01s0n1vy." In case you are unaware, P01s0n1vy is an APT group that has targeted Wayne Enterprises. Your goal, as Alice, is to investigate the defacement, with an eye towards reconstructing the attack via the Lockheed Martin Kill Chain.



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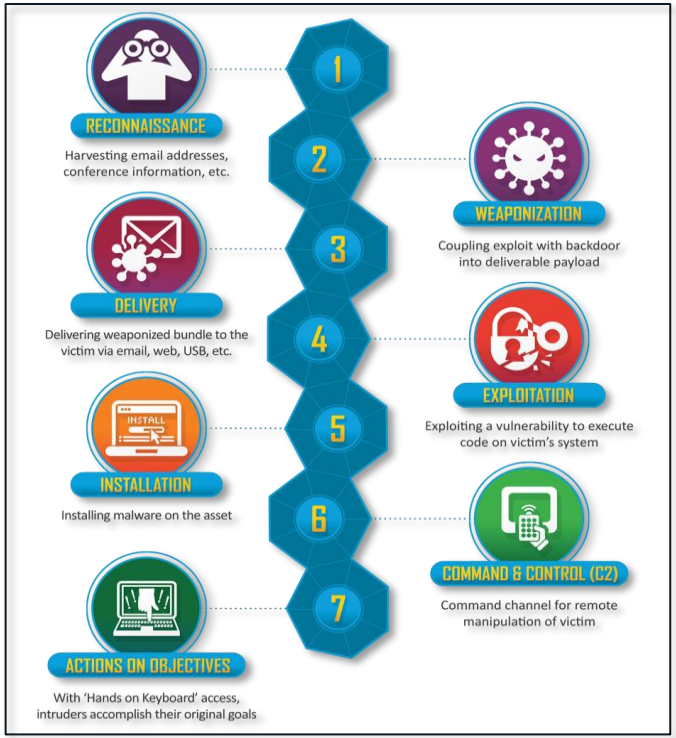
Lockheed Martin Cyber Kill Chain

- Method for characterising different parts of an attack for intelligence gathering, situational awareness and better understanding of a multi-stage threat
- Does not apply to all threats but is a good place to start for targeted attacks



http://www.lockheedmartin.com/content/dam/lockheed/data/corporate/documents/LM-White-Paper-Intel-Driven-Defense.pdf

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Start investigating!

During an investigation, there are a number of questions that need to be answered.

- Some questions will build off of earlier questions
- Pro tip: have a notepad and pencil at the ready!

We created these questions to guide your investigation, there are more questions you can ask and more badness you can find!

- After each question, the instructor will set aside a few minutes to allow you to find the answer
- We will re-group to review the question and the process we took
- Reference the app if you get stuck or ask your instructors
- We will provide a couple of hints to get you started...

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Finding the IP scanning your web server

Kill Chain Phase: Reconnaissance

What is the likely IP address of someone from the Po1s0n1vy group scanning imreallynotbatman.com for web application vulnerabilities?

Hints

- All searches used today will have an index of botsv1
  - index=botsv1
- The field src is the field you are looking for
- Focusing your search on specific sourcetypes will be helpful

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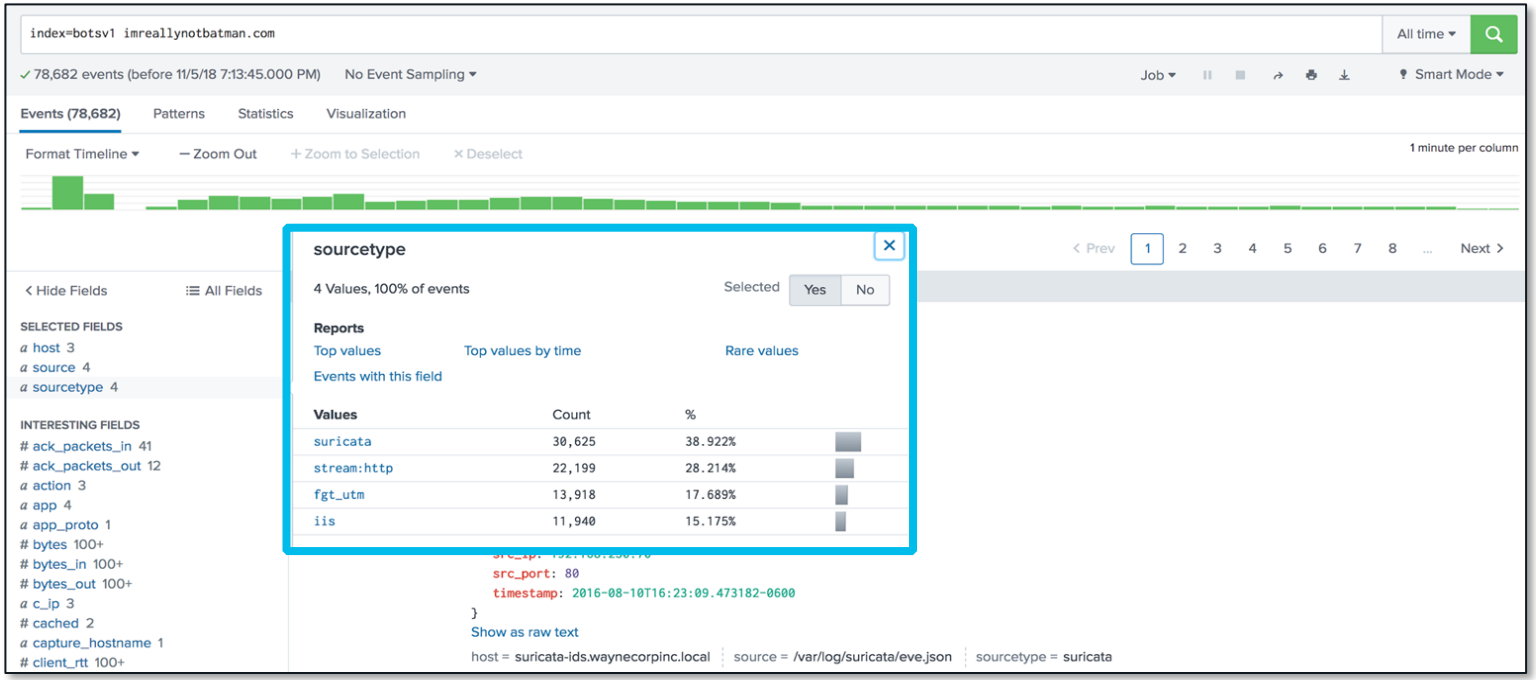
Identify source types associated with search values

Kill Chain Phase: Reconnaissance



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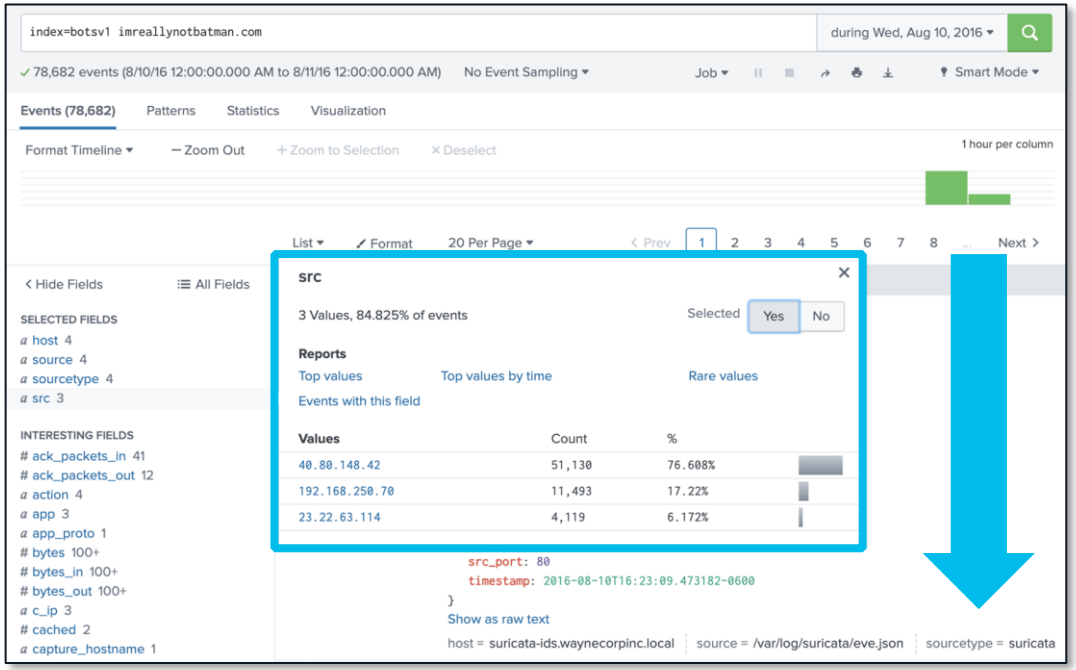
Finding source addresses

Kill Chain Phase: Reconnaissance



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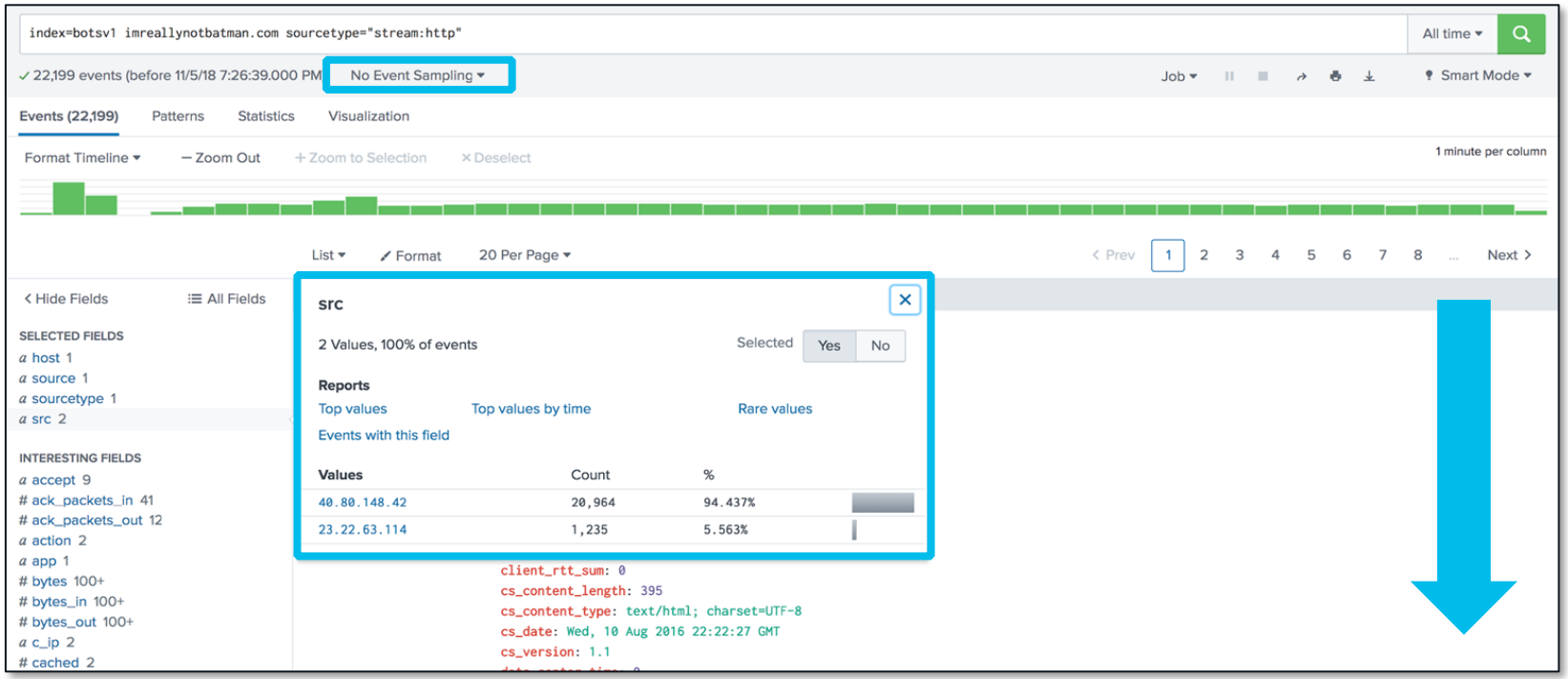
Selecting a sourcetype and searching for source address



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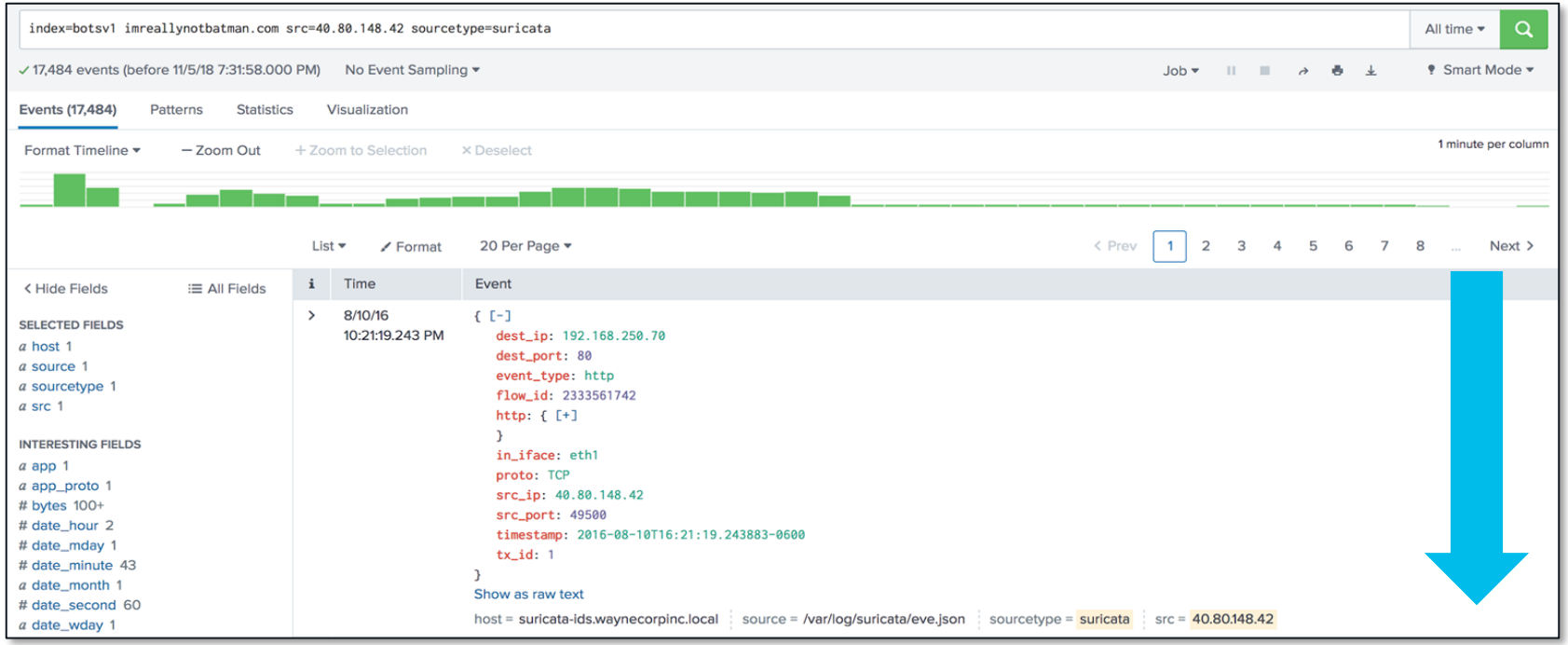
Validation with suricata



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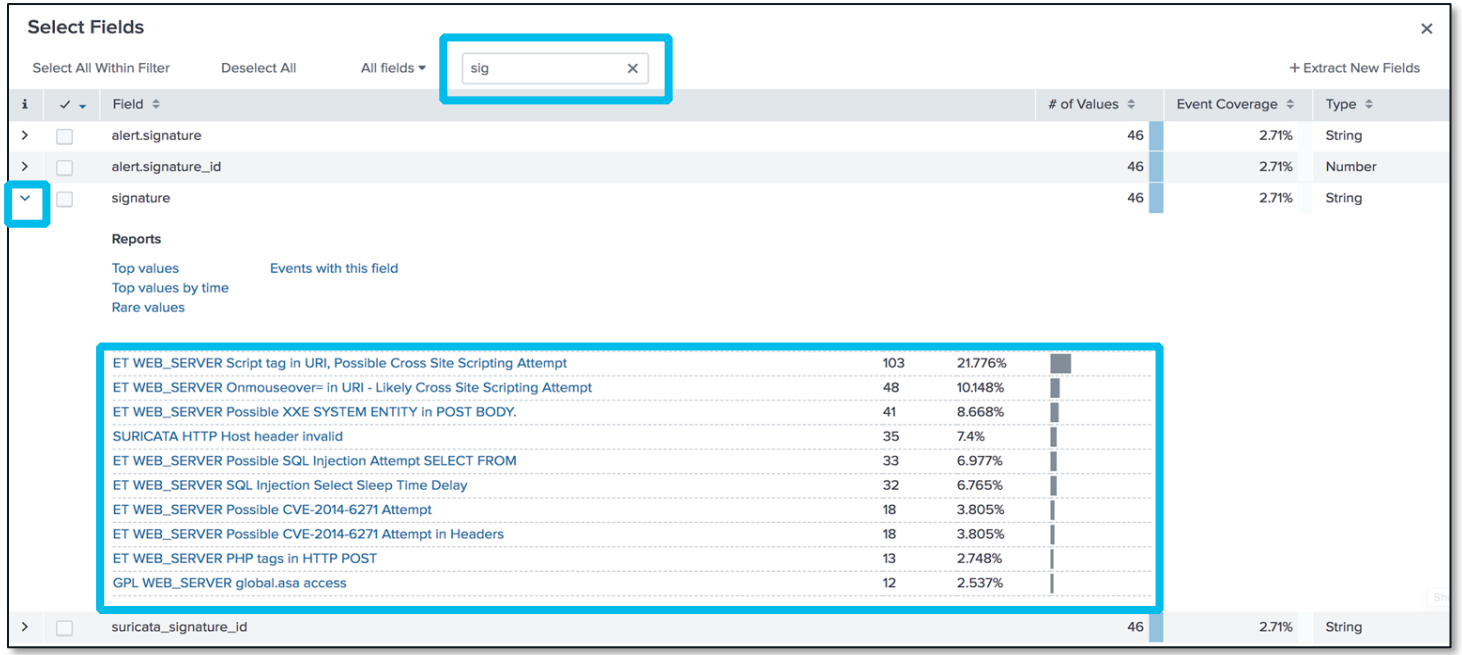
More fields...

- a tag 3
- a tag::eventtype 3
- # timeendpos 1
- a timestamp 100+
- # timestartpos 1
- a transport 1
- a url 100+
- a vendor 1

19 more fields

+ Extract New Fields



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Finding the IP scanning your web server

Kill Chain Phase: Reconnaissance

What is the likely IP address of someone from the Po1s0n1vy group scanning imreallynotbatman.com for web application vulnerabilities?

- 40.80.148.42

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Kill Chain

IP Scanning the Web Server:
40.80.148.42

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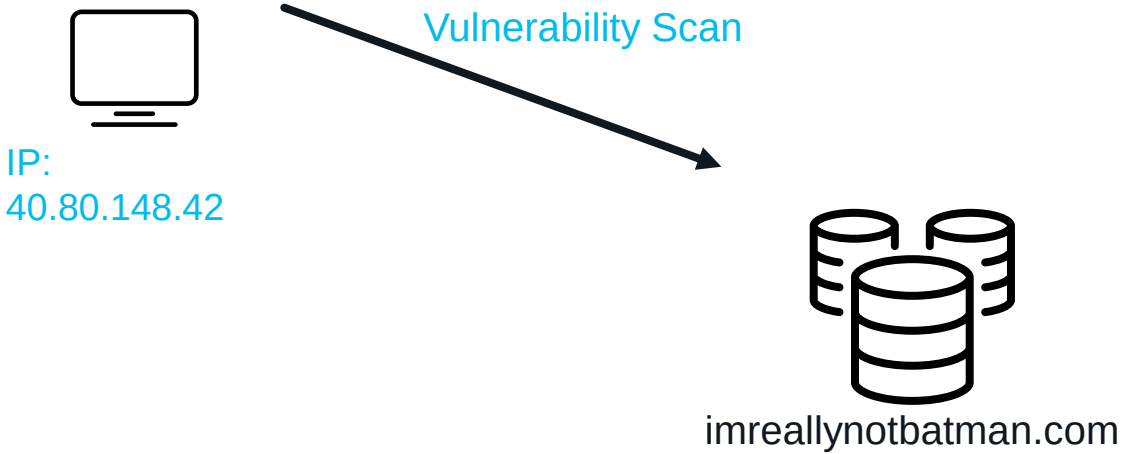
APT picture



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Identifying the web vulnerability scanner

Kill Chain Phase: Reconnaissance

- What company created the web vulnerability scanner used by Po1s0n1vy?

- Hints
  - Use the src found in the prior question as the source of the scans
  - The sourcetype stream:http provides a good deal of insight into communications between a web browser and server
  - User agent strings can provide value here
  - If you don’t know what a term is, Google it!

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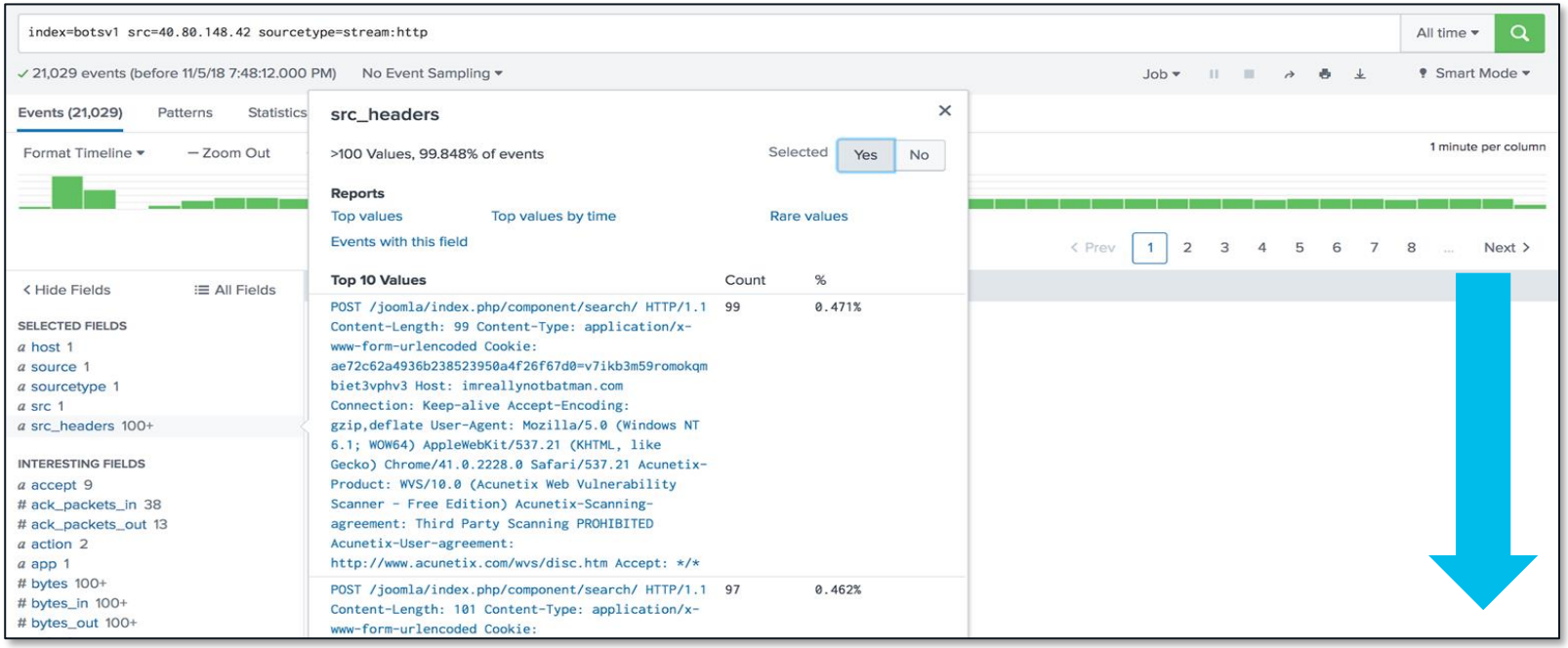
Looking at src_headers

Kill Chain Phase: Reconnaissance



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Looking at src_headers

Top 10 Values	Count	%
POST /joomla/index.php/component/search/ HTTP/1.1 Content-Length: 99 Content-Type: application/x-www-form-urlencoded Cookie: ae72c62a4936b238523950a4f26f67d0=v7ikb3m59romokqmbiet3vphv3 Host: imreallynotbatman.com Connection: Keep-alive Accept-Encoding: gzip,deflate User-Agent: Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.21 (KHTML, like Gecko) Chrome/41.0.2228.0 Safari/537.21 Acunetix-Product: WVS/10.0 (Acunetix Web Vulnerability Scanner - Free Edition) Acunetix-Scanning-agreement: Third Party Scanning PROHIBITED Acunetix-User-agreement: http://www.acunetix.com/wvs/disc.htm Accept: */*	99	0.471%
POST /joomla/index.php/component/search/ HTTP/1.1 Content-Length: 101 Content-Type: application/x-www-form-urlencoded Cookie: ae72c62a4936b238523950a4f26f67d0=v7ikb3m59romokqmbiet3vphv3 Host: imreallynotbatman.com Connection: Keep-alive Accept-Encoding: gzip,deflate User-Agent: Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.21 (KHTML, like Gecko) Chrome/41.0.2228.0 Safari/537.21 Acunetix-Product: WVS/10.0 (Acunetix Web Vulnerability Scanner - Free Edition) Acunetix-Scanning-agreement: Third Party Scanning PROHIBITED Acunetix-User-agreement: http://www.acunetix.com/wvs/disc.htm Accept: */*	97	0.462%

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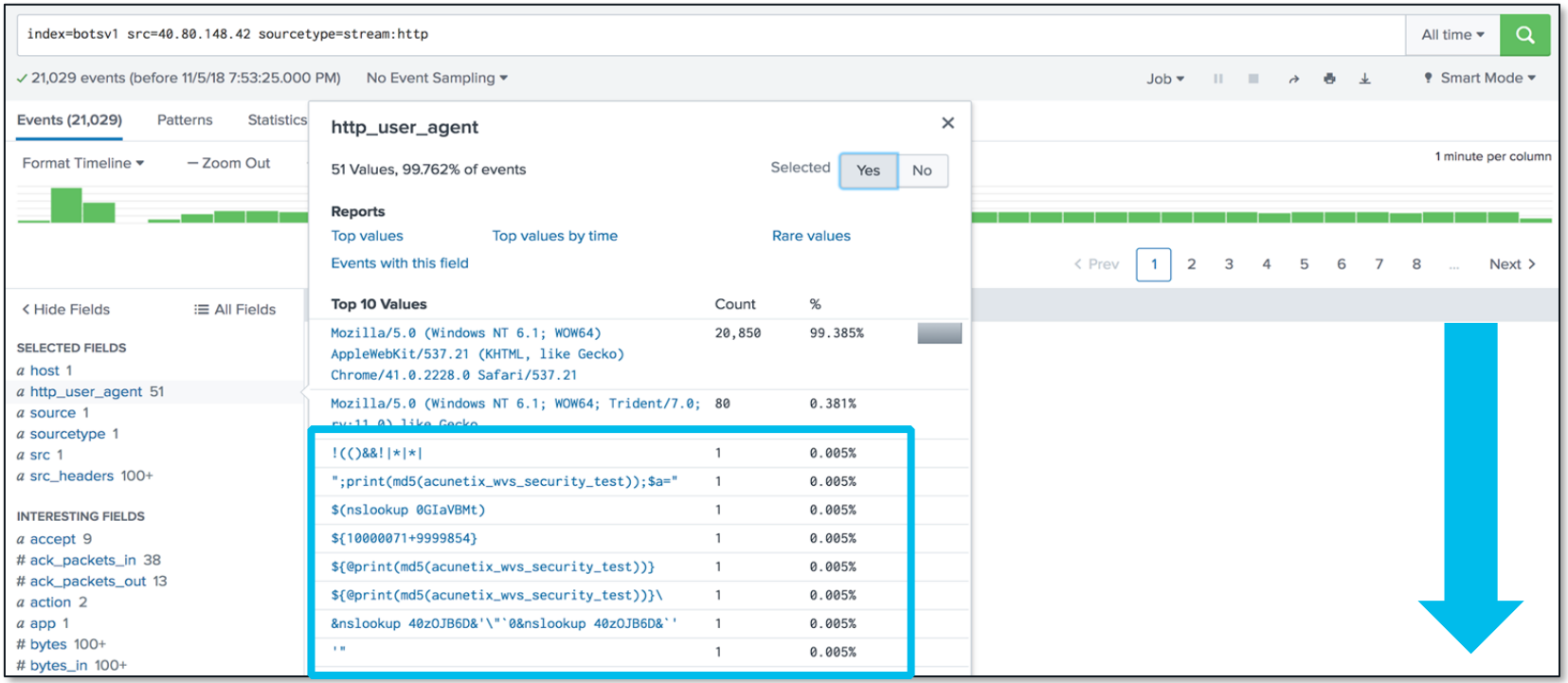
Looking at http_user_agent strings



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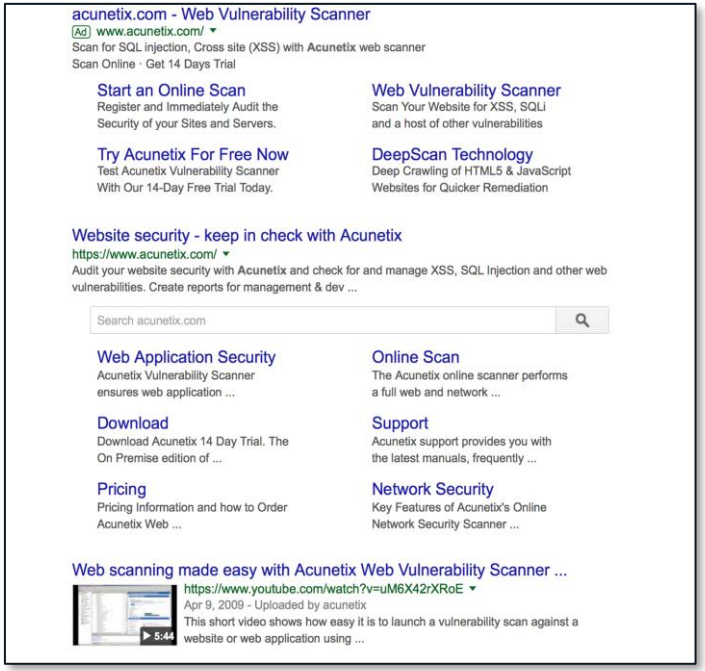
Research on the internet

If you see something in the logs you don't understand, Google it!

- What If You Don't Know What Acunetix Is?



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Identifying the web vulnerability scanner

Kill Chain Phase: Reconnaissance

- What company created the web vulnerability scanner used by P01s0n1vy?
  - Acunetix

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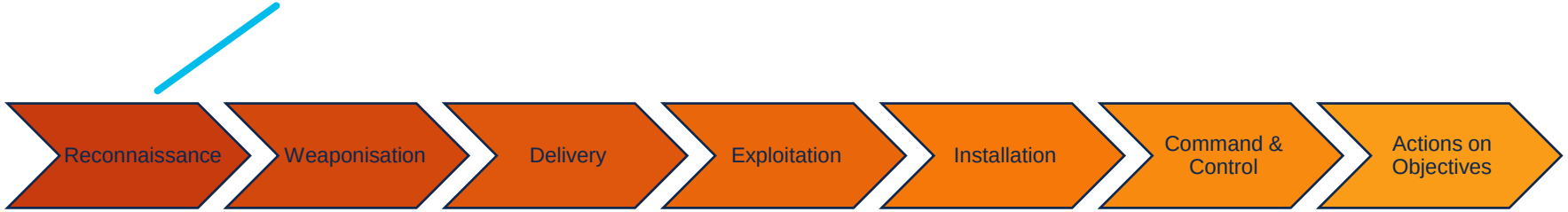
Kill Chain

IP Scanning the Web Server: 40.80.148.42

Web Vulnerability Scanner: Acunetix



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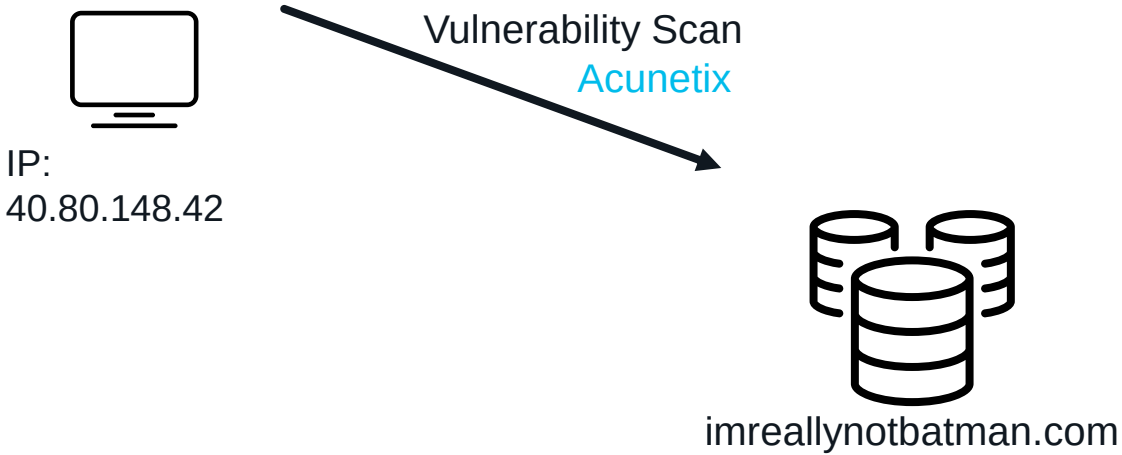
APT picture



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Determining which web server is the target

Kill Chain Phase: Reconnaissance

- What content management system is imreallynotbatman.com likely using?

- Hints
  - If you aren't sure what a content management system is, Google it.
  - Sourcetypes that are relevant to web communication are helpful
  - URIs contain information that will lead you in the right direction

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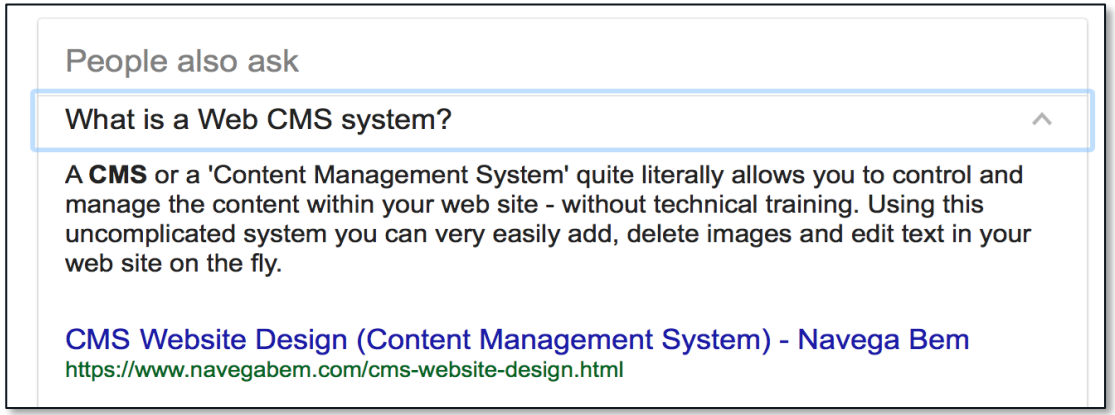
Where to start?



- Based on that in what kind of logs should I look?
- Do we have the IP of the system in question?
- Based on our previous findings, probably so...

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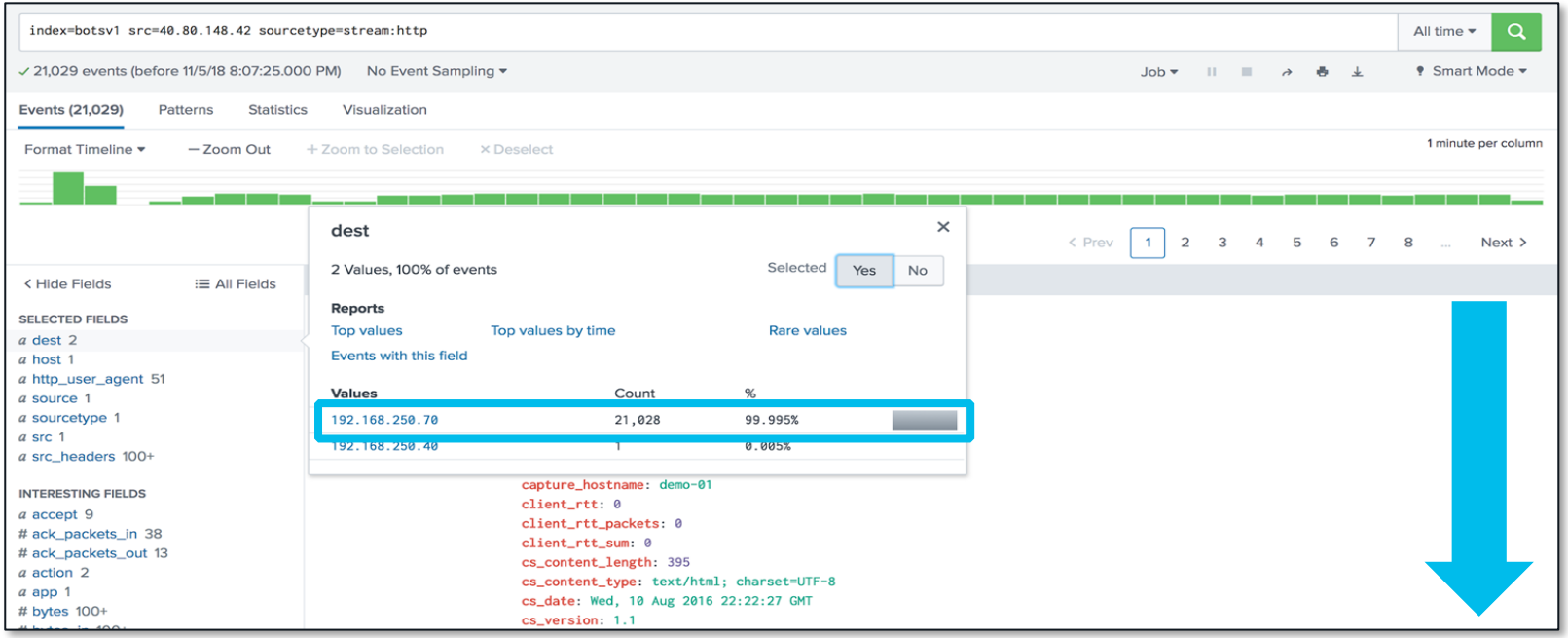
Where to start?



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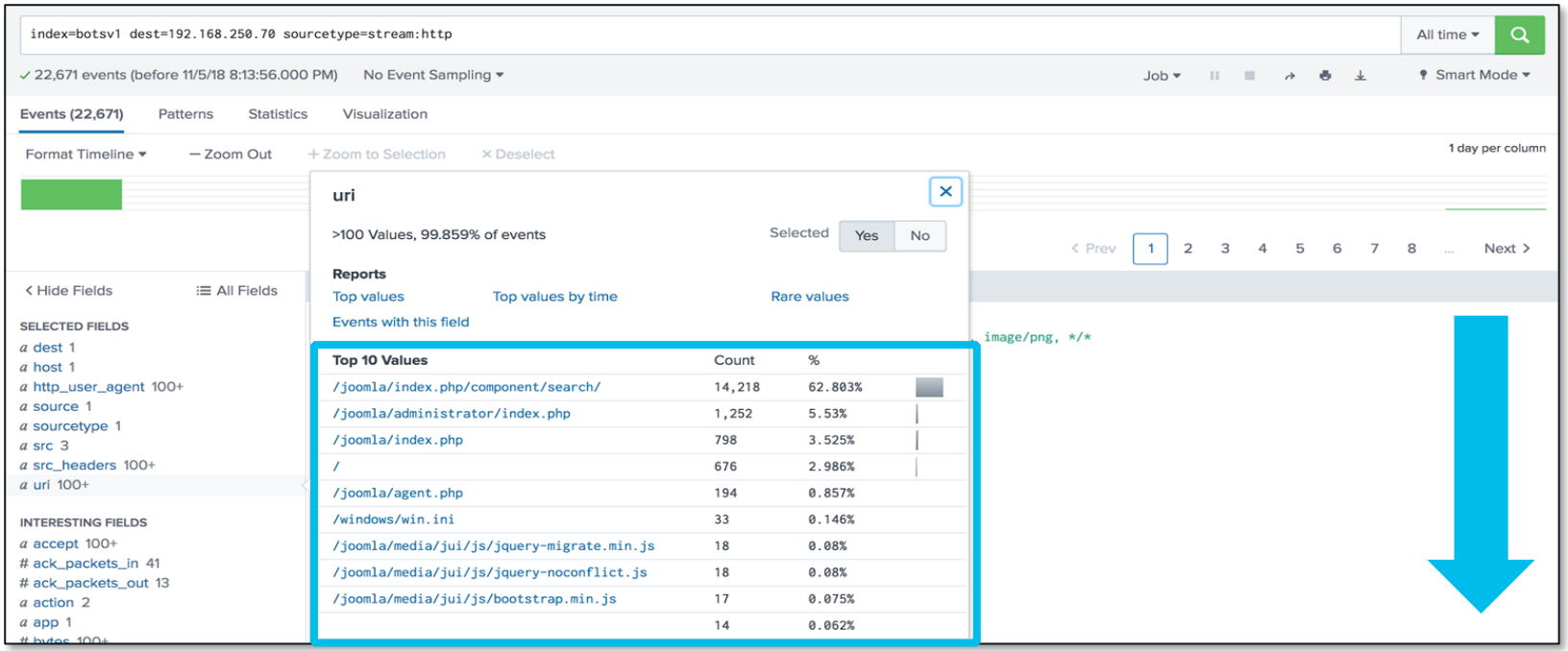
Digging into the URI



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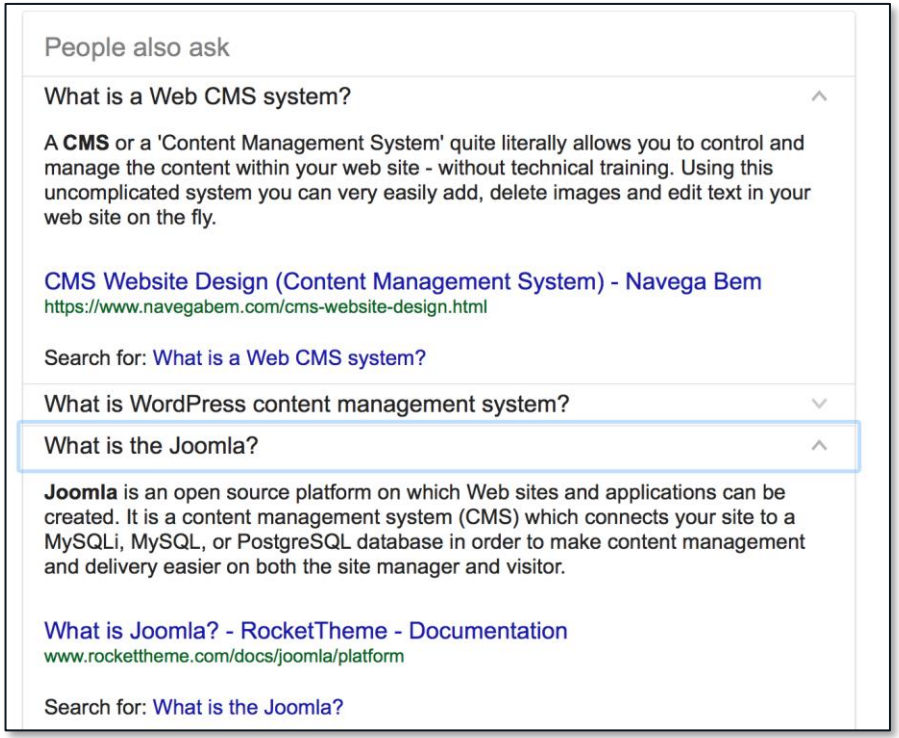
Digging into the URI

External Research

- Much like the previous question, if you see values you have never seen before, Google is your friend



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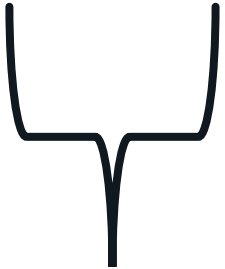
Looking for confirmation

Add The Response Code condition to ensure we have successful page loads

```
index=botsv1 dest=192.168.250.70 sourcetype=stream:http status=200 | stats count by uri | sort - count
```



Generate a count by URI to see what values are most frequently seen

Sort descending by count so the greatest values come to the top

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Our results? Lots of Joomla

```
index=botsv1 dest=192.168.250.70 sourcetype=stream:http status=200 | stats count by uri | sort - count
```

uri	count
/joomla/index.php/component/search/	2207
/joomla/administrator/index.php	840
/joomla/index.php	688
/	610
/joomla/agent.php	193
/windows/win.ini	33
/joomla/media/jui/js/jquery-migrate.min.js	17
/joomla/media/jui/js/jquery-noconflict.js	17
/joomla/media/jui/js/bootstrap.min.js	16
/joomla/media/system/js/html5fallback.js	13

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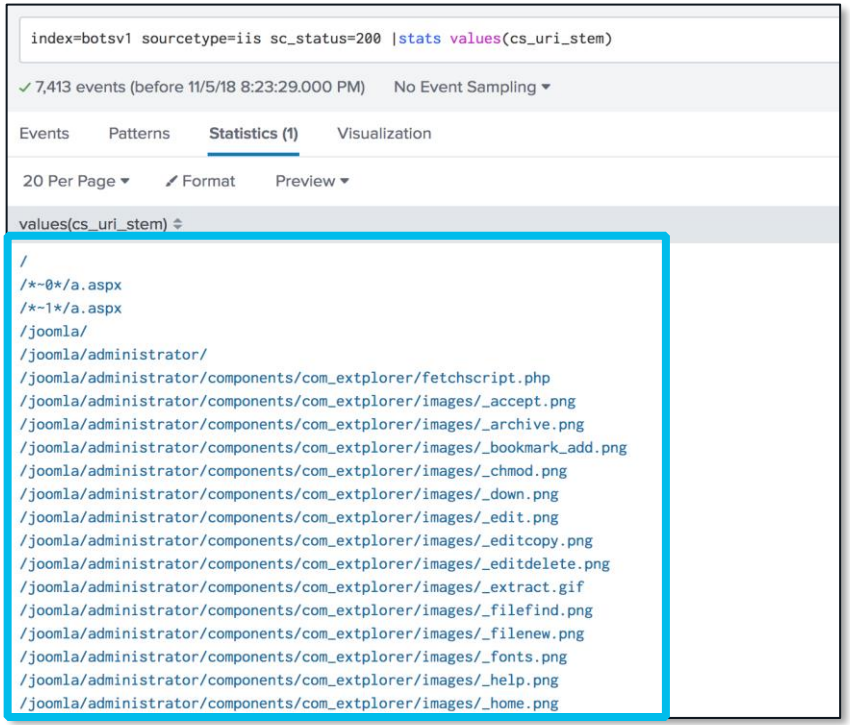
Finding the answer with IIS



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Determining which web server is the target

Kill Chain Phase: Reconnaissance

- What content management system is imreallynotbatman.com likely using?
  - Joomla

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Kill Chain

IP Scanning the Web Server: 40.80.148.42
Web Vulnerability Scanner: Acunetix
Which Web Server?: 192.168.250.70/Joomla

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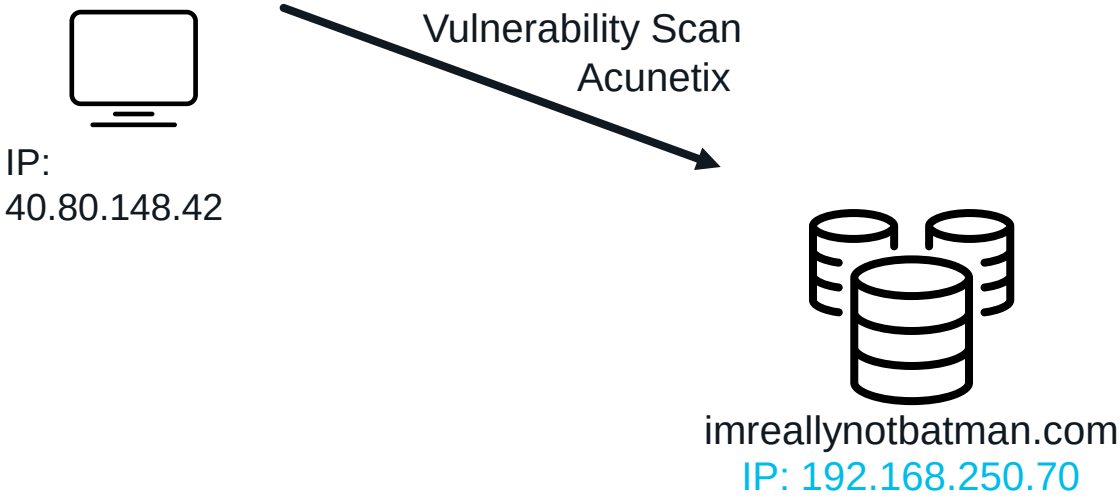
APT picture



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Identifying where a brute force attack originated

Kill Chain Phase: Exploitation

- What IP address is likely attempting a brute force password attack against imreallynotbatman.com?

- Hints
  - A sourcetype that can see web browser to server communication would be very helpful
  - Knowing the destination IP address of the web server being attacked would be good
  - The web method will be helpful to focus our search
  - The field form_data will have user names and passwords in it if you look closely

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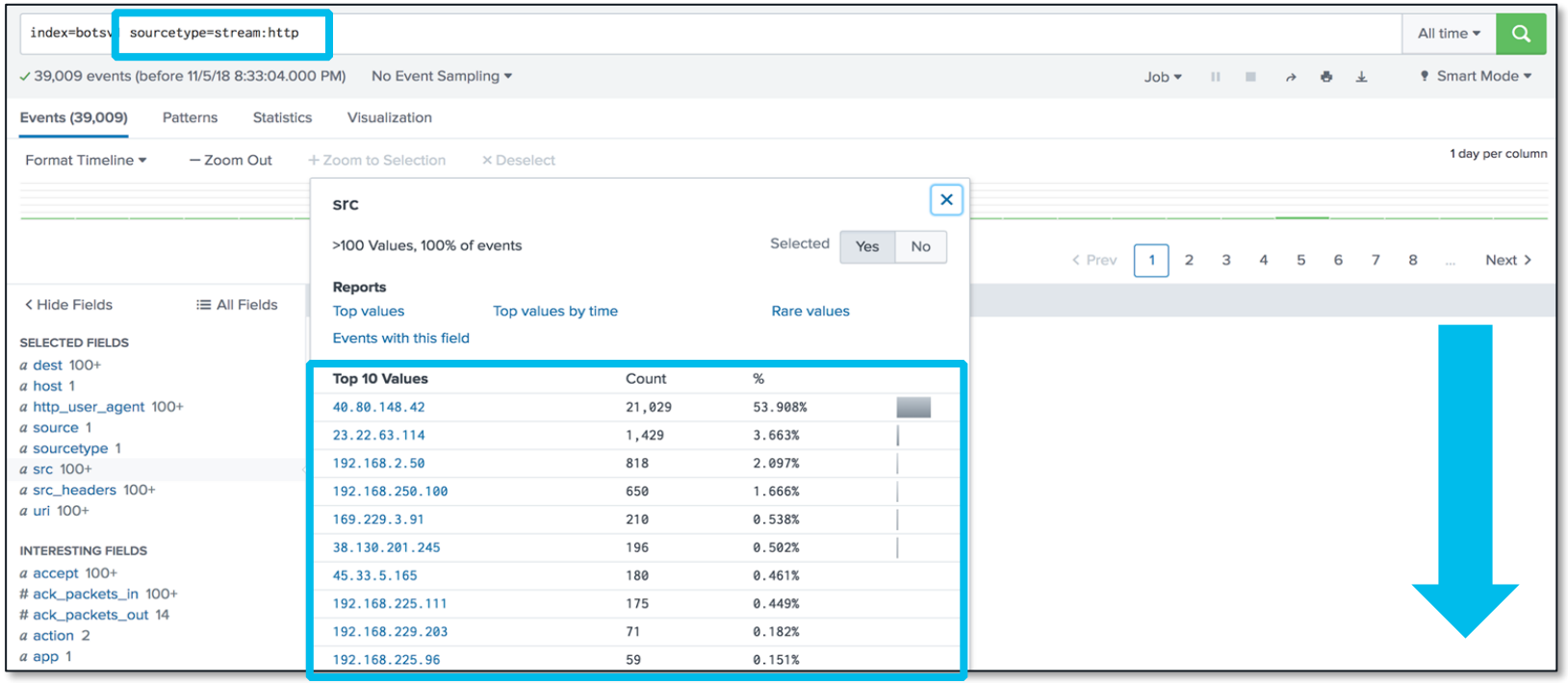
Looking in Wire Data - stream:http



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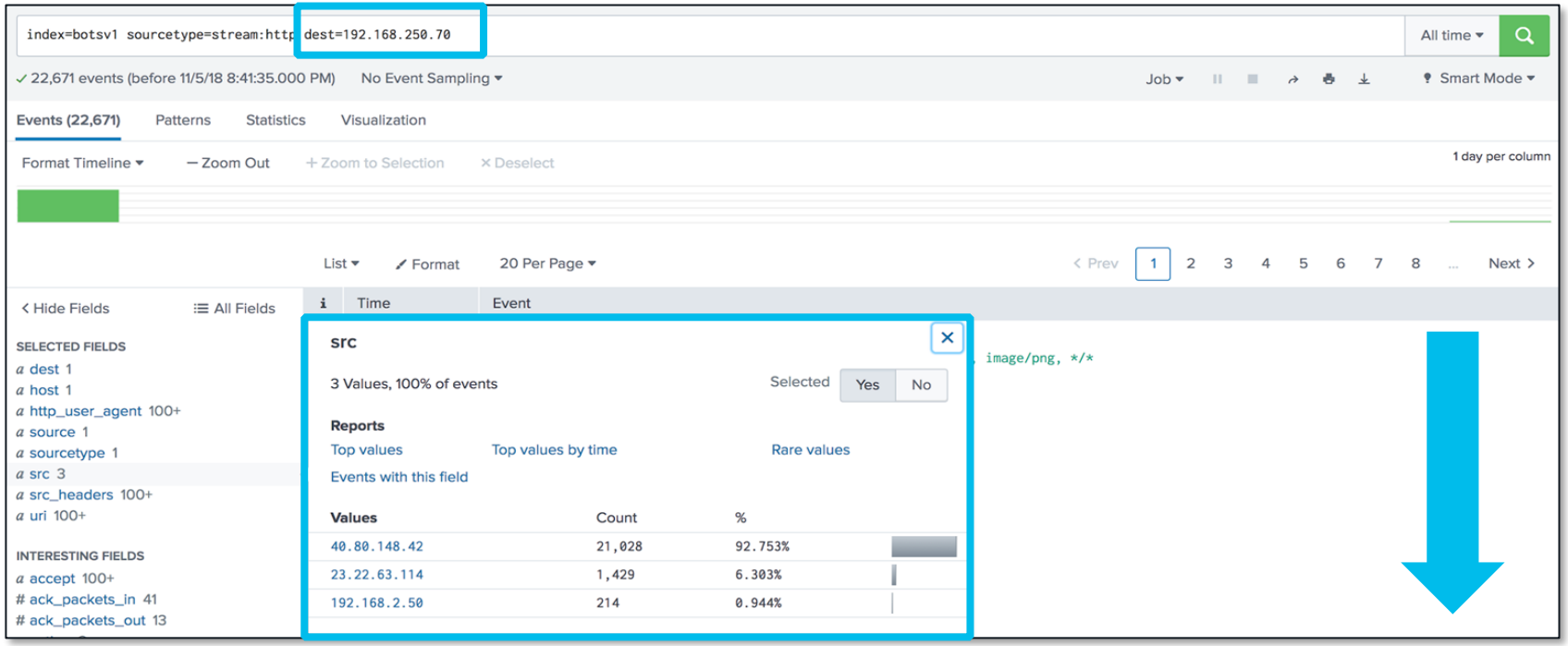
Refine our search with the web server address



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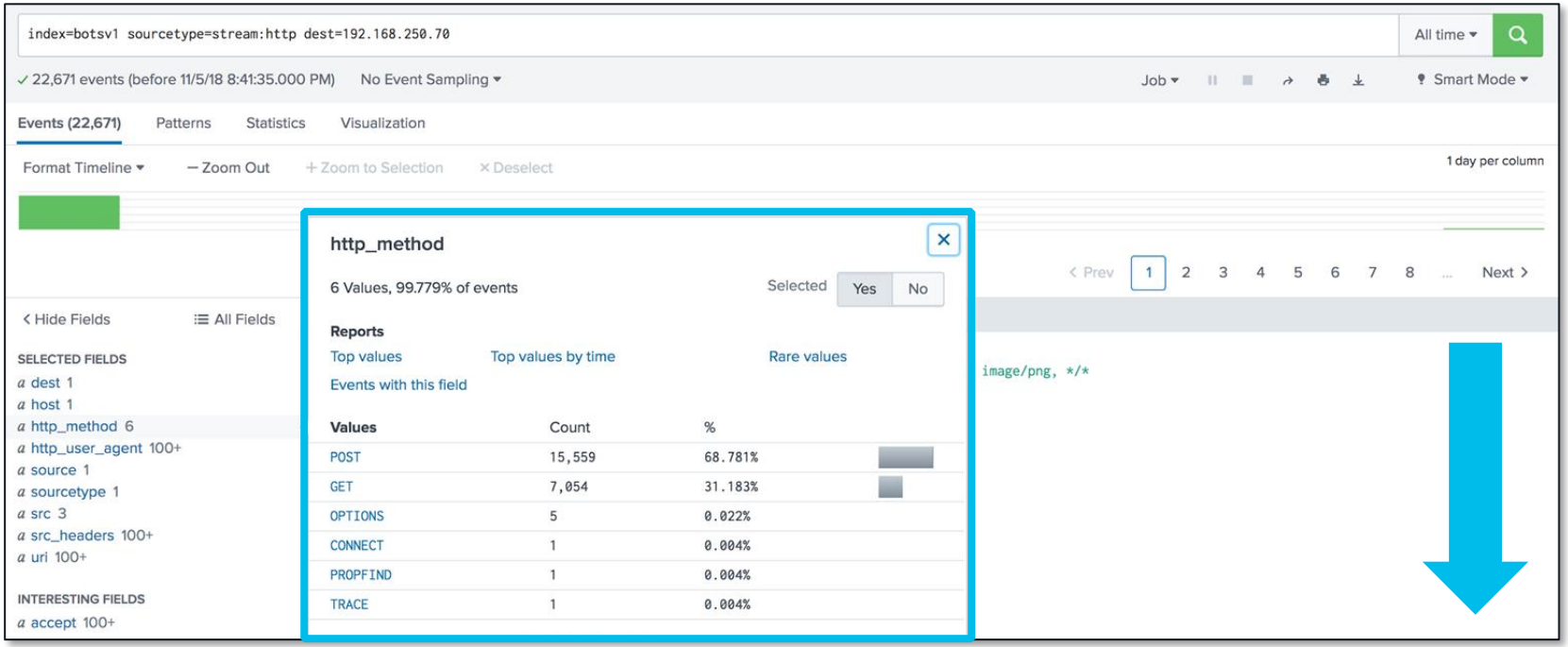
Same search, different pivot



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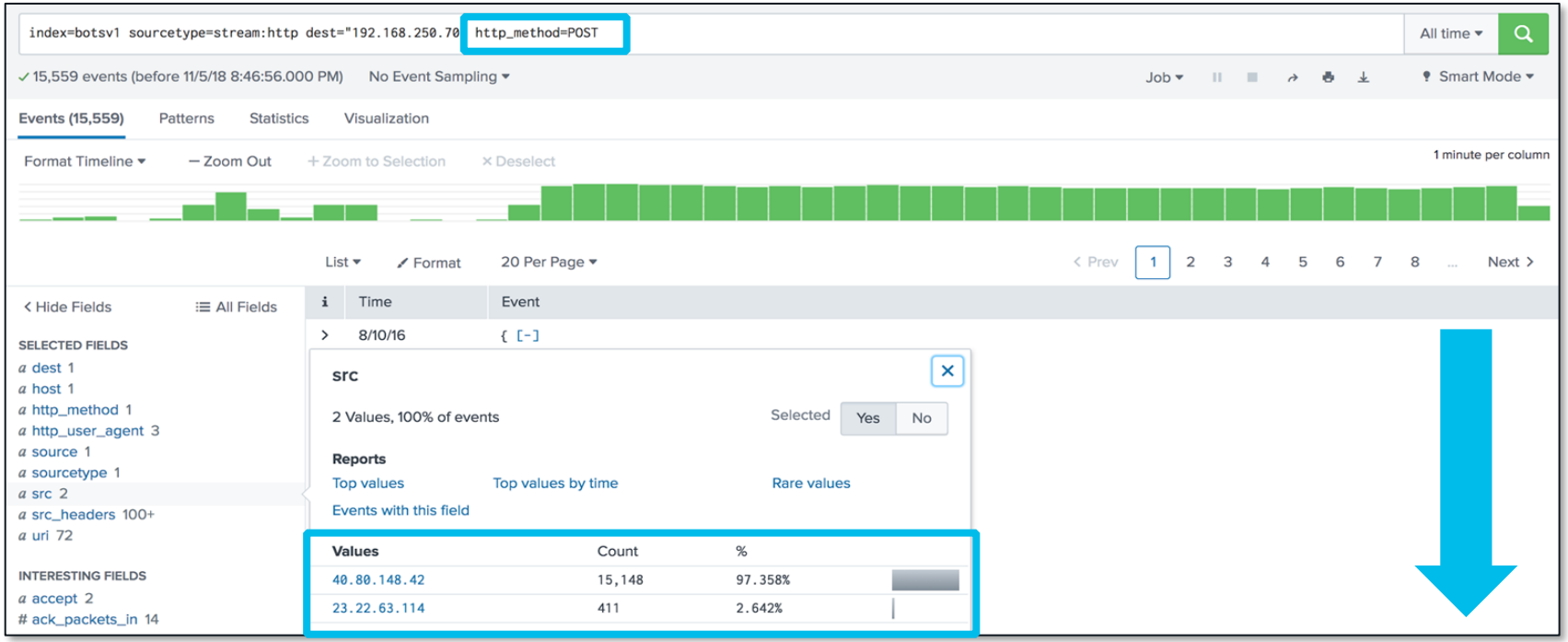
Adding a HTTP method to narrow our results



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Finding passwords in HTTP Wire Data

```
index=botsv1 sourcetype=stream:http dest="192.168.250.70" http_method=POST form_data=*username*passwd*
```

dest	192.168.250.70
dest_content	<head><title>Document Moved</title></head> <body> Object Moved This document may be found <a HREF="http://imreallynotbatman.com/joomla/administrator/index.php">here</body>
dest_headers	HTTP/1.1 303 See other Content-Type: text/html; charset=UTF-8 Location: http://imreallynotbatman.com/joomla/administrator/index.php Server: Microsoft-IIS/8.5 X-Powered-By: PHP/5.5.38 Date: Wed, 10 Aug 2016 21:48:05 GMT Content-Length: 182
dest_ip	192.168.250.70
dest_mac	00:0C:29:C4:02:7E
dest_port	80
duplicate_packets_in	1
duplicate_packets_out	1
duration	1754955
endtime	2016-08-10T21:48:05.858372Z
eventtype	stream_network_traffic (communicate network) stream_web (web)
form_data	username=admin&passwd=batman&option=com_login&task=login&return=aW5kZXgucGhw&e5ec827a3f67ce0efc546d81f7356acc=1
http_comment	HTTP/1.1 303 See other

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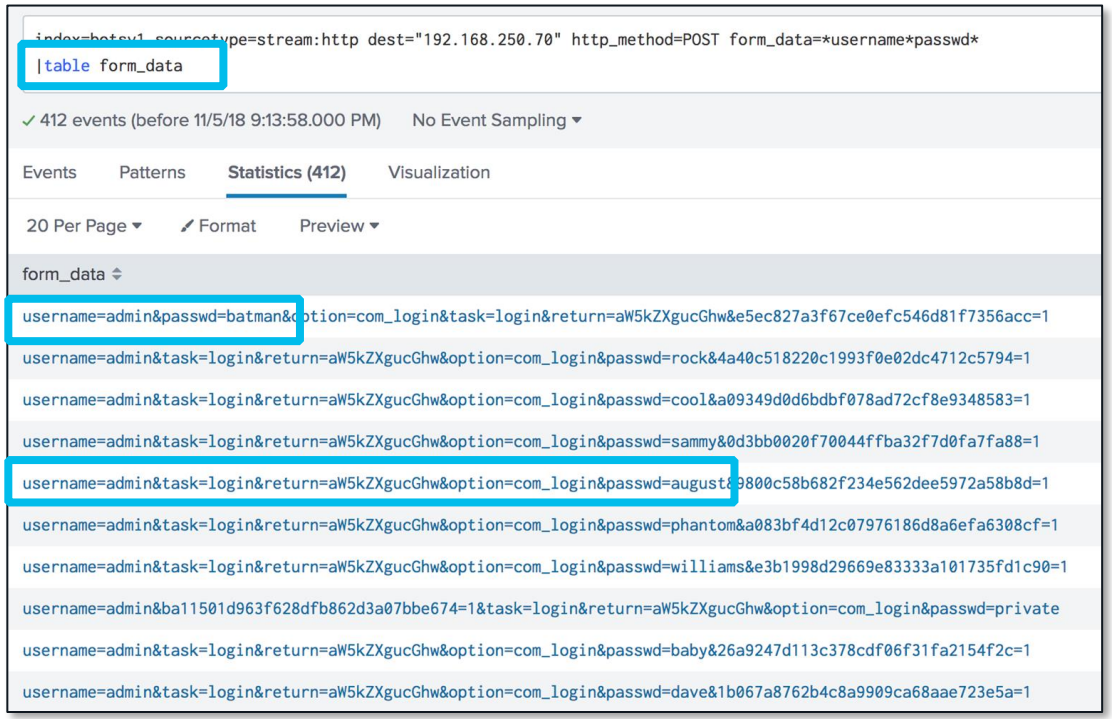
Finding passwords in HTTP Wire Data



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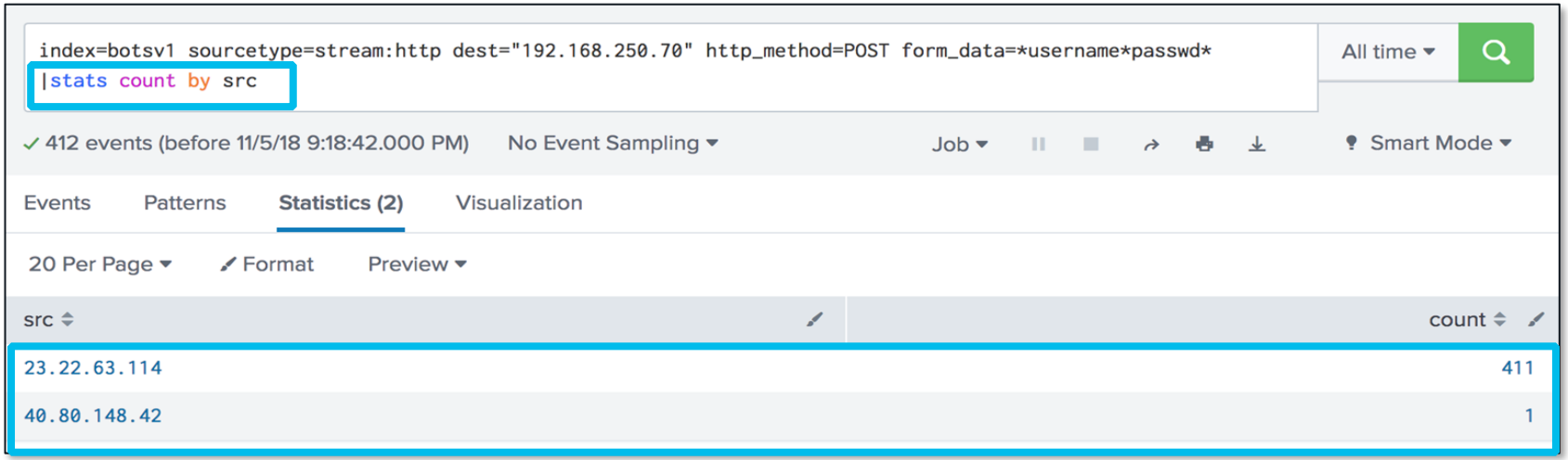
Using stats for the win!



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Identifying where a brute force attack originated

Exploitation

- What IP address is likely attempting a brute force password attack against imreallynotbatman.com?
  - 23.22.63.114

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Kill Chain

IP Scanning the Web Server: 40.80.148.42
Web Vulnerability Scanner: Acunetix
Which Web Server?: 192.168.250.70/Joomla

Brute Force Attack Originated: 23.22.63.114

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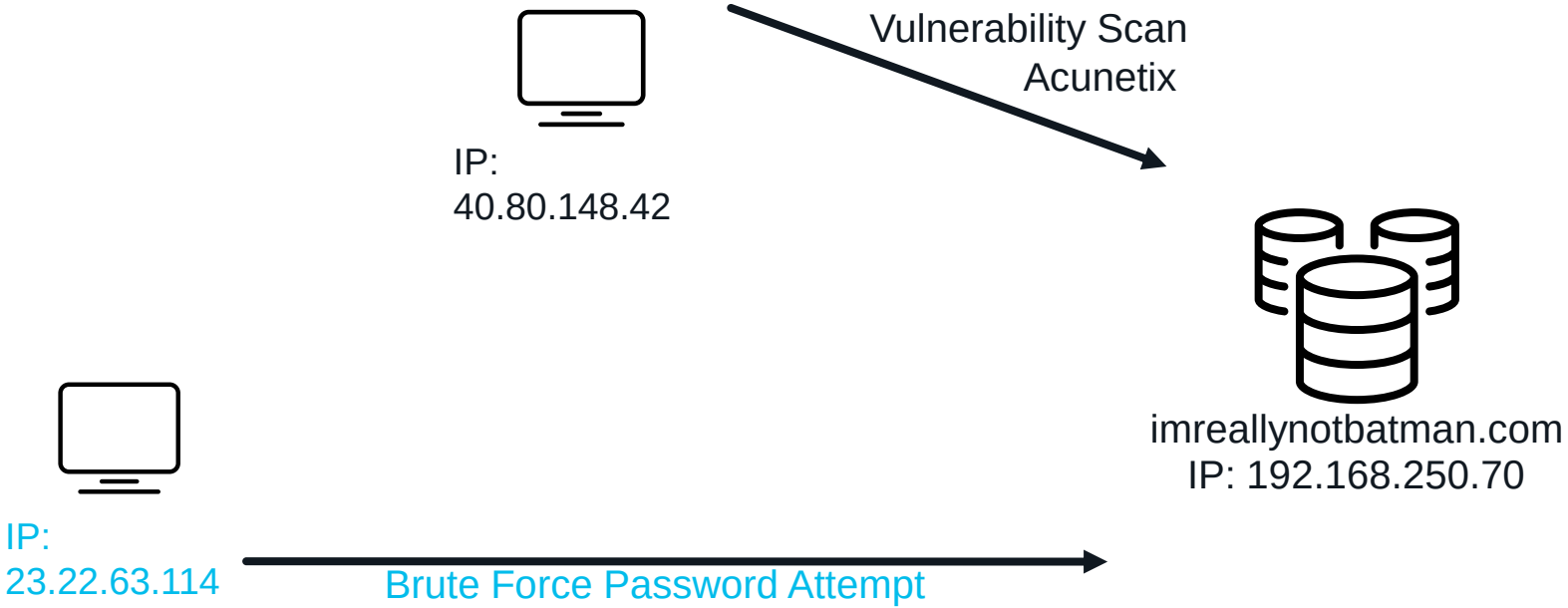
APT picture



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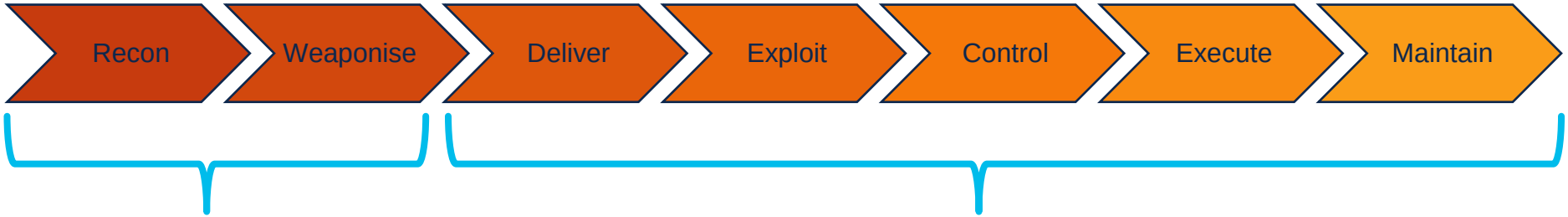
MITRE ATT&CK

Adversarial tactics, techniques, and common knowledge



Reconnaissance

Resource Development

Initial Access, Execution, Persistence, Privilege Escalation, Defense Evasion, Credential Access, Discovery, Lateral Movement, Collection, Command and Control, Exfiltration, Impact

"The 14 tactic categories within ATT&CK for Enterprise were derived from the all stages (recon, weaponize, delivery exploit, control, maintain, and execute) of a seven-stage Cyber Attack Lifecycle (first articulated by Lockheed Martin as the Cyber Kill Chain®). This provides a deeper level of granularity in describing what can occur during an intrusion."

https://attack.mitre.org/

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Identifying the first password attempted in the attack

Kill Chain Phase: Exploitation

- What was the first brute force password used?

- Hints
  - Sourcetype that logs interactions between web browser and server is important
  - Form_data has usernames and passwords in it
  - The _time field shows when the event occurred
  - Build on the search from the previous question

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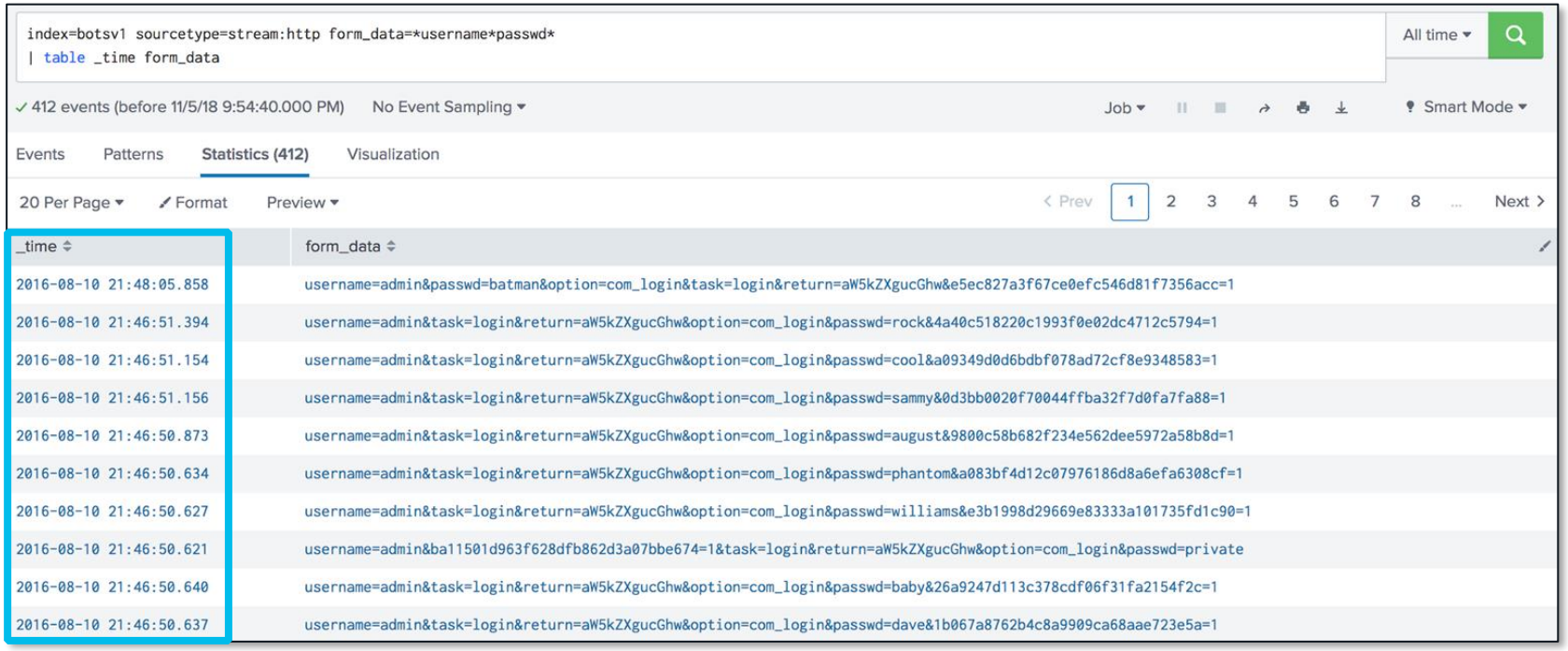
Adding time



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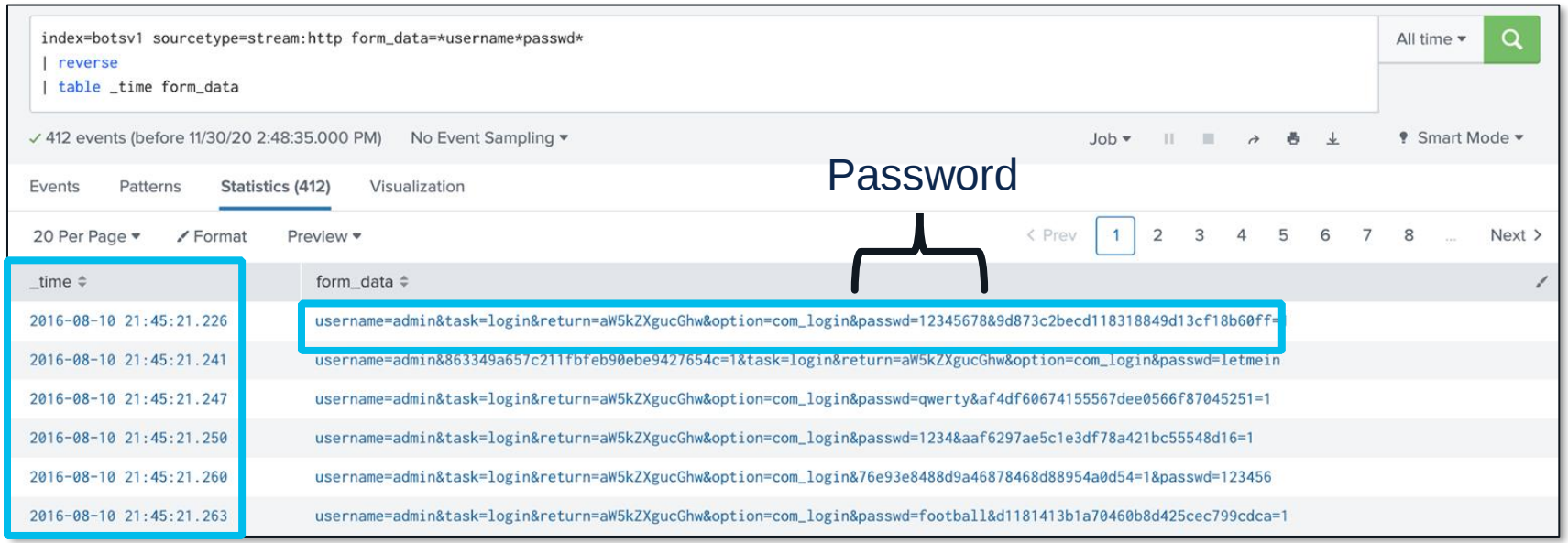
Reversing the order of output (Oldest First)



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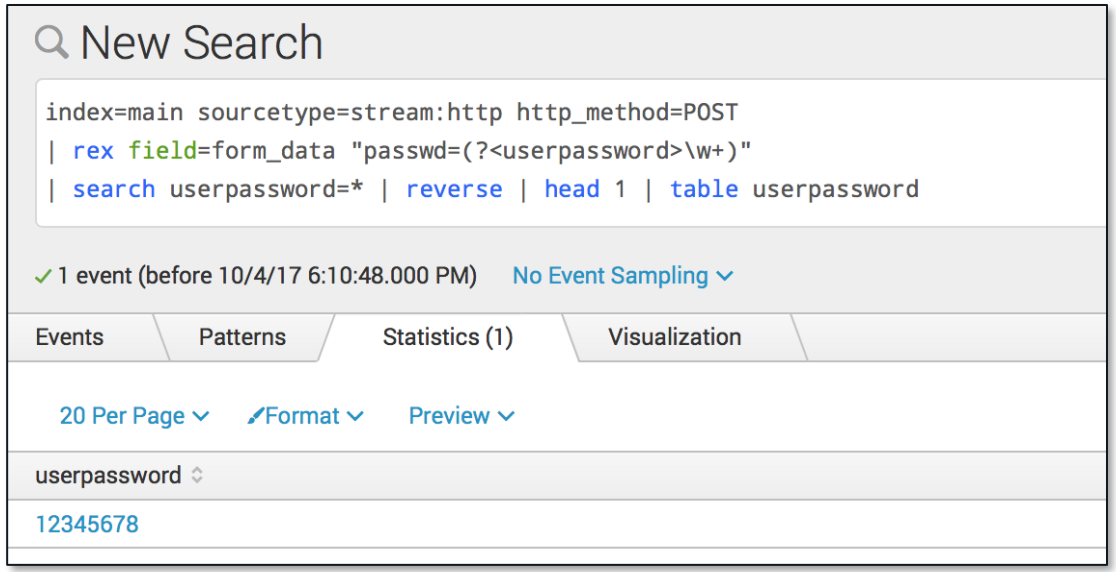
A more elegant way to view the passwords

Kill Chain Phase: Exploitation

- What was the first brute force password used?
  - 12345678



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Identifying the Password Used To Gain Access

Kill Chain Phase: Exploitation

- What was the correct password for admin access to the content management system running imreallynotbatman.com?

- Bonus Question: From what IP address was the password used?

- Hints
  - Sourcetype should be one that provides communication between web browser and server
  - The stats command will be helpful to identify the correct password
  - The command to extract the password from the form_data is

```
| rex field=form_data "passwd=(?<userpassword>\w+)"
```


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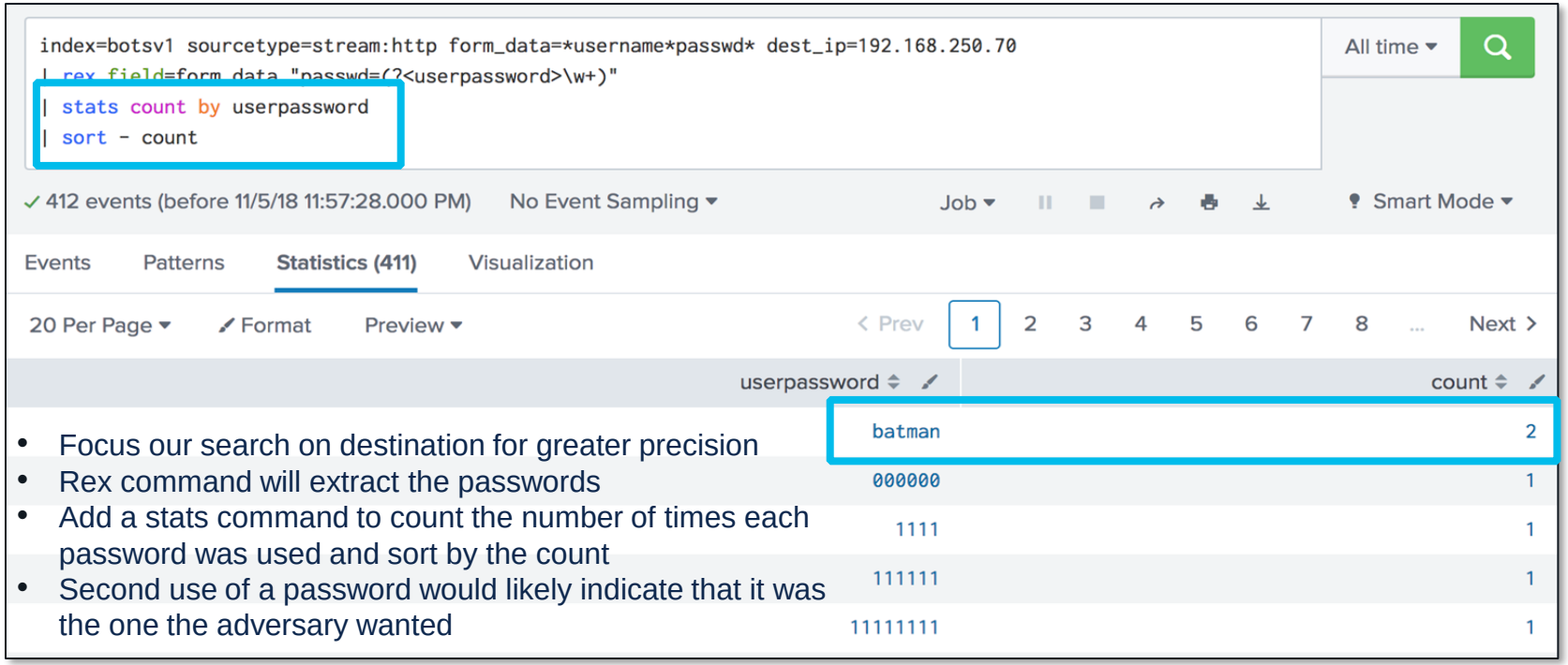
What else do we need?



- Focus our search on destination for greater precision
- Rex command will extract the passwords
- Add a stats command to count the number of times each password was used and sort by the count
- Second use of a password would likely indicate that it was the one the adversary wanted

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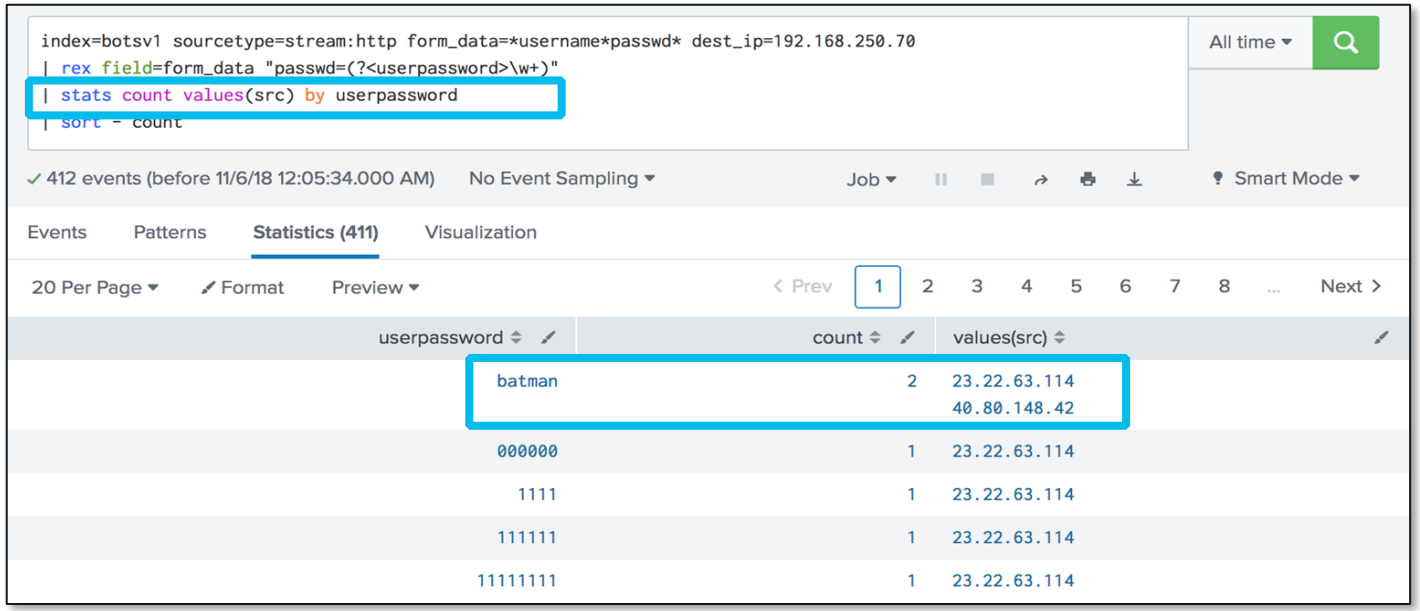
Stats command provides a wider view

- From an investigation perspective, knowing the password was used twice is nice, but knowing where it was used is far more interesting



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Collecting additional attributes around the login events

Kill Chain Phase: Exploitation

- What was the correct password for admin access to the content management system running "imreallynotbatman.com"?
  - batman

- Bonus Question: From what IP address was the password used?
  - 40.80.148.42

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Kill Chain

IP Scanning the Web Server: 40.80.148.42
Web Vulnerability Scanner: Acunetix
Which Web Server?: 192.168.250.70/Joomla

Brute Force Attack Originated:
23.22.63.114
Identifying the First Password Attempted in a Brute Force Attack
Extracting Passwords from
Events
Identifying the Password Used To Gain Access:
40.80.148.42

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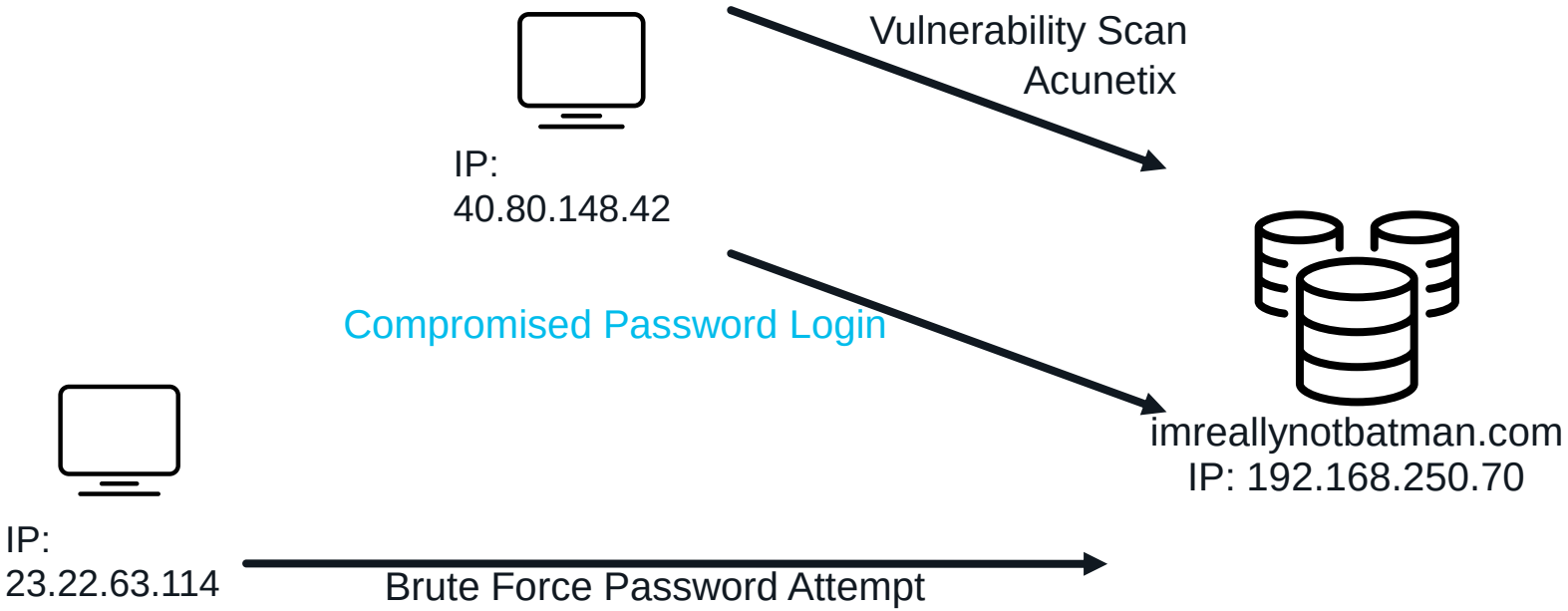
APT picture



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Determining the elapsed time between events

Kill Chain Phase: Exploitation

- How many seconds elapsed between the time the brute force password scan identified the correct password and the compromised login?

- Hints
  - Use the rex command that we used previously to extract the passwords
  - Identify the password that was used multiple times
  - Look at the transaction command

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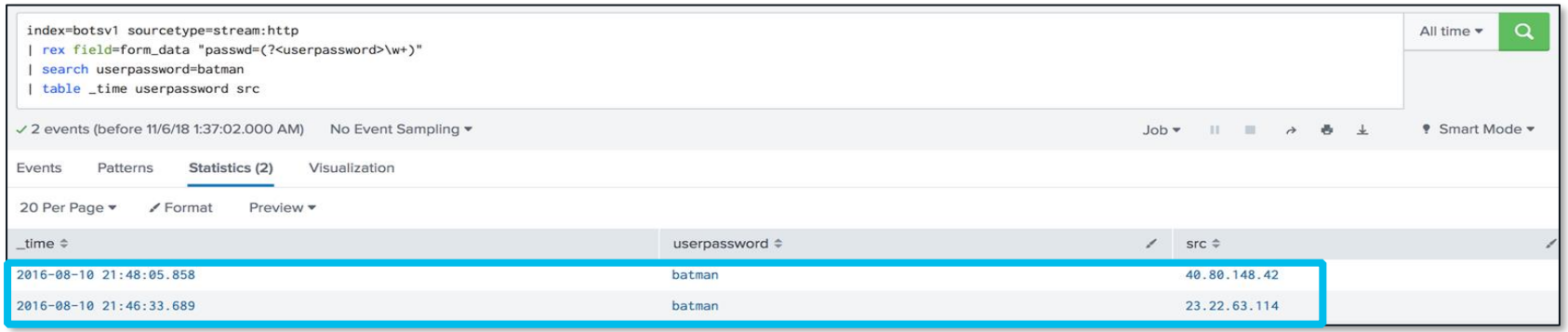
Tabling our logins with the same password

- Build on our earlier searches for the userpassword extraction
- We know from earlier research the password of interest is batman, isolate search on those events



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Transaction command

- Use transaction command to group these events together

```
index=main sourcetype=stream:http | rex field=form_data "passwd=(?<userpassword>\w+)"
| search userpassword=batman | transaction userpassword | table duration
```

Group events together based on a common value or values. In this case group events as a transaction based on the same userpassword

Duration is a value created with transaction that calculates the difference between the first and last event

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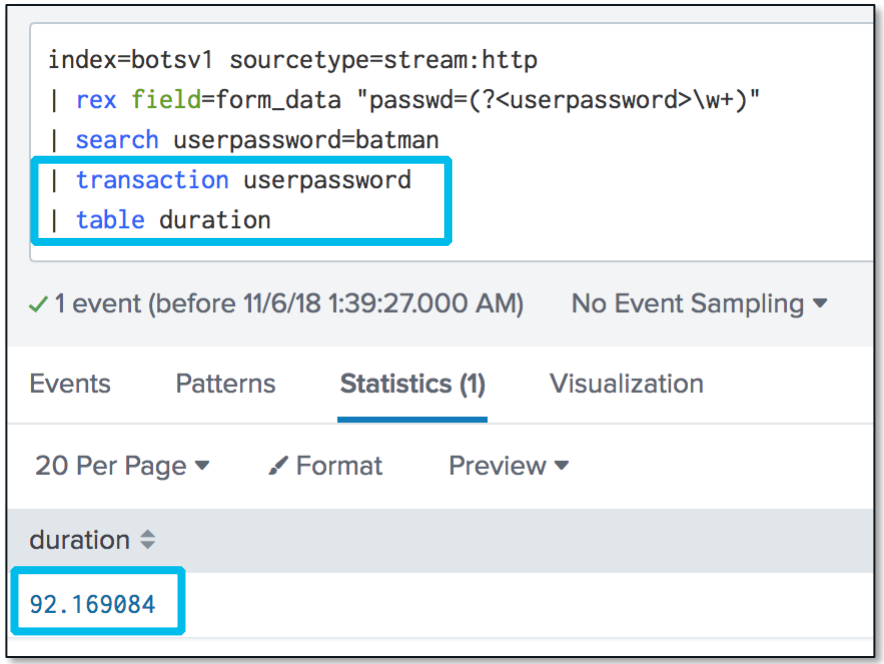
Determining the elapsed time between events

Kill Chain Phase: Exploitation

- How many seconds elapsed between the time the brute force password scan identified the correct password and the compromised login?
  - 92.169084



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Identifying the executable uploaded

Kill Chain Phase: Installation

- What is the name of the executable uploaded by P01s0n1vy?
(For example, "notepad.exe" or "favicon.ico")

- Bonus Question: What is the source address of the executable?

- Hints
  - If we are looking for executables uploaded, what sourcetypes would have visibility into files in motion?
  - If a file is being uploaded what is likely to be the http_method?

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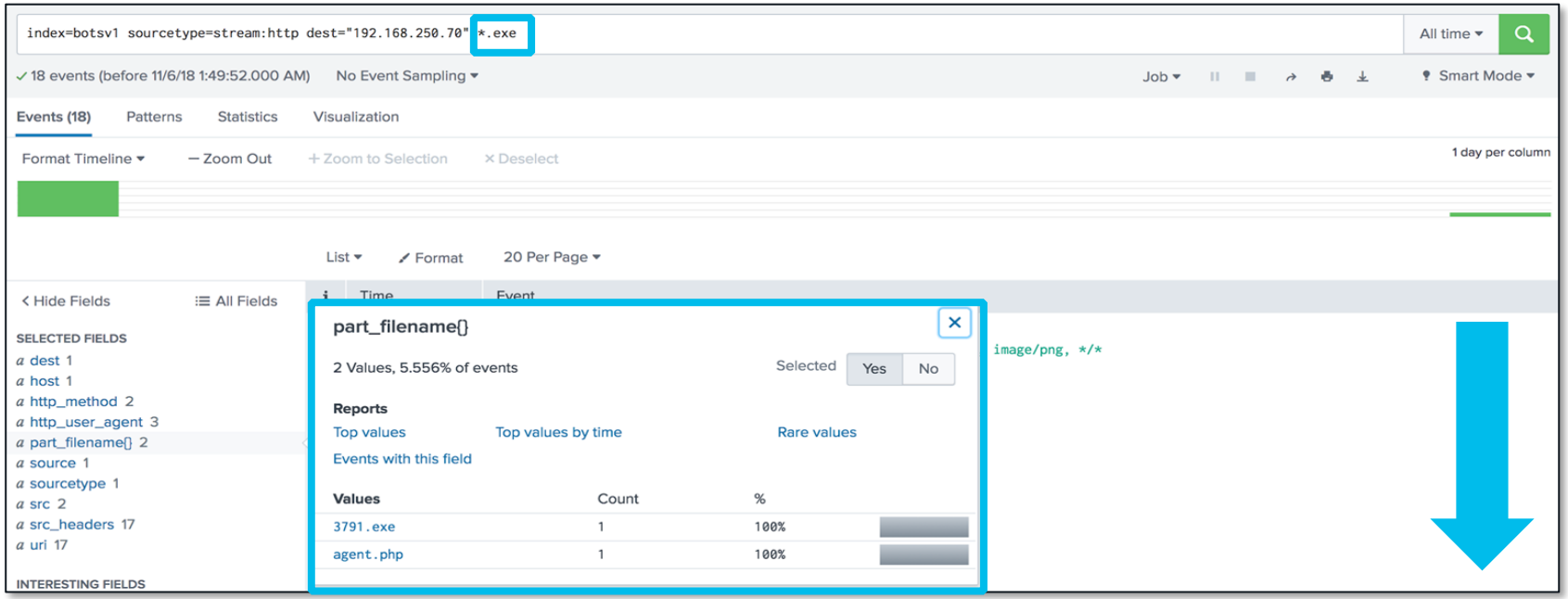
Search for EXEs in stream:http



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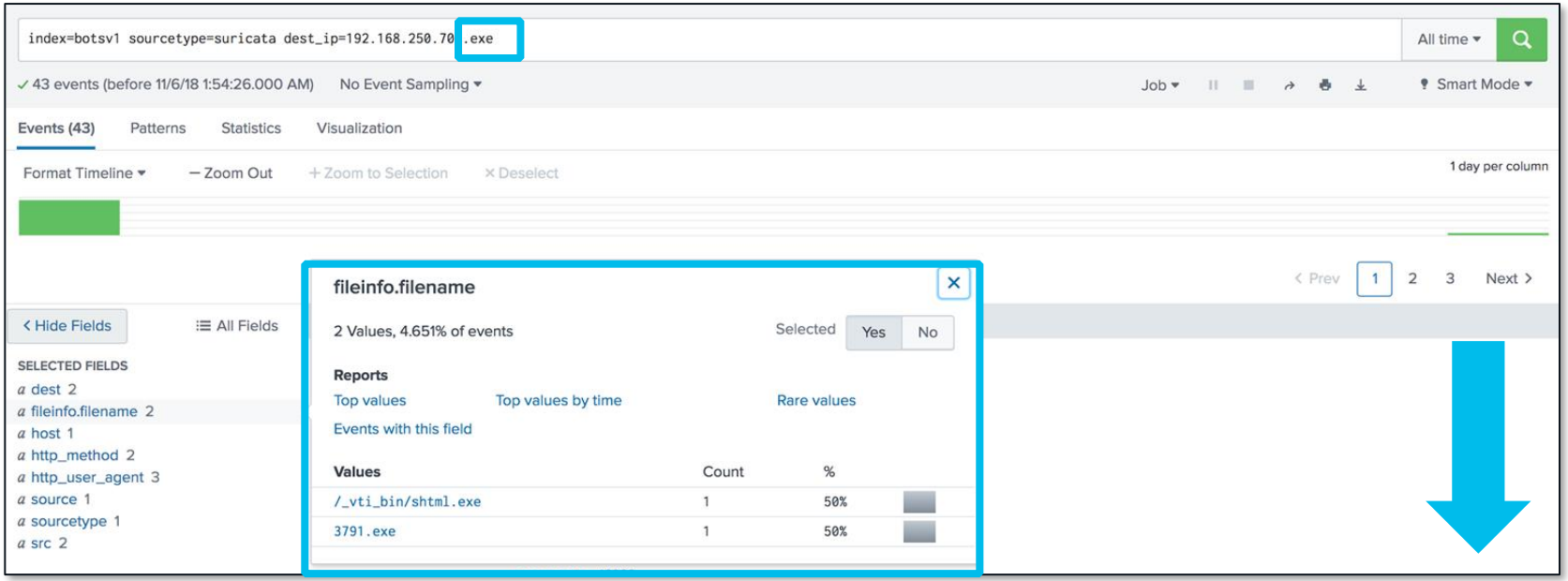
Search for EXEs in Suricata



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Hostnames v IPs

Important Note About Fields

- Fields may not have the same values based on the logging structure
- dest v dest_ip could have different values
  - Try using OR and parenthesis to bracket the search (dest=1.1.1.1 OR dest_ip=1.1.1.1)

```
index=botsv1 sourcetype=suricata (dest="192.168.250.70" OR dest_ip="192.168.250.70") .exe
```


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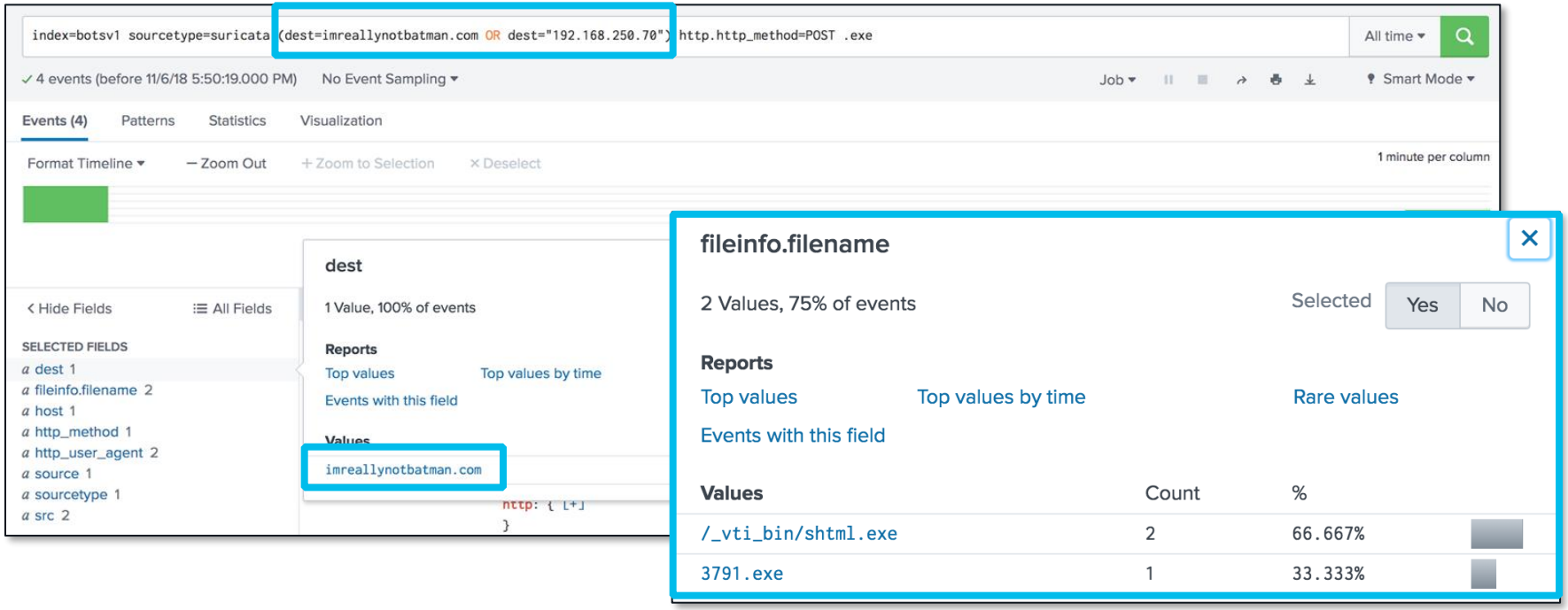
When destination and destination IP are different



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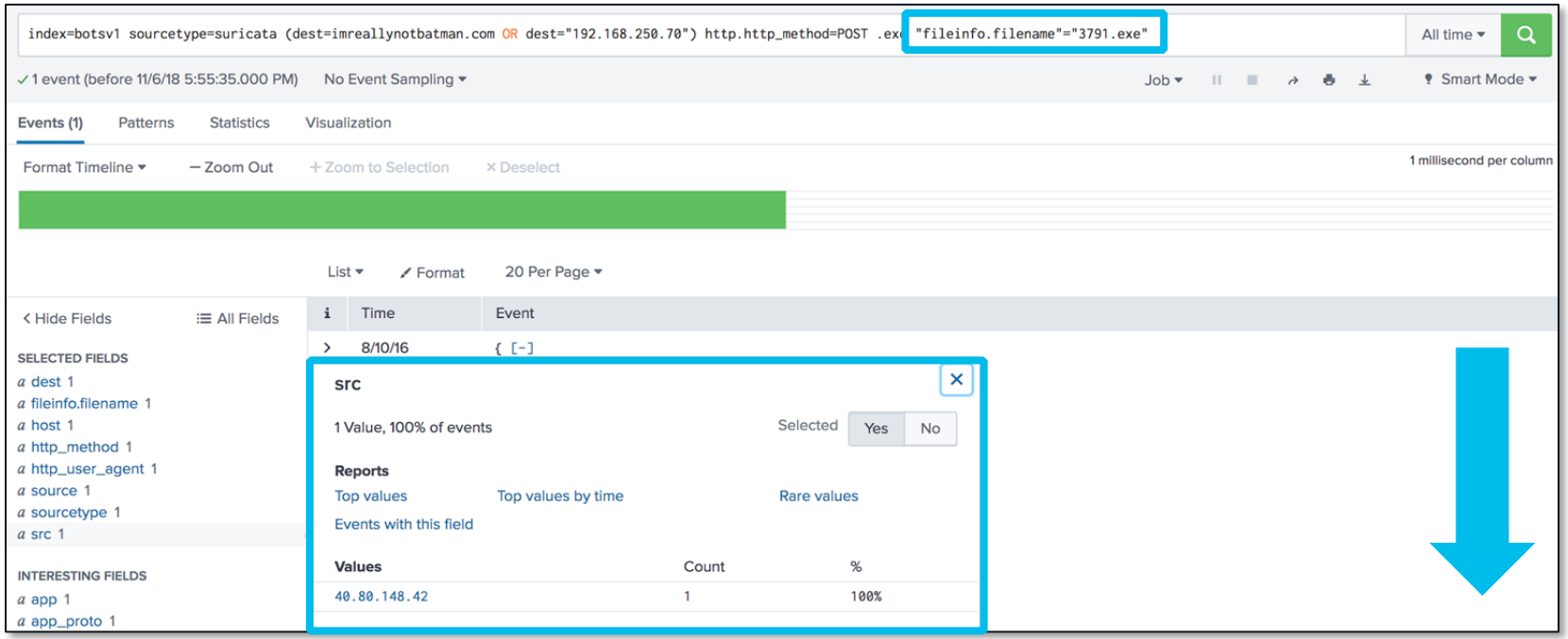
Capturing the source of the executable



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Identifying the executable uploaded

Kill Chain Phase: Installation

- What is the name of the executable uploaded by P01s0n1vy? Please include file extension. (For example, "notepad.exe" or "favicon.ico")?
  - 3791.exe

- Bonus Question: What is the source of the executable?
  - 40.80.148.82

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Kill Chain

IP Scanning the Web Server: 40.80.148.42
Web Vulnerability Scanner: Acunetix
Which Web Server?: 192.168.250.70/Joomla

Executable Uploaded: 3791.exe

Brute Force Attack Originated:
23.22.63.114
Identifying the First Password Attempted in a Brute Force Attack
Extracting Passwords from
Events
Identifying the Password Used To Gain Access:
40.80.148.42
Determining The Elapsed Time Between Events

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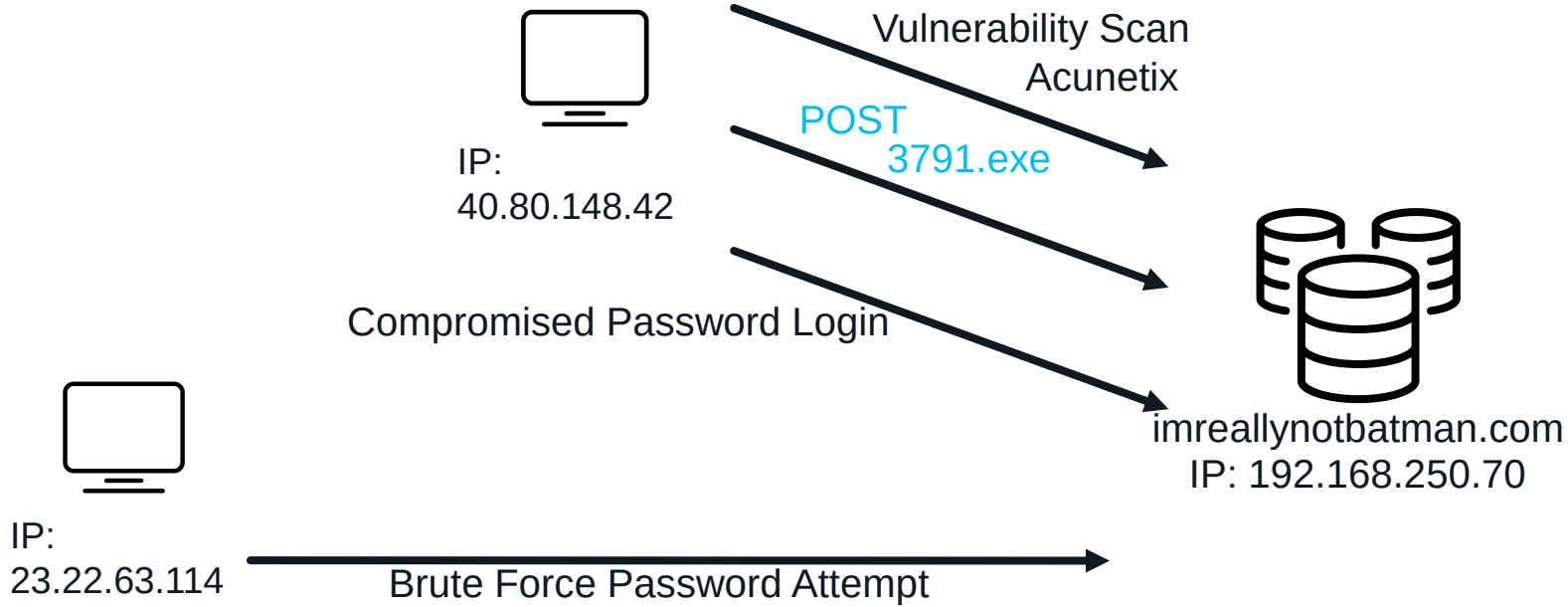
APT picture



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Determining the Hash of the Uploaded File

Kill Chain Phase: Installation

- What is the MD5 hash of the executable uploaded?

- Hints
  - Which sourcetypes have the correct filename?
  - File hashes can be found in the log stream if you know which sourcetype to look in...
  - Process Execution events will capture the MD5 at process launch

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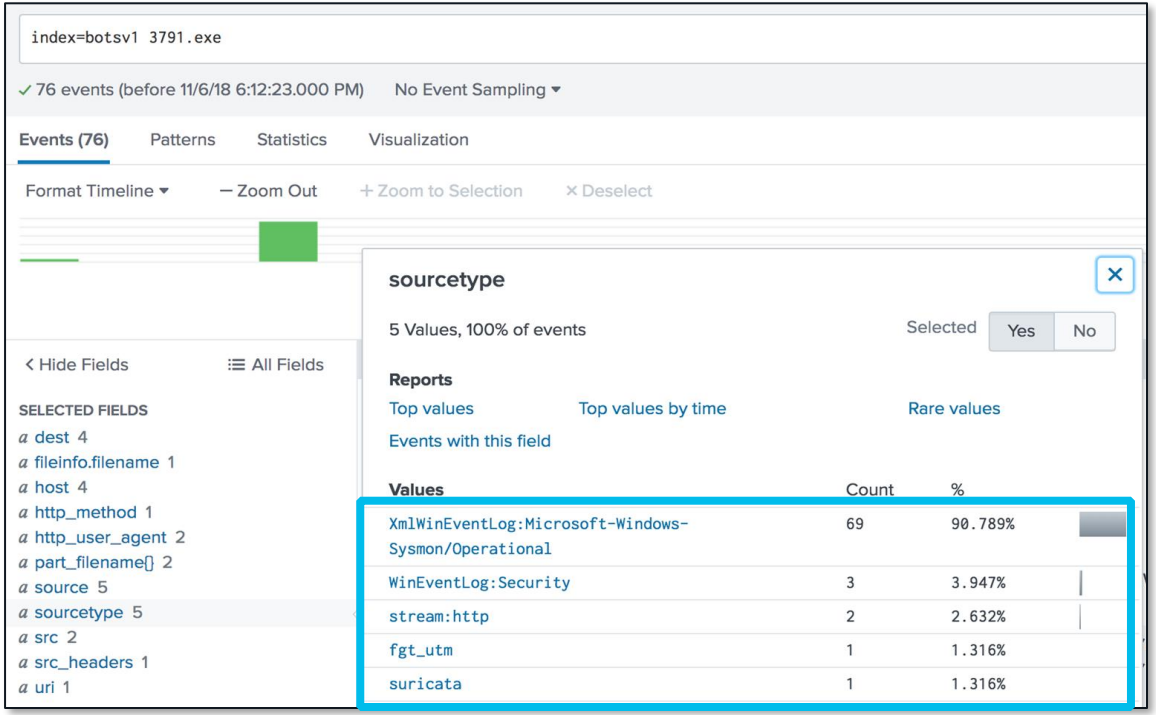
What sourcetype should i start with?

- Overview of Sysmon Capabilities
  - Records the hash of process image files using SHA1 (the default), MD5, SHA256 or IMPHASH.
  - https://docs.microsoft.com/en-us/sysinternals/downloads/sysmon



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sysmon Primer

- Windows System Service and Device Driver
- Resident across reboots
- Logs numerous Windows activities including
  - Process Creation
  - Network Connection
  - Driver Loaded
  - File Creation
  - Registry Event
  - And more...

```
<Sysmon  schemaversion="3.2">
  <!-- Capture all the hashes -->
  <HashAlgorithms>*</HashAlgorithms>
  <EventFiltering>
    <!-- Log all drivers except if the signature -->
    <!-- contains Microsoft or Windows -->
    <DriverLoad onmatch="exclude">
      <Signature condition="contains">microsoft</Signature>
      <Signature condition="contains">windows</Signature>
    </DriverLoad>
    <!-- Do not log process termination -->
    <ProcessTerminate onmatch="include"/>
    <!-- Log network connection if the destination port equals 443 -->
    <!-- or 80, and the process isn't InternetExplorer -->
    <NetworkConnect onmatch="include">
      <DestinationPort>443</DestinationPort>
      <DestinationPort>80</DestinationPort>
    </NetworkConnect>
    <NetworkConnect onmatch="exclude">
      <Image condition="end with">iexplore.exe</Image>
    </NetworkConnect>
  </EventFiltering>
</Sysmon>
```

- Configuration files in XML are used to determine which events are logged
  - https://github.com/SwiftOnSecurity/sysmon-config

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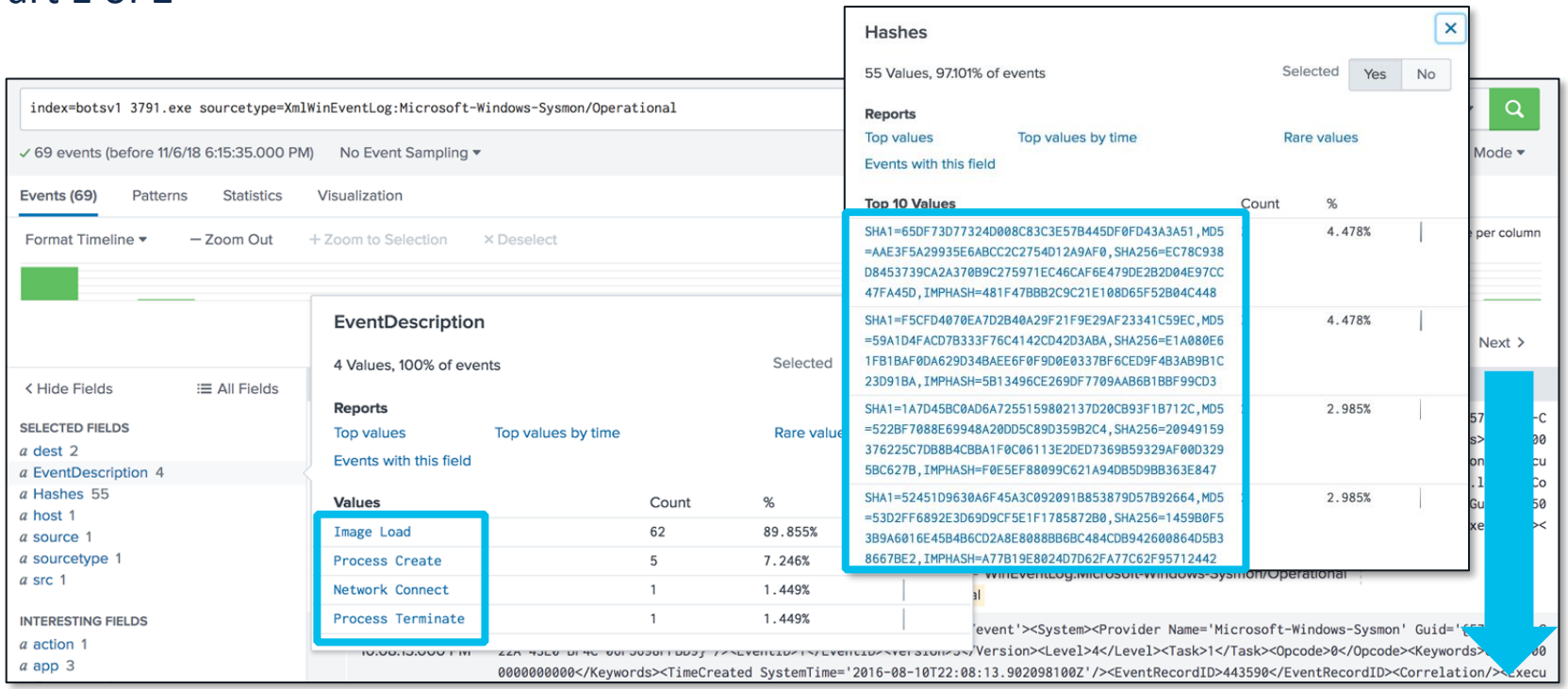
What can I find with Sysmon?

Part 1 of 2



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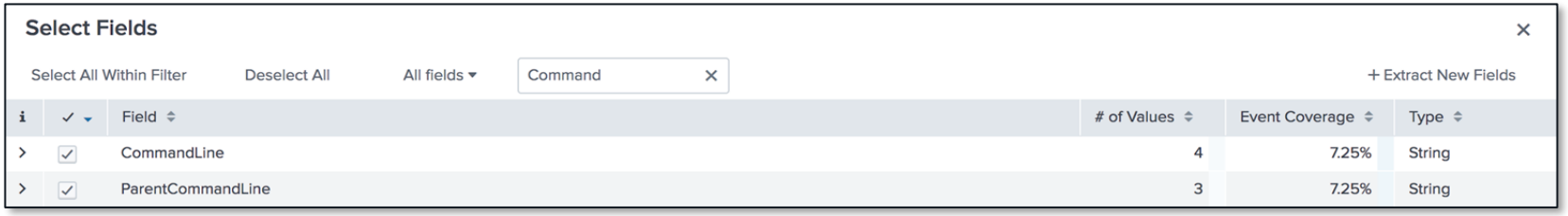
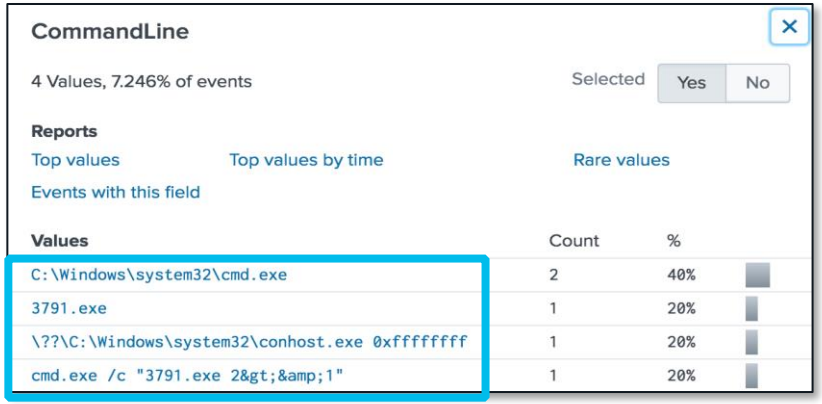
What can I find with Sysmon?

Part 2 of 2





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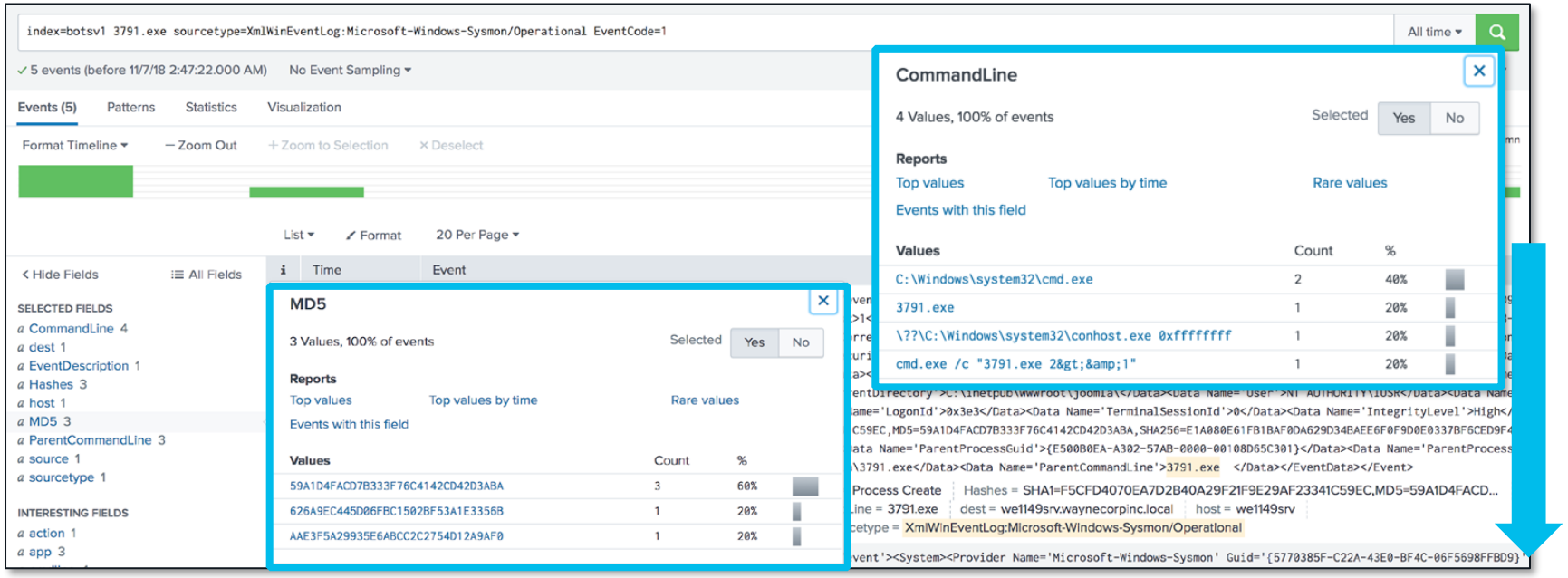
Drilling down on MD5 & CommandLine



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Exploring the Sysmon event

```
index=botsv1 3791.exe sourcetype=XmlWinEventLog:Microsoft-Windows-Sysmon/Operational EventCode=1 CommandLine="3791.exe"
```

8/10/16
9:56:18.000 PM

<Event xmlns='http://schemas.microsoft.com/win/2004/08/events/event'><System><Provider Name='Microsoft-Windows-Sysmon' Guid='{5770385F-C22A-43E0-BF4C-06F5698FFBD9}' /><EventID>1</EventID><Version>5</Version><Level>4</Level><Task>1</Task><Opcode>0</Opcode><Keywords>0x8000000000000000</Keywords><TimeCreated SystemTime='2016-08-10T21:56:18.142461700Z'/><EventRecordID>428908</EventRecordID><Correlation/><Execution ProcessID='1296' ThreadID='1416'/><Channel>Microsoft-Windows-Sysmon/Operational</Channel><Computer>we1149srv.waynecorpinc.local</Computer><Security UserID='S-1-5-18'/></System><EventData><Data Name='UtcTime'>2016-08-10 21:56:18.142</Data><Data Name='ProcessGuid'>{E500B0EA-A302-57AB-0000-00108D65C301}</Data><Data Name='ProcessId'>3880</Data><Data Name='Image'>C:\inetpub\wwwroot\joomla\3791.exe</Data><Data Name='CommandLine'>3791.exe </Data><Data Name='CurrentDirectory'>C:\inetpub\wwwroot\joomla\</Data><Data Name='User'>NT AUTHORITY\IUSR</Data><Data Name='LogonGuid'>{E500B0EA-219E-57AA-0000-0020E3030000}</Data><Data Name='LogonId'>0x3e3</Data><Data Name='TerminalSessionId'>0</Data><Data Name='IntegrityLevel'>High</Data><Data Name='Hashes'>SHA1=65DF73D77324D008C83C3E57B445DF0FD43A3A51,MD5=AAE3F5A29935E6ABCC2C2754D12A9AF0,SHA256=EC78C938D8453739CA2A370B9C275971EC46CAF6E479DE2B2D04E97CC47FA45D,IMPHASH=481F47BBB2C9C21E108D65F52B04C448</Data><Data Name='ParentProcessGuid'>{E500B0EA-A302-57AB-0000-00102E63C301}</Data><Data Name='ParentProcessId'>2896</Data><Data Name='ParentImage'>C:\Windows\SysWOW64\cmd.exe</Data><Data Name='ParentCommandLine'>cmd.exe /c "3791.exe 2>&1"</Data></EventData></Event>

Event Actions

Type	Field	Value	Actions
Selected	CommandLine	3791.exe	
	EventDescription	Process Create	
	Hashes	SHA1=65DF73D77324D008C83C3E57B445DF0FD43A3A51,MD5=AAE3F5A29935E6ABCC2C2754D12A9AF0,SHA256=EC78C938D8453739CA2A370B9C275971EC46CAF6E479DE2B2D04E97CC47FA45D,IMPHASH=481F47BBB2C9C21E108D65F52B04C448	
	MD5	AAE3F5A29935E6ABCC2C2754D12A9AF0	
	ParentCommandLine	cmd.exe /c "3791.exe 2>&1"	
	dest	we1149srv.waynecorpinc.local	
	host	we1149srv	
	source	WinEventLog:Microsoft-Windows-Sysmon/Operational	
	sourcetype	XmlWinEventLog:Microsoft-Windows-Sysmon/Operational	
Event	Computer	we1149srv.waynecorpinc.local	
	CurrentDirectory	C:\inetpub\wwwroot\joomla\	
	EventChannel	Microsoft-Windows-Sysmon/Operational	
	EventCode	1	

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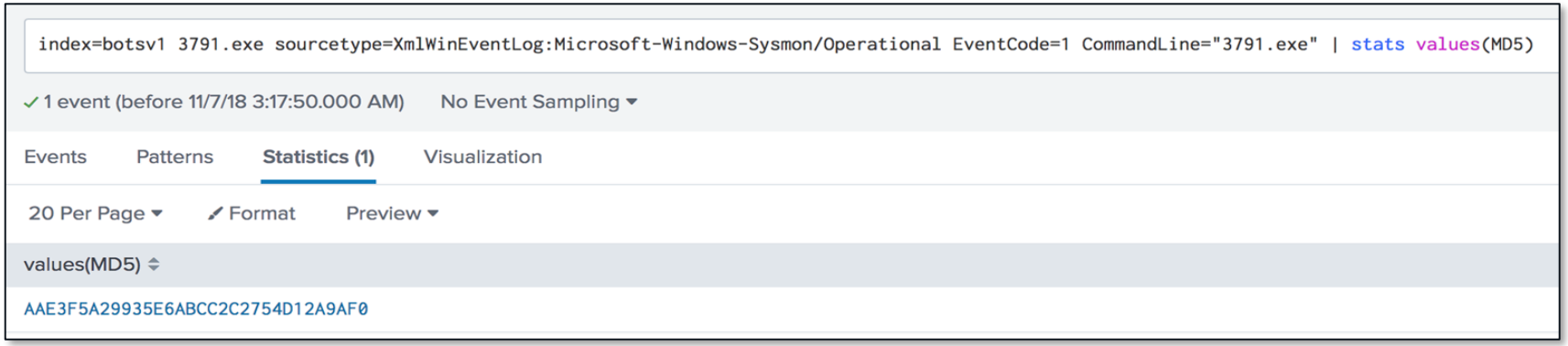
Putting it together



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Determining the hash of the uploaded file

Kill Chain Phase: Installation

- What is the MD5 hash of the executable uploaded?
  - AAE3F5A29935E6ABCC2C2754D12A9AF0

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Kill Chain

IP Scanning the Web Server: 40.80.148.42
Web Vulnerability Scanner: Acunetix
Which Web Server?: 192.168.250.70/Joomla

Executable Uploaded: 3791.exe
Hash of the Uploaded File:
AAE3F5A29935E6ABCC2C2754D12A9AF0

Brute Force Attack Originated:
23.22.63.114
Identifying the First Password Attempted in a Brute Force Attack
Extracting Passwords from Events
Identifying the Password Used To Gain Access:
40.80.148.42
Determining The Elapsed Time Between Events

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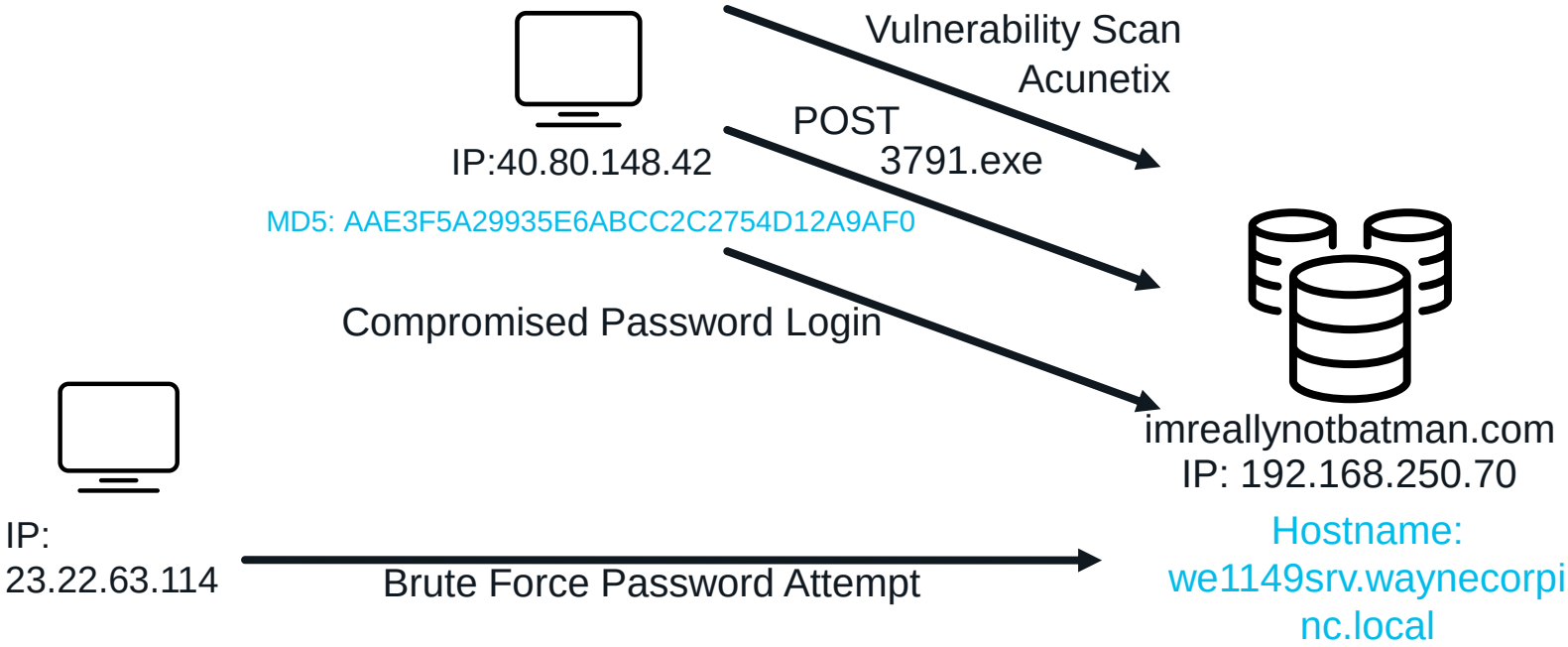
APT picture



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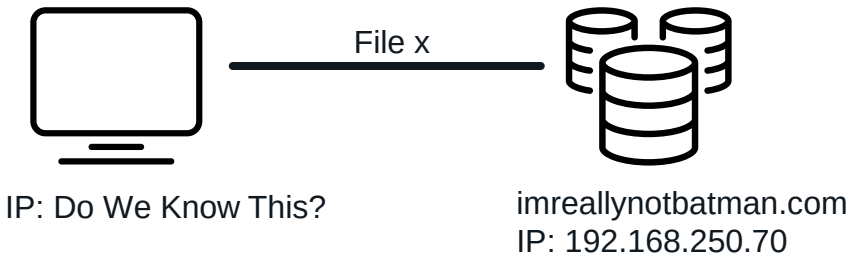
Identifying the file that defaced our web server

Kill Chain Phase: Actions on Objective

- What is the name of the file that defaced the imreallynotbatman.com website?

- Hints
  - Data sources that show communication between the web browser and server will provide good visibility
  - Determining the IP address of the other system could be helpful
  - The flow of information (directionality) is the important key.
    - POST v GET
    - Previous information gathered in the investigation will be helpful here



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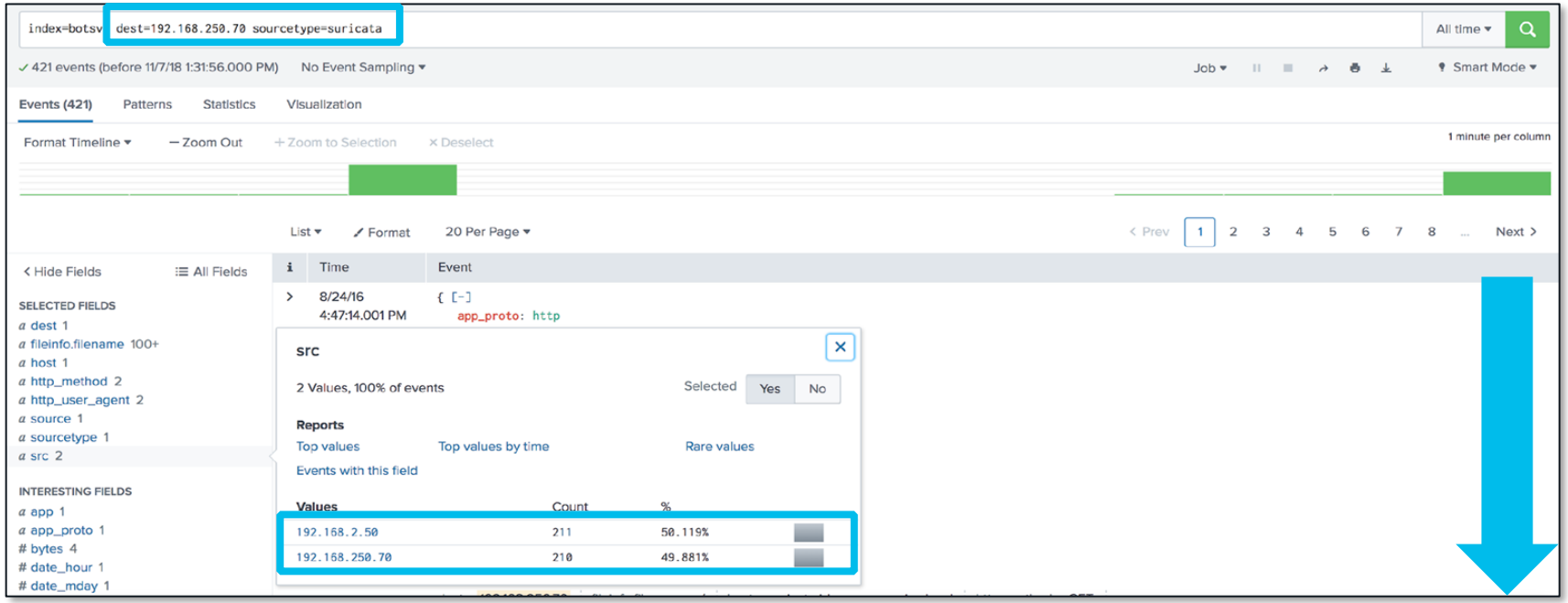
Looking at directional flow of data - Part 1

Nothing coming from outside in



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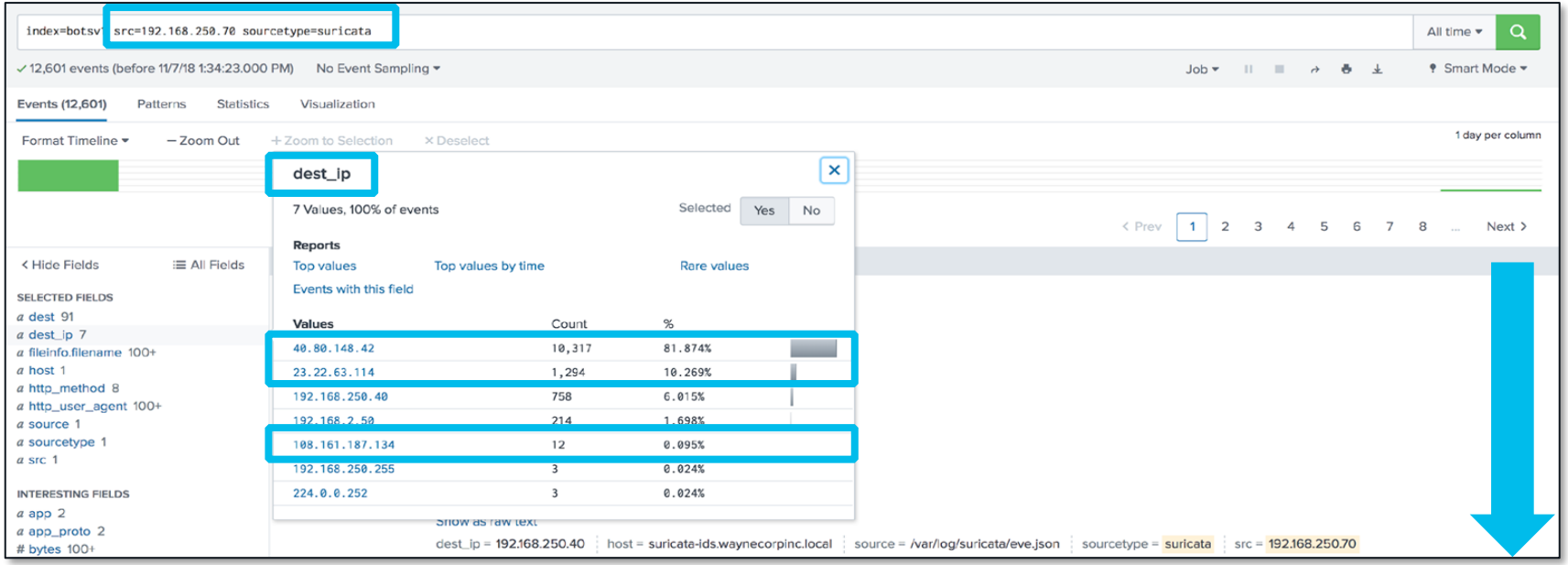
Looking at directional flow of data - Part 1

Looking from inside out



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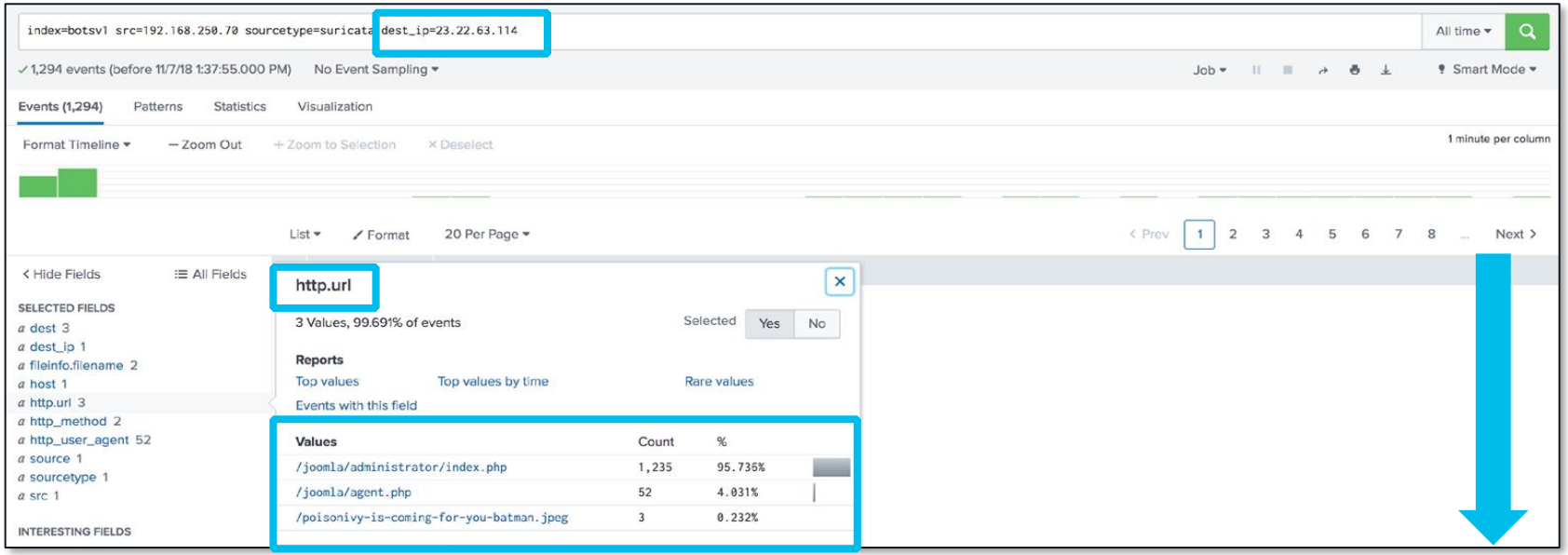
Pivot into destination IP addresses to view URLs



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HTTP Get v Post Traffic Flow

HTTP GET will generally retrieve data

HTTP POST submits data to be processed

imreallynotbatman.com

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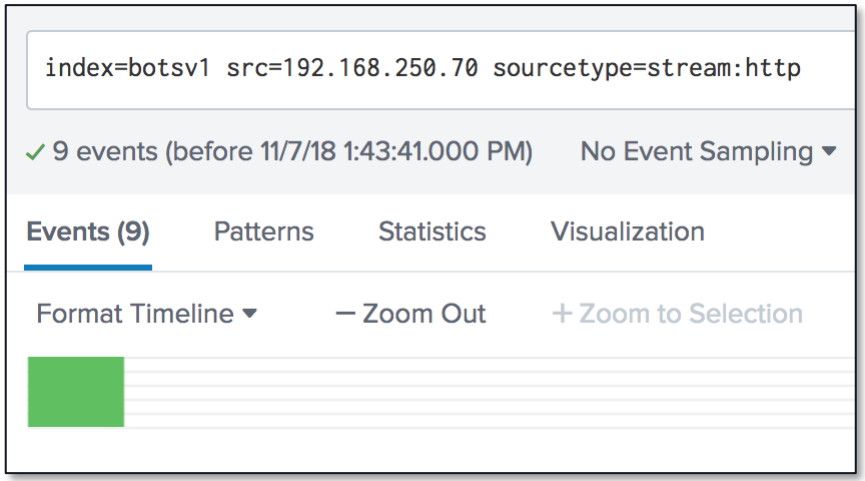
Do web servers start a conversation?

- How often should web servers start a conversation?



- If they are starting the conversation is that interesting and should be looked at?

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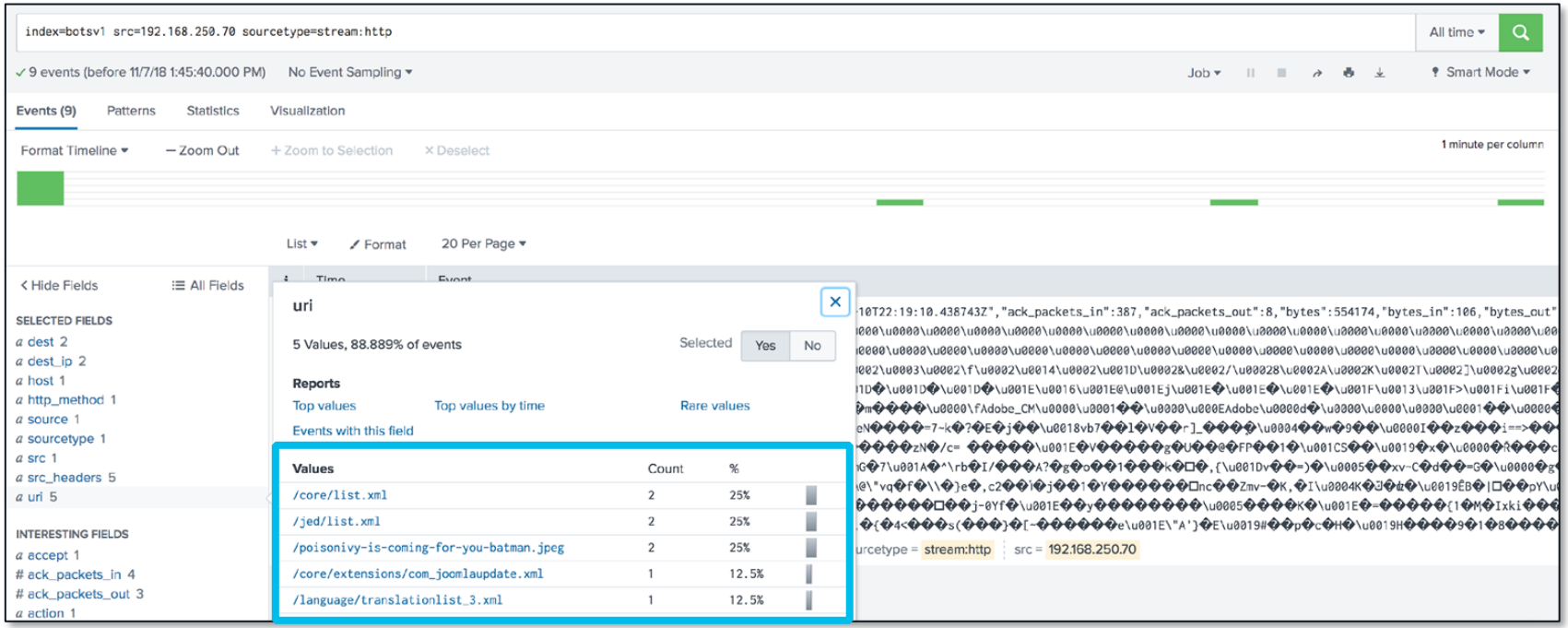
Any similarities between Suricata and stream:http?



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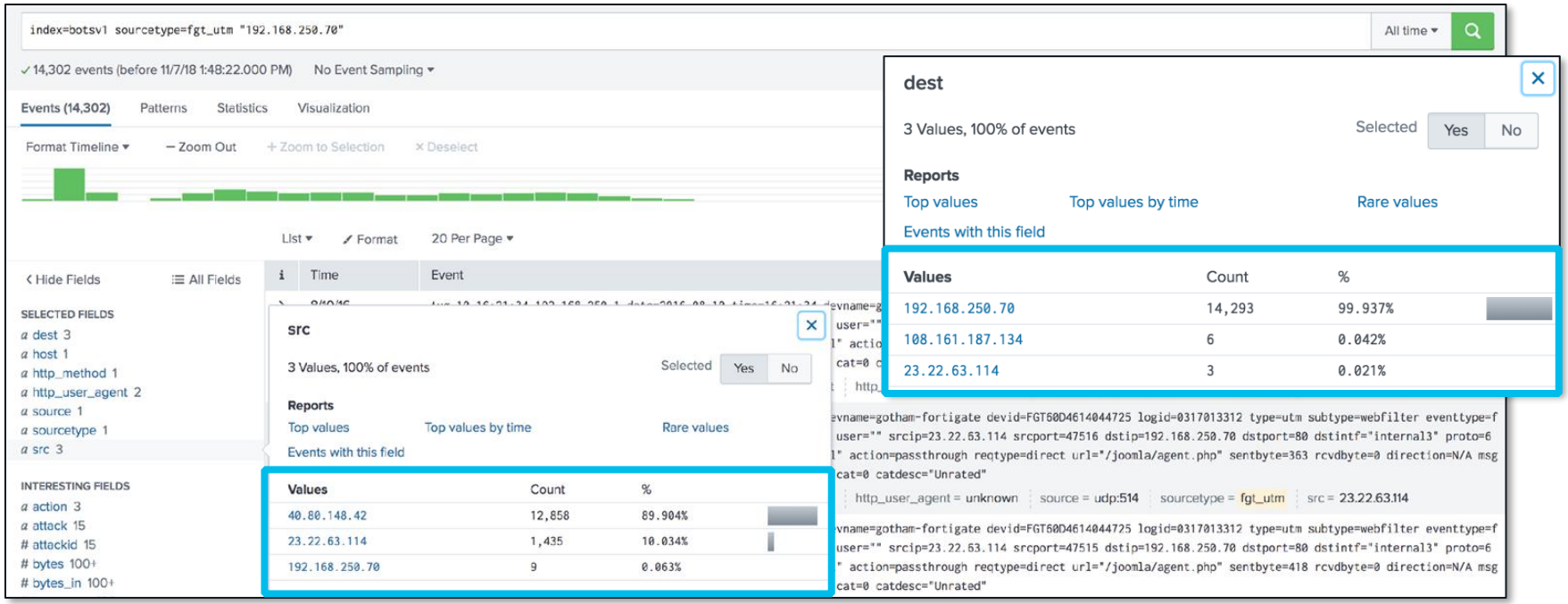
What about firewall data?



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Which search do I start with?

```
index=botsv1 sourcetype=fgt_utm "192.168.250.70" NOT dest="192.168.250.70" | stats count
```

✓ 9 events (before 11/7/18 1:50:52.000 PM) No Event Sampling ▾

```
index=botsv1 sourcetype=fgt_utm "192.168.250.70" NOT src="192.168.250.70" |stats count
```

✓ 14,293 events (before 11/7/18 1:50:55.000 PM) No Event Sampling ▾

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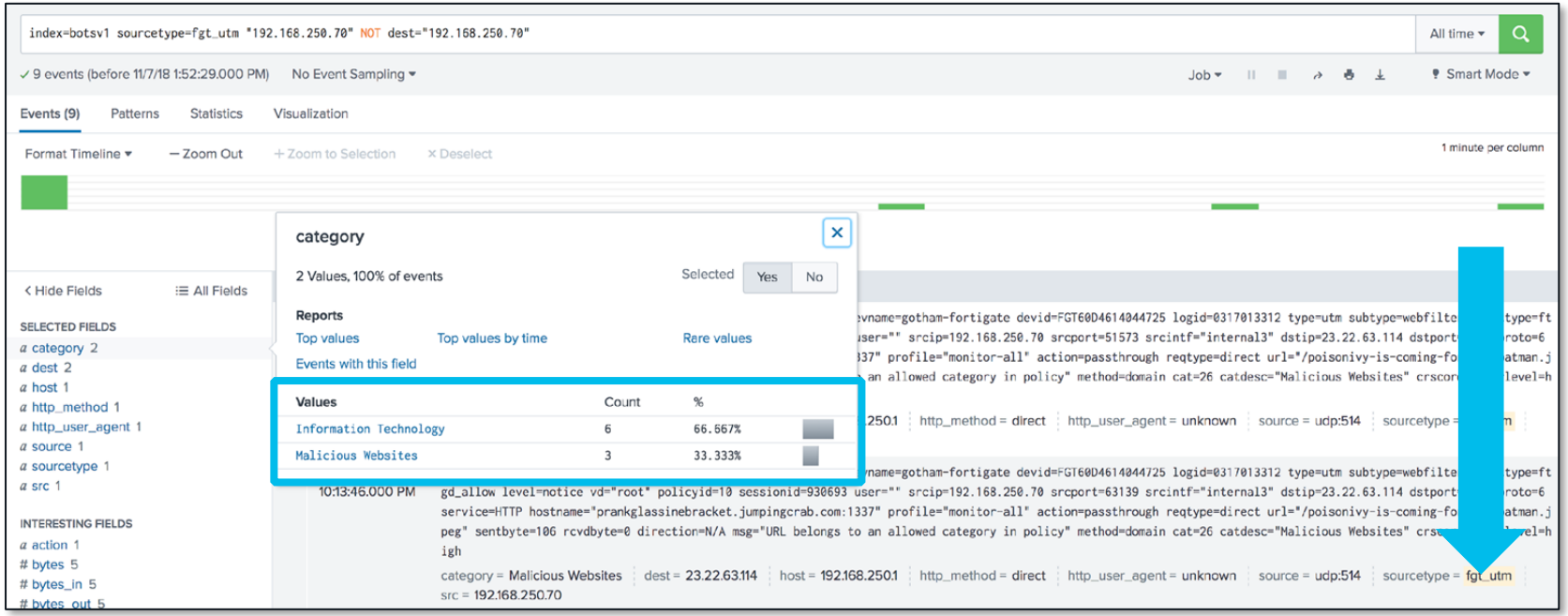
Use web site categorisation to filter



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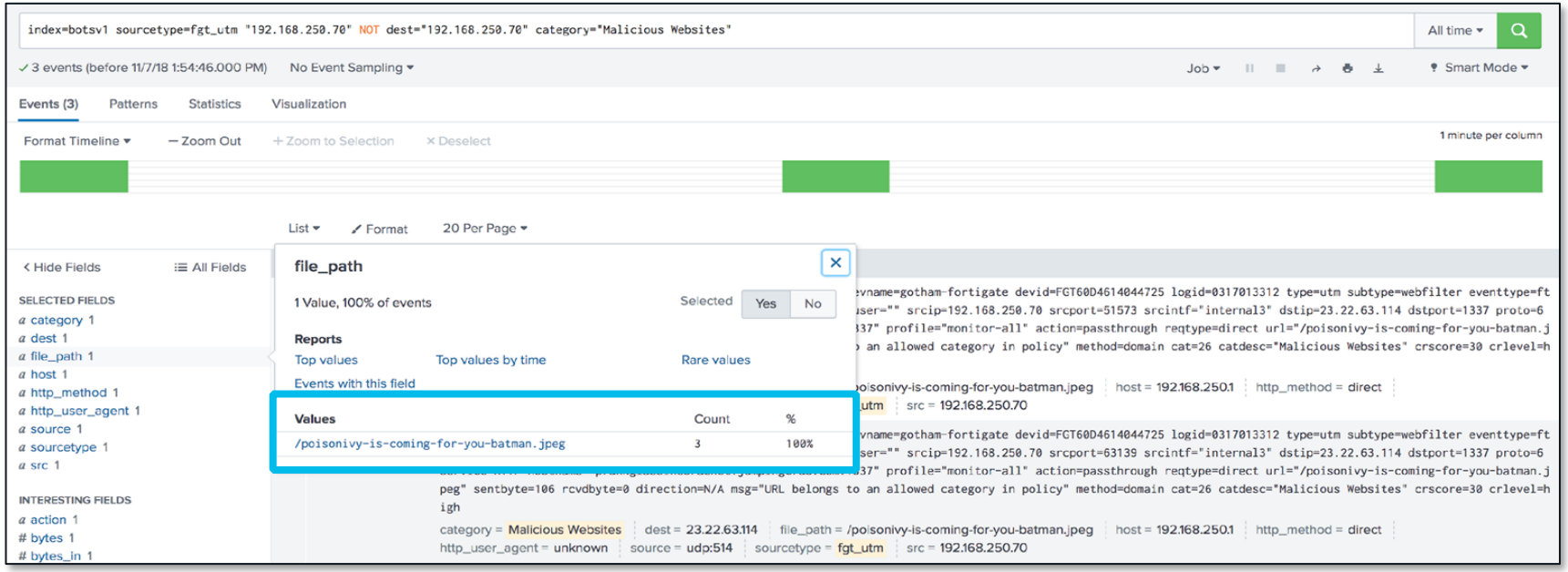
Firewall gives us confirmation



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Identifying the file that defaced our web server

Kill Chain Phase: Actions on Objective

- What is the name of the file that defaced the imreallynotbatman.com website?
  - poisonivy-is-coming-for-you-batman.jpeg

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Kill Chain

IP Scanning the Web Server:
40.80.148.42

Which Web Server?:
192.168.250.70/Joomla

Web Vulnerability Scanner:
Acunetix

Executable Uploaded:
3791.exe

Hash of the Uploaded File:
AAE3F5A29935E6ABCC2C2754D12A9AF0

File that Defaced Our Web Server: poisonivy-is-coming-for-you-batman.jpeg

Brute Force Attack Originated:
23.22.63.114

Identifying the First Password Attempted in a Brute Force Attack

Extracting Passwords from Events

Identifying the Password Used To Gain Access:
40.80.148.42

Determining The Elapsed Time Between Events

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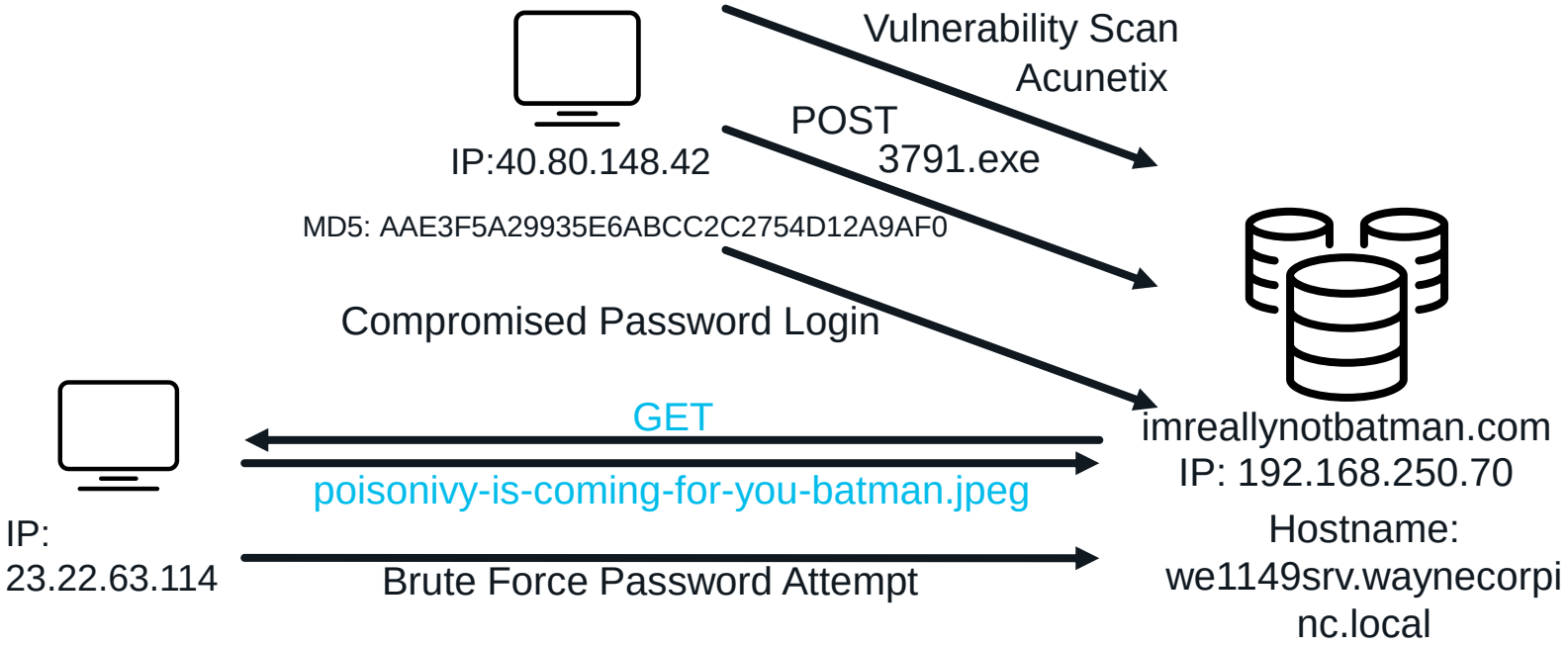
APT picture



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Identifying the FQDN of the system that defaced...

Kill Chain Phase: Command & Control

- This attack used dynamic DNS to resolve to the malicious IP. What fully qualified domain name (FQDN) is associated with this attack?

- Hint
  - Information just recently uncovered will help answer this

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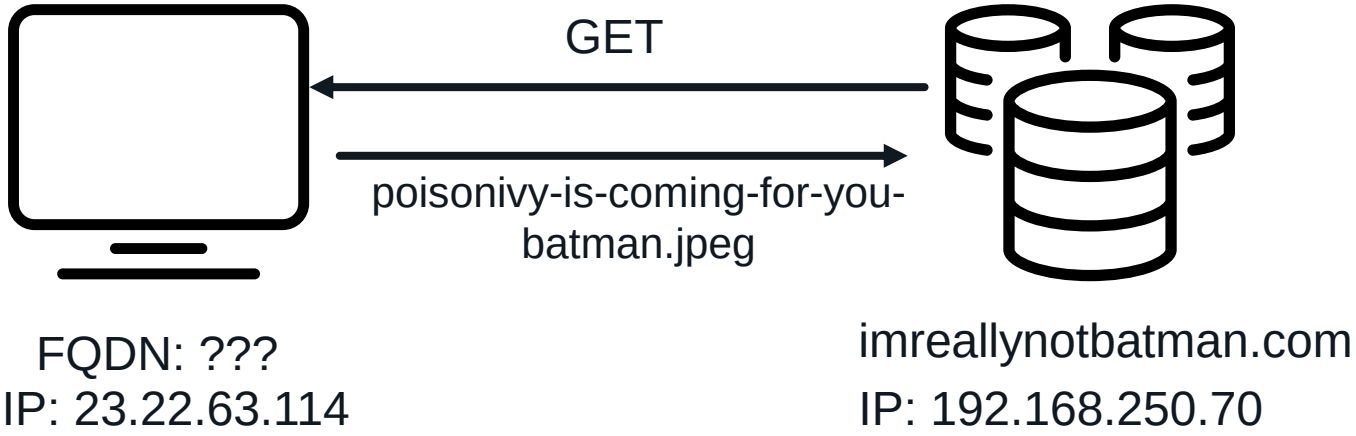
HTTP Get traffic flow

- HTTP GET will generally retrieves data



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Using Fortigate Firewall Events we just found

8/10/16
10:19:10.000 PM

```
Aug 10 16:19:10 192.168.250.1 date=2016-08-10 time=16:19:10 devname=gotham-fortigate devid=FGT60D4614044725 logid=0317013312 type=utm subtype=webfilter eventtype=ftgd_allow level=notice vd="root" policyid=10 sessionid=932526 user="" srcip=192.168.250.70 srcport=51573 srcintf="internal3" dstip=23.22.63.114 dstport=1337 proto=6 service=HTTP hostname="prankglassinebracket.jumpingcrab.com:1337" profile="monitor-all" action=passthrough reqtype=direct url="/poisonivy-is-coming-for-you-batman.jpeg" sentbyte=106 rcvdbyte=0 direction=N/A msg="URL belongs to an allowed category in policy" method=domain cat=26 catdesc="Malicious Websites" crscore=30 crlevel=high
```

Event Actions ▾

Type	Field	Value	Actions
Selected	category ▾	Malicious Websites	⌄
	dest ▾	23.22.63.114	⌄
	file_path ▾	/poisonivy-is-coming-for-you-batman.jpeg	⌄
	host ▾	192.168.250.1	⌄
	http_method ▾	direct	⌄
	http_user_agent ▾	unknown	⌄
	source ▾	udp:514	⌄
	sourcetype ▾	fgt_utm	⌄
	src ▾	192.168.250.70	⌄
	url ▾	prankglassinebracket.jumpingcrab.com:1337/poisonivy-is-coming-for-you-batman.jpeg	⌄
Event	action ▾	allowed	▾

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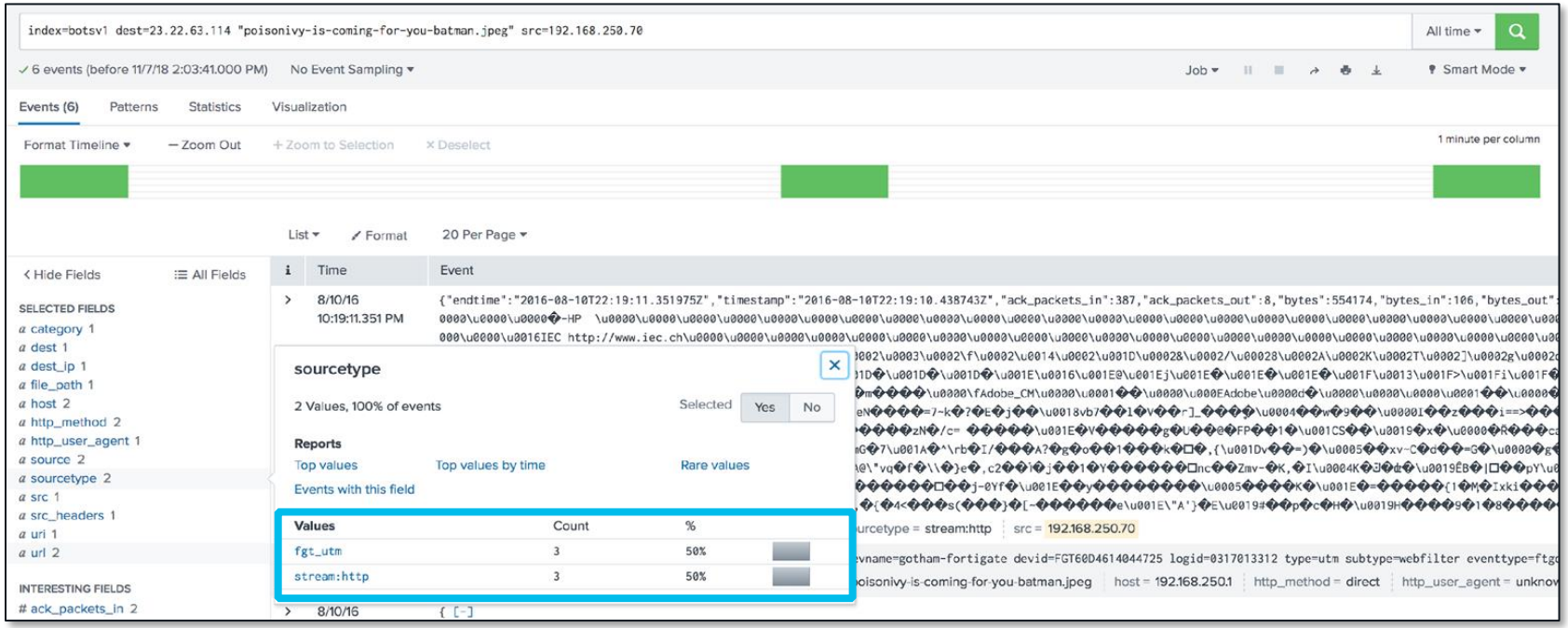
What data sets saw this file?



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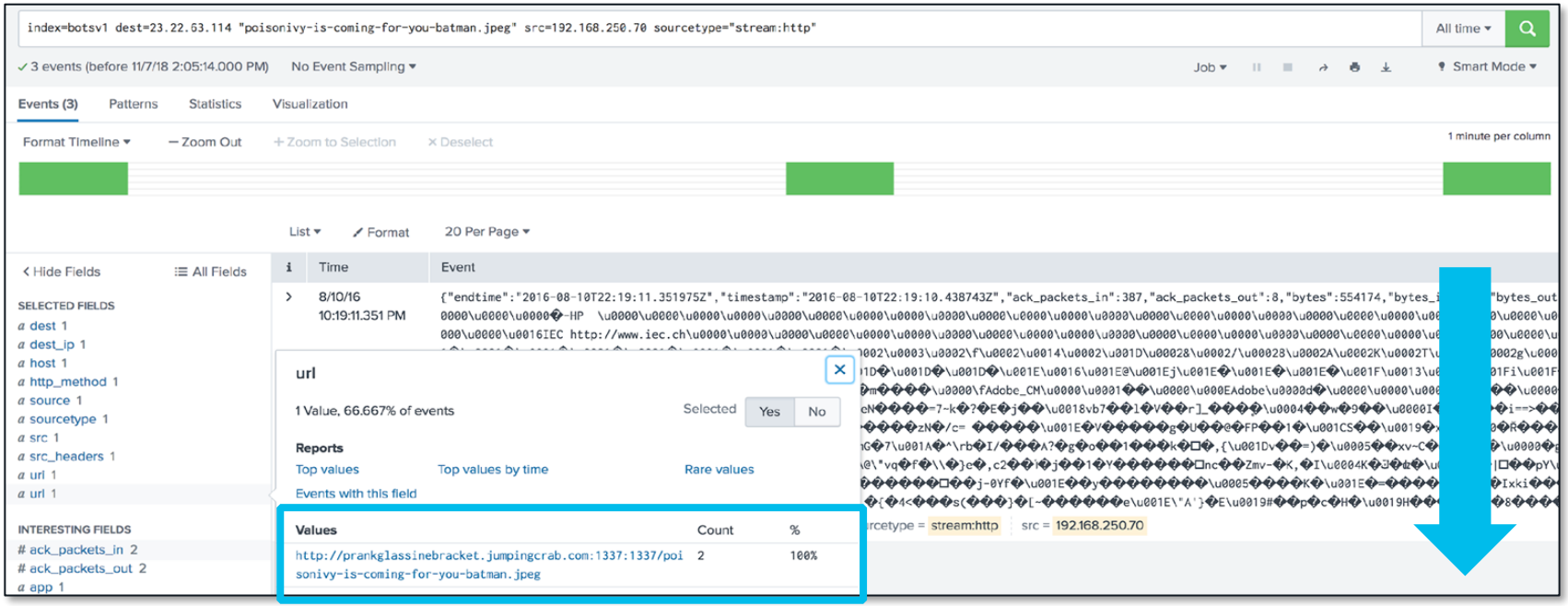
Using stream:http



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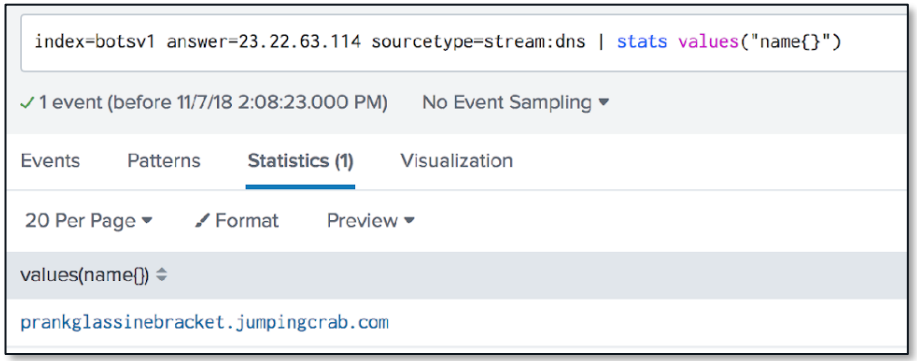
What if I don’t have the file name?

- If we know there was DNS resolution to the malicious IP, how can we craft a search?
- DNS will be associated with the stream:dns sourcetype
- We identified a couple of IP addresses of interest even if we don’t have the filename, we probably know that 23.22.63.114 is of concern



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Identifying the FQDN of the system that defaced...

Kill Chain Phase: Command & Control

- This attack used dynamic DNS to resolve to the malicious IP. What fully qualified domain name (FQDN) is associated with this attack?
  - prankglassinebracket.jumpingcrab.com

- More information on this topic
  - http://blogs.splunk.com/2015/08/04/detecting-dynamic-dns-domains-in-splunk/

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Kill Chain

IP Scanning the Web Server:
40.80.148.42
Web Vulnerability Scanner:
Acunetix
Which Web Server?:
192.168.250.70/Joomla

Executable Uploaded:
3791.exe
Hash of the Uploaded File:
AAE3F5A29935E6ABCC2C2754D12A9AF0

File that Defaced Our Web Server: poisonivy-is-coming-for-you-batman.jpeg

Brute Force Attack Originated:
23.22.63.114
Identifying the First Password Attempted in a Brute Force Attack
Extracting Passwords from Events
Identifying the Password Used To Gain Access:
40.80.148.42
Determining The Elapsed Time Between Events

Fully Qualified Domain Name of the System that Defaced the Web Server:
prankglassinebracket.jumpingcrab.com

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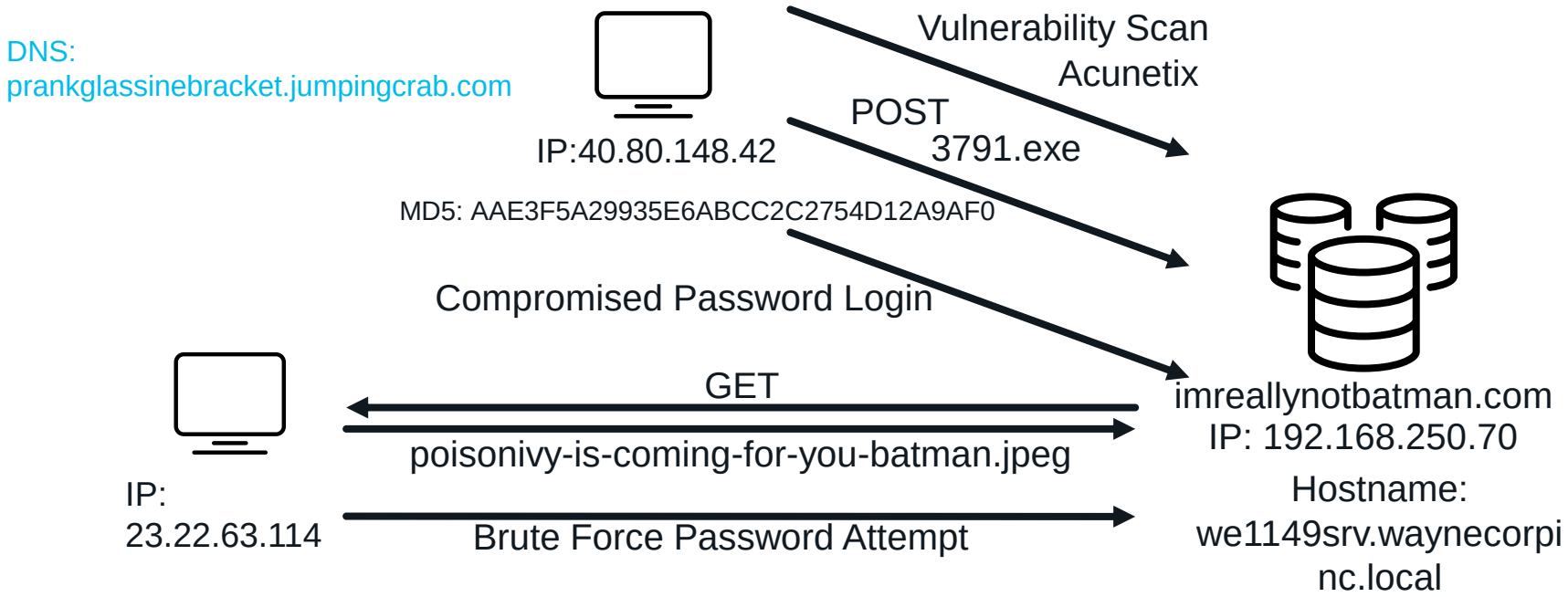
APT picture



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Using OSINT to identify attacker infrastructure

Kill Chain Phase: Weaponisation

- What IP address has P01s0n1vy tied to domains that are pre-staged to attack Wayne Enterprises?

- Bonus Question: What additional domains were tied to that IP address?

- Hints
  - Sites like VirusTotal and ThreatCrowd will help identify the domain to IP association

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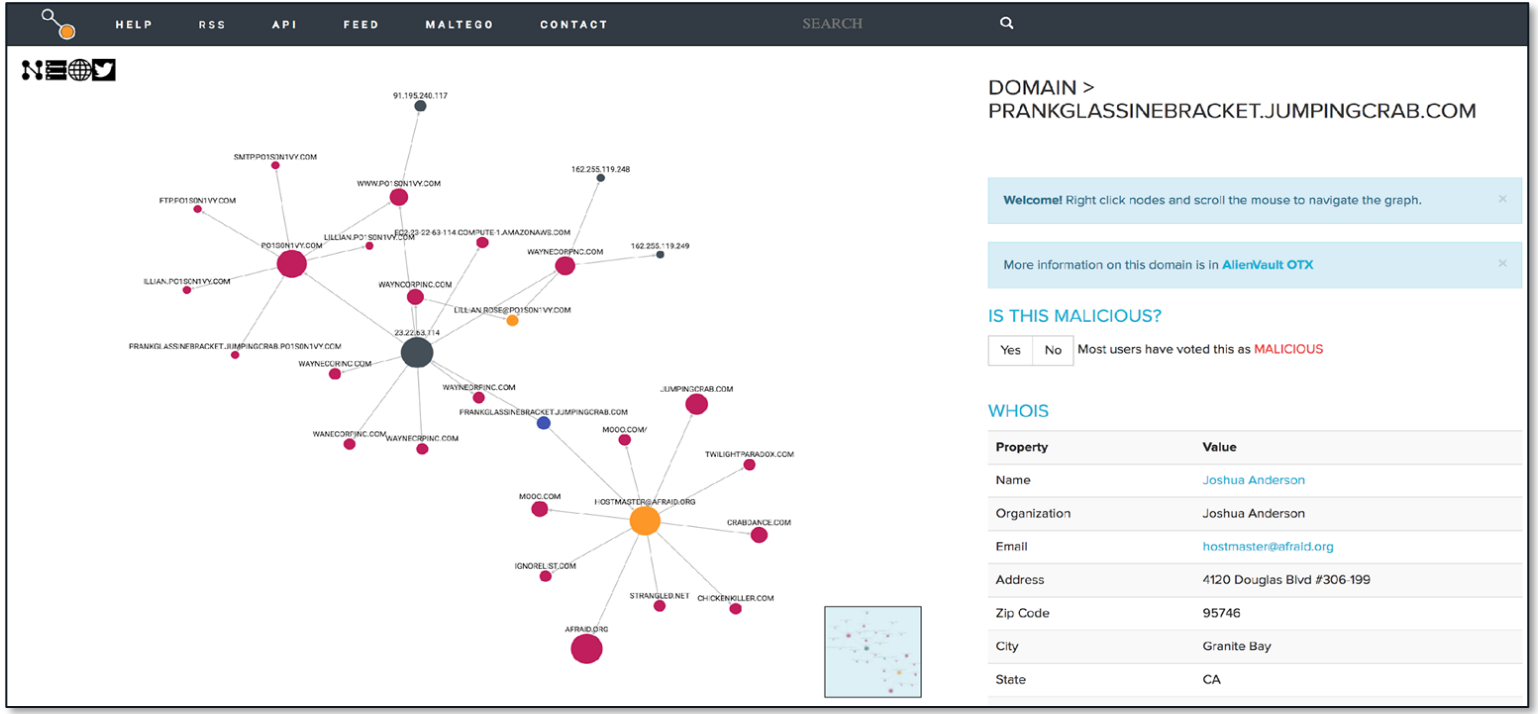
ThreatCrowd domain search



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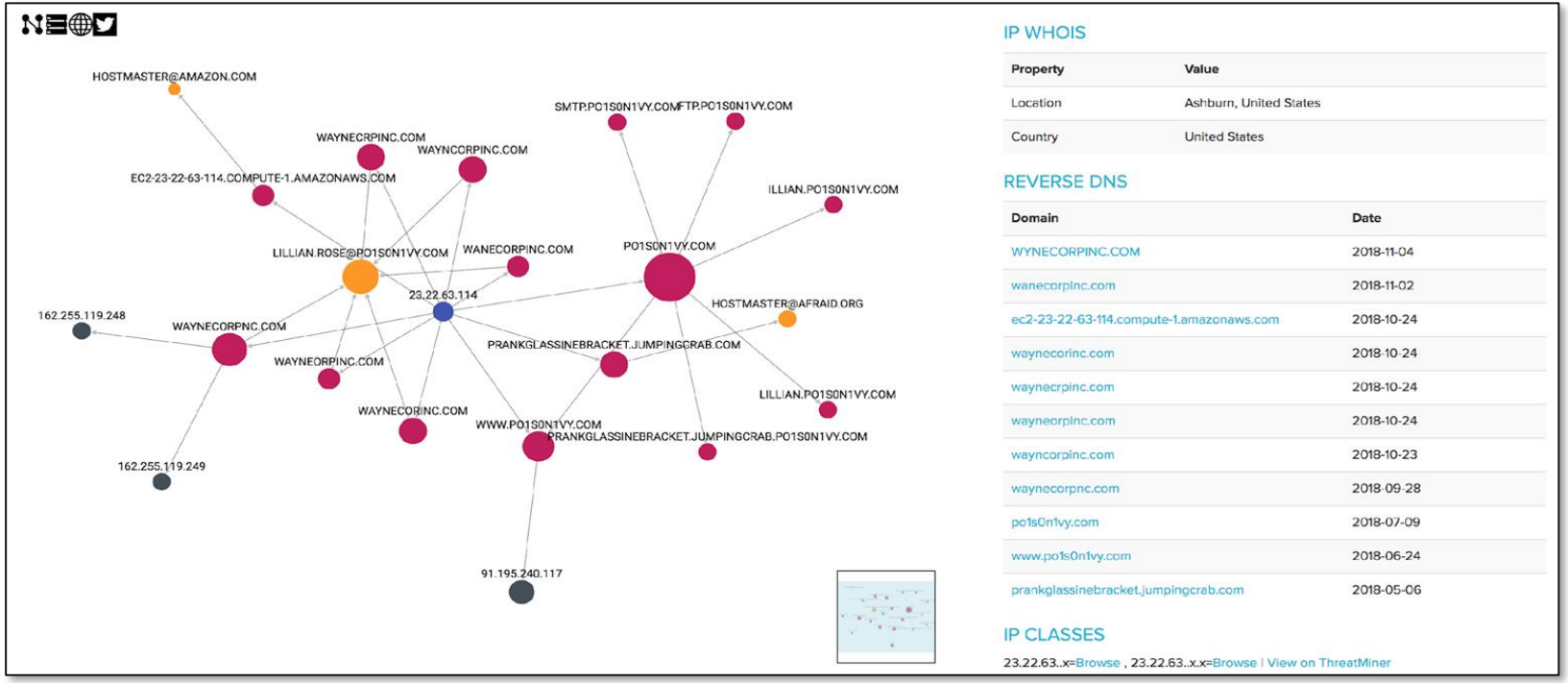
ThreatCrowd – Pivot to IP



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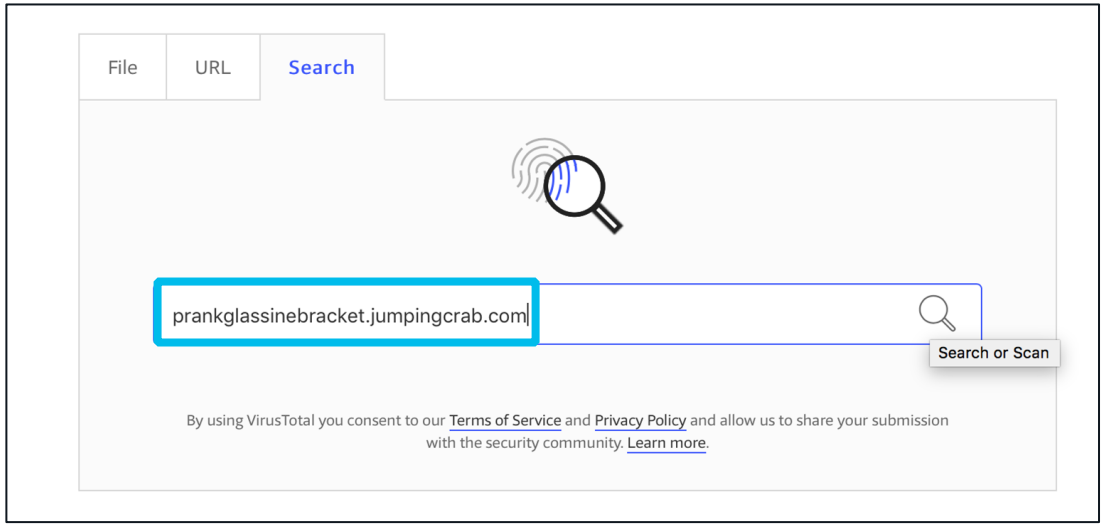
Virus Total



Passive DNS Replication

Date resolved	IP address
2016-09-14	23.22.63.114

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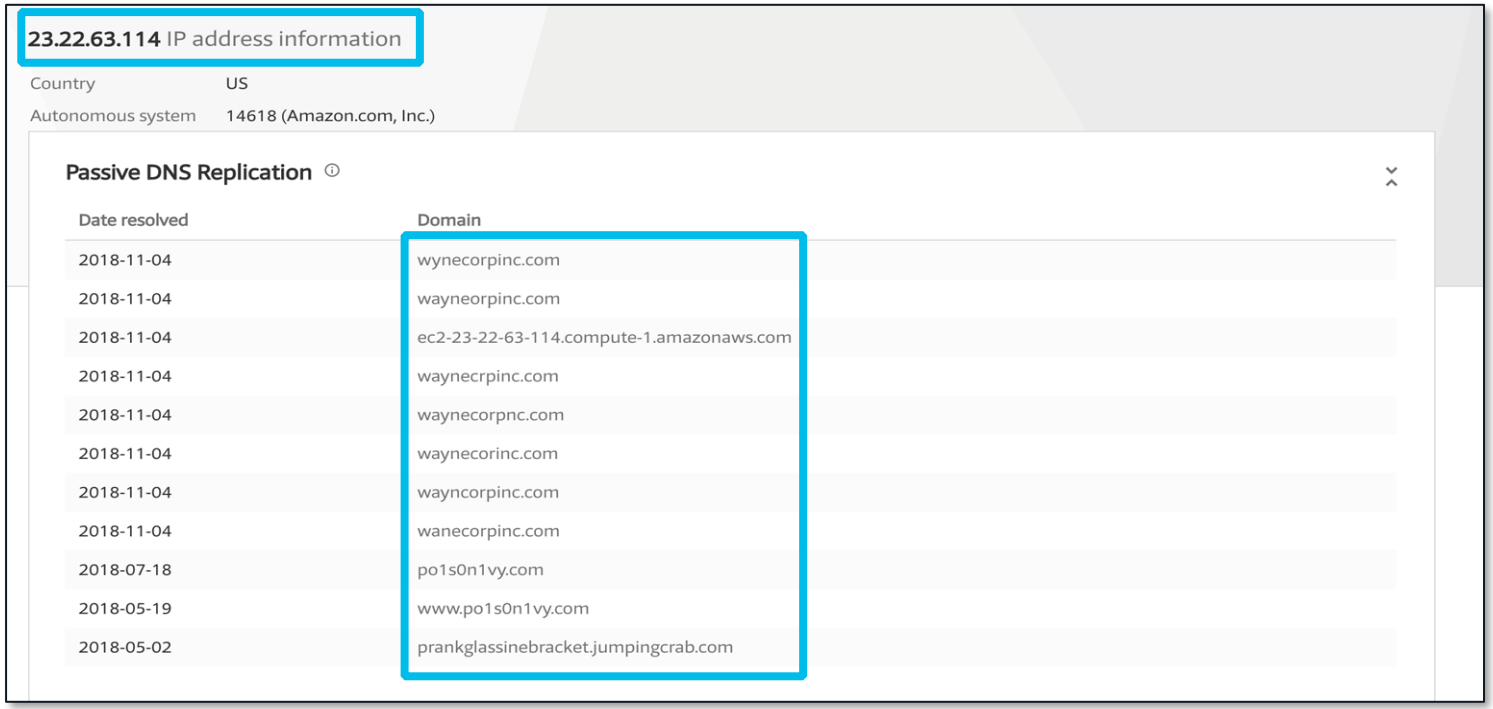
VirusTotal



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Using OSINT to identify attacker infrastructure

Kill Chain Phase: Weaponisation

- What IP address has P01s0n1vy tied to domains that are pre-staged to attack Wayne Enterprises?
  - 23.22.63.114

- Bonus Question: What additional domains were tied to that IP address?
  - wynecorpinc.com
  - wayneorpinc.com
  - waynecrpinc.com
  - waynecorpnc.com
  - waynecorinc.com
  - wayncorpinc.com
  - wanecorpinc.com
  - po1s0n1vy.com

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Kill Chain

IP Scanning the Web Server:
40.80.148.42
Web Vulnerability Scanner:
Acunetix
Which Web Server?:
192.168.250.70/Joomla

Executable Uploaded:
3791.exe
Hash of the Uploaded File:
AAE3F5A29935E6ABCC2C2754D12A9AF0

File that Defaced Our Web Server: poisonivy-is-coming-for-you-batman.jpeg

Attacker Infrastructure: wynecorpinc.com, wayncorpinc.com, waynecorinc.com, waynecrpinc.com, wayneorpinc.com, wanecorpinc.com, po1s0n1vy.com

Brute Force Attack Originated:
23.22.63.114
Identifying the First Password Attempted in a Brute Force Attack

Extracting Passwords from Events
Identifying the Password Used To Gain Access:
40.80.148.42
Determining The Elapsed Time Between Events

Fully Qualified Domain Name of the System that Defaced the Web Server:
prankglassinebracket.jumpingcrab.com

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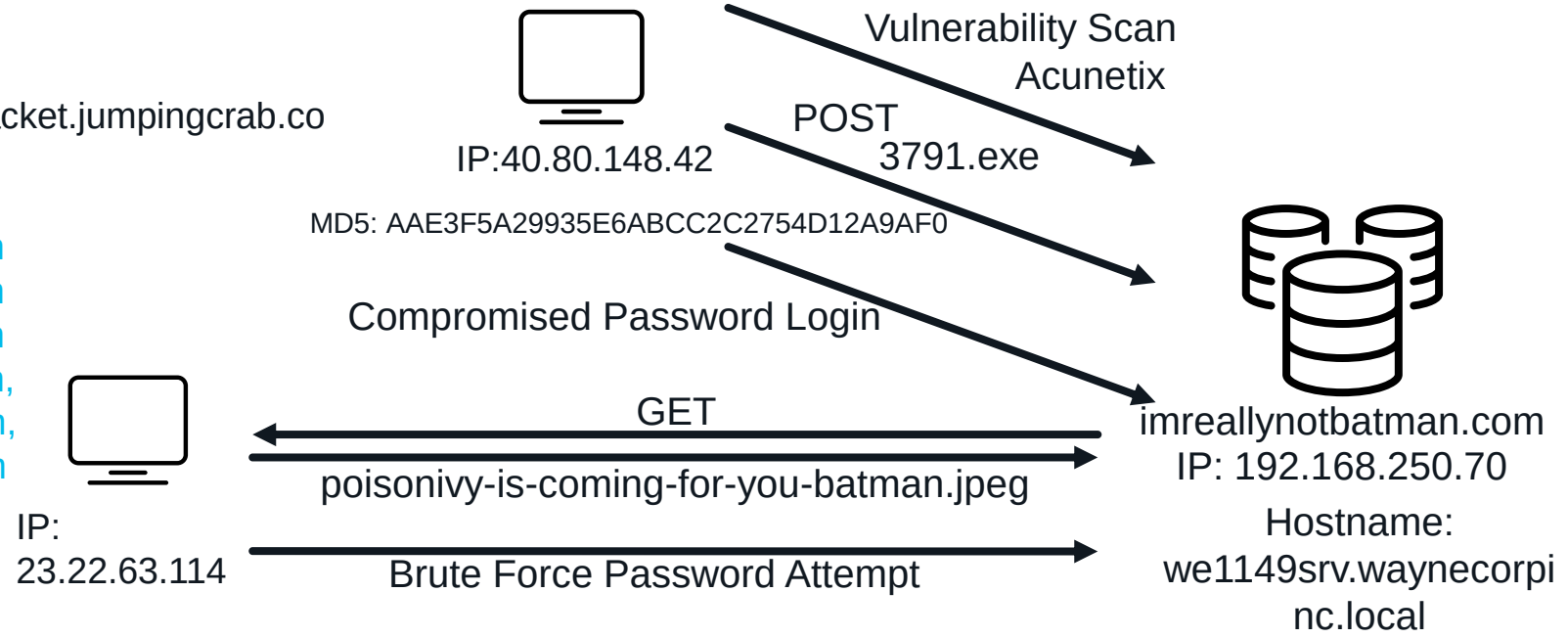
APT picture

DNS:
prankglassinebracket.jumpingcrab.com
Other Domains:
wynecorpinc.com
wayncorpinc.com
waynecorinc.com
waynecrpinc.com,
wayneorpinc.com,
wanecorpinc.com
po1s0n1vy.com



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Using OSINT to identify associated malware

Kill Chain Phase: Delivery

- GCPD reported that common TTPs (Tactics, Techniques, Procedures) for the P01s0n1vy APT group if initial compromise fails is to send a spear phishing email with custom malware attached to their intended target. This malware is usually connected to P01s0n1vy's initial attack infrastructure. Using research techniques, provide the SHA256 hash of this malware.

- Bonus Question: What is the name of the file that was matches the hash?

- Hints
  - The initial compromise was successful, so the email was never sent. Splunk will not contain the answer.
  - You have a number of indicators already collected, use these!
  - ThreatMiner, VirusTotal and Hybrid-Analysis are all good OSINT sites to look for malware

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Back to OSINT

- What do we know about the attack infrastructure from our earlier investigation?
  - IPs of Attack Infrastructure
  - List of Domains

- Anything else?

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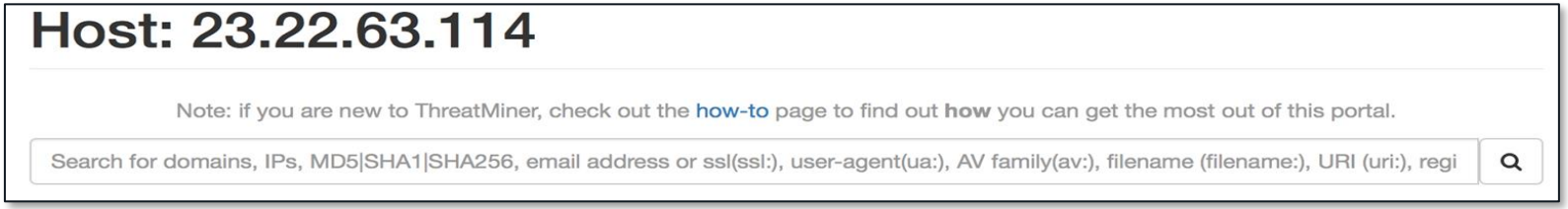
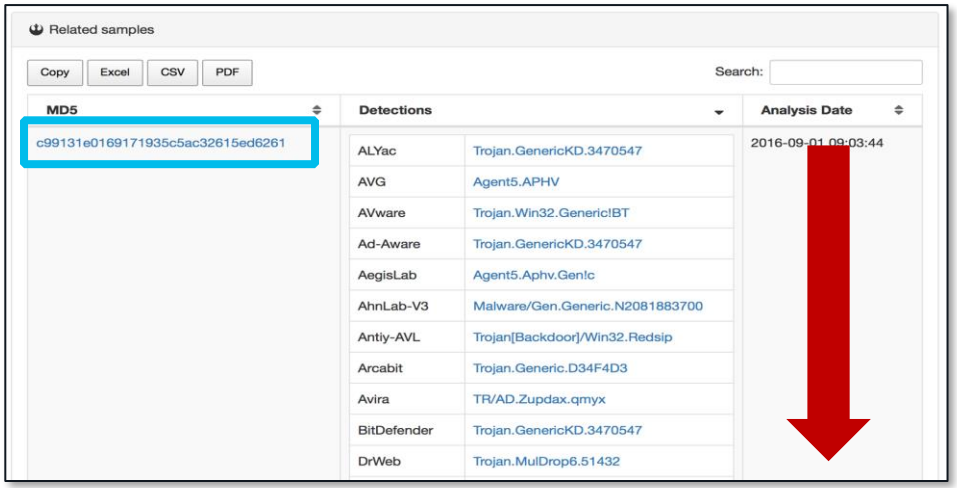
TheatMiner



- Threatminer can give me an MD5 of samples from 23.22.63.114 but not SHA256



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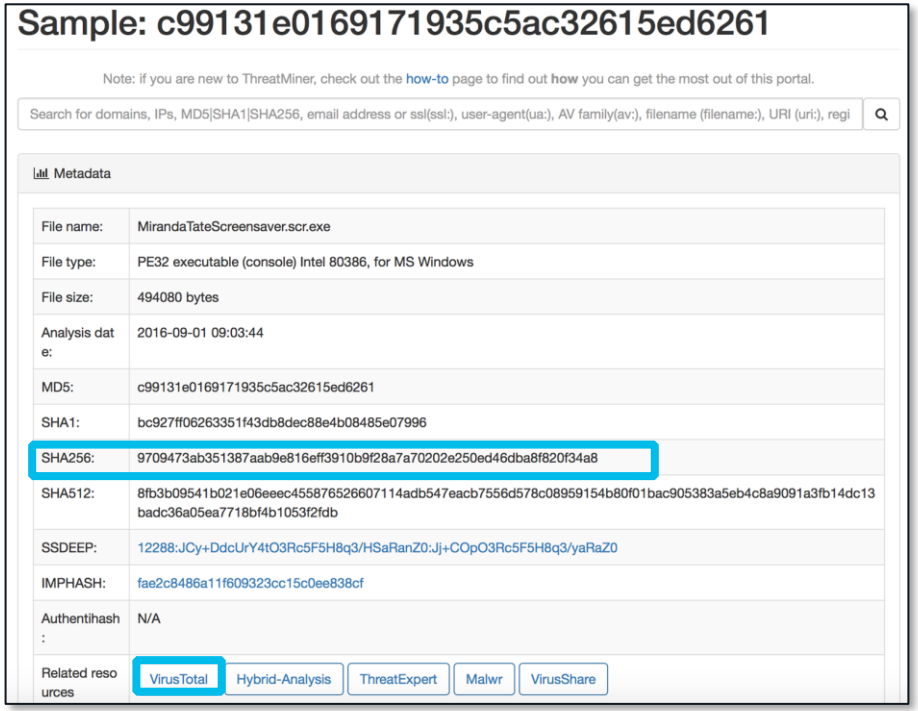
ThreatMiner - File Metadata



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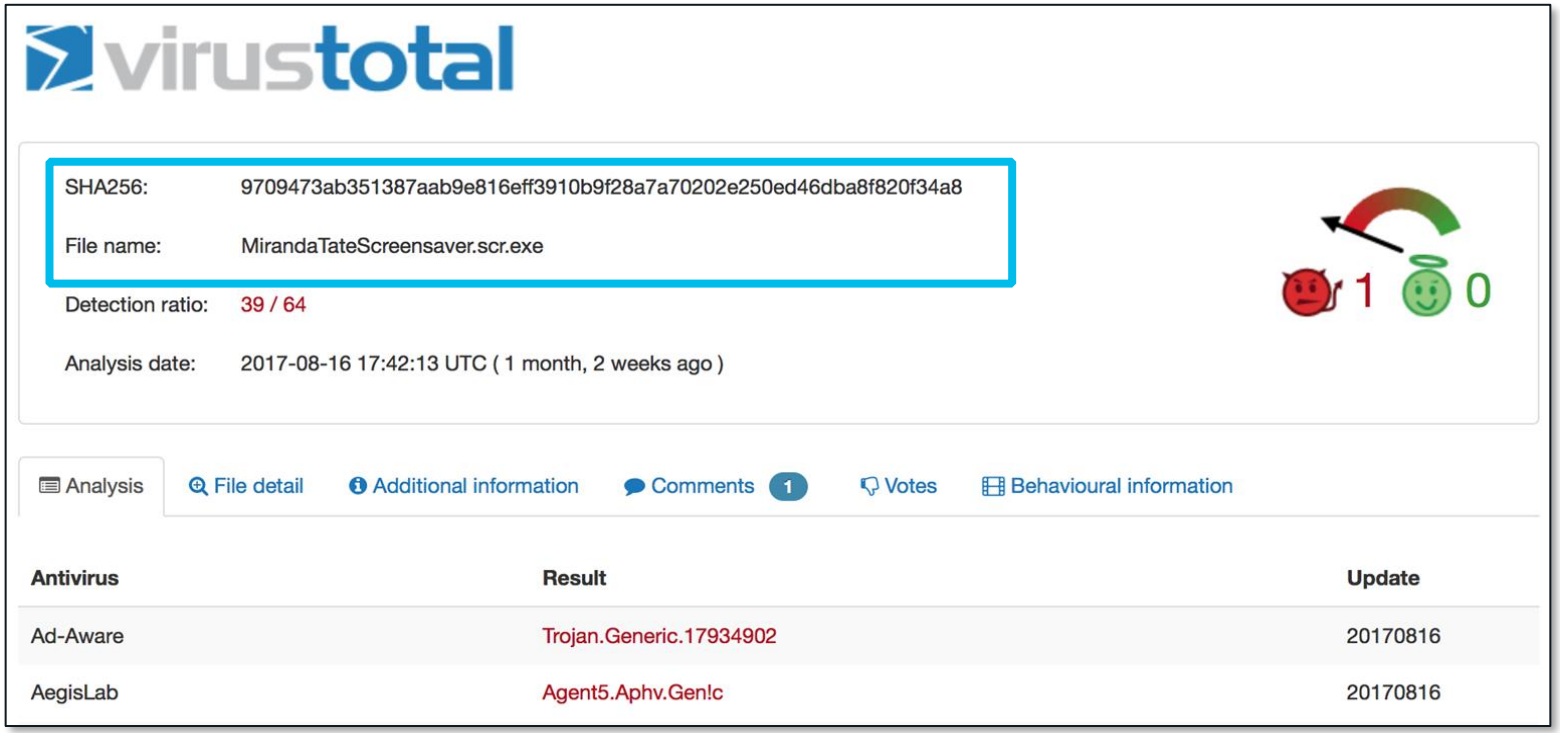
VirusTotal - File Hash



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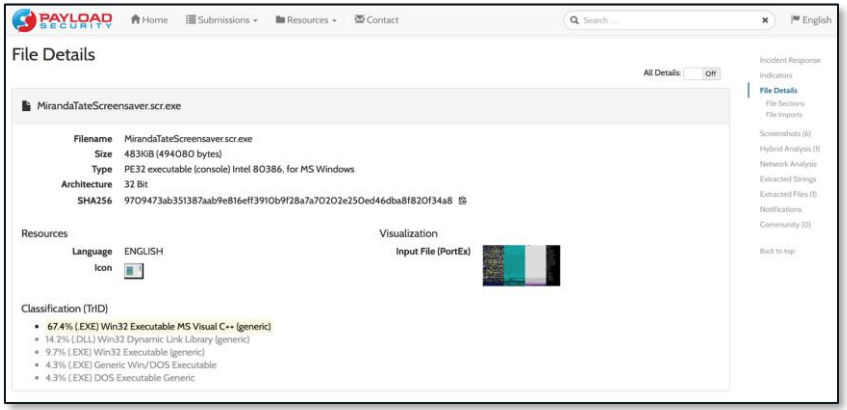
Using OSINT to identify associated malware

Kill Chain Phase: Delivery

- GCPD reported that common TTPs (Tactics, Techniques, Procedures) for the Po1s0n1vy APT group, if initial compromise fails, is to send a spear phishing email with custom malware attached to their intended target. This malware is usually connected to Po1s0n1vy's initial attack infrastructure. Using research techniques, provide the SHA256 hash of this malware.
  - 9709473ab351387aab9e816eff3910b9f28a7a70202e250ed46dba8f820f34a8

- Bonus Question: What is the name of the file that was matches the hash?
  - MirandaTateScreensaver.scr.exe

- Other sites of interest:
  - www.hybrid-analysis.com
  - virusshare.com



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IP Scanning the Web Server:
40.80.148.42
Web Vulnerability Scanner:
Acunetix
Which Web Server?:
192.168.250.70/Joomla

Using OSINT to Identify Associated Malware:
9709473ab351387aab9e816eff3910b9f28a7a70202e250ed46dba8f820f34a8
File Name:
MirandaTateScreensaver.scr.exe

Executable Uploaded:
3791.exe
Hash of the Uploaded File:
AAE3F5A29935E6ABCC2C2754D12A9AF0

File that Defaced Our Web Server: poisonivy-is-coming-for-you-batman.jpeg

Attacker Infrastructure: wynecorpinc.com, wayncorpinc.com, waynecorinc.com, waynecrpinc.com, wayneorpinc.com, wanecorpinc.com, po1s0n1vy.com

Brute Force Attack Originated:
23.22.63.114
Identifying the First Password Attempted in a Brute Force Attack
Extracting Passwords from Events
Identifying the Password Used To Gain Access:
40.80.148.42
Determining The Elapsed Time Between Events

Fully Qualified Domain Name of the System that Defaced the Web Server:
prankglassinebracket.jumpingcrab.com

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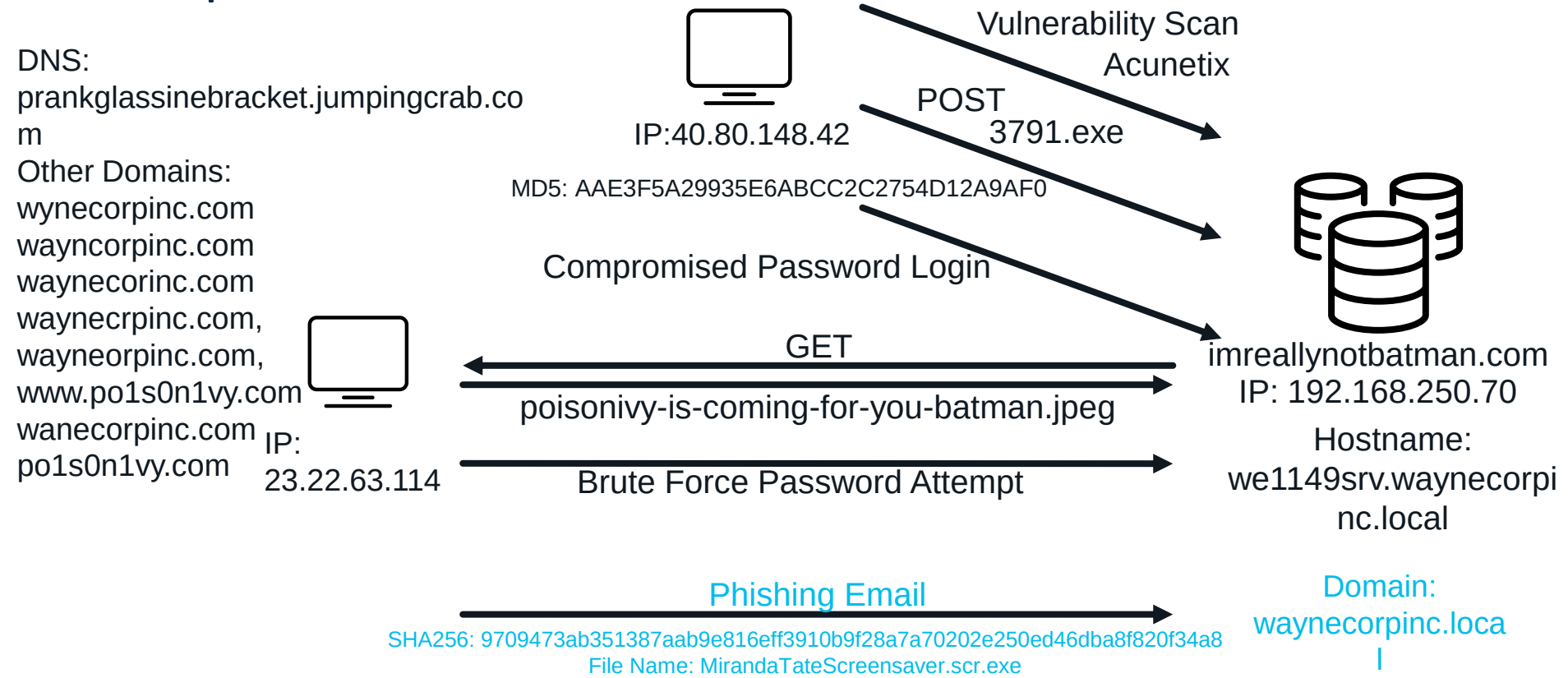
APT picture



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APT summary

- Scanned for vulnerabilities
- Found site is running Joomla
- Performed a brute force password scan, logged into Joomla, installed file upload modules
- Uploaded webshell
- Used webshell to upload reverse TCP shell
- Connected via metasploit
- Tried to move around but couldn't get out of locked down Windows 2012R2
- Defaced website with downloaded defacement image

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IP Scanning the Web Server:
40.80.148.42

Web Vulnerability Scanner:
Acunetix

Which Web Server?:
192.168.250.70/Joomla

Using OSINT to Identify Associated Malware:
9709473ab351387aab9e816eff3910b9f28a7a70202e250ed46dba8f820f34a8

File Name:
MirandaTateScreensaver.scr.exe

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Attacker Infrastructure: wynecorpinc.com, wayncorpinc.com, waynecorinc.com, waynecrpinc.com, wayneorpinc.com, wanecorpinc.com, po1s0n1vy.com

Brute Force Attack Originated:
23.22.63.114

Identifying the First Password Attempted in a Brute Force Attack

Extracting Passwords from Events

Identifying the Password Used To Gain Access:
40.80.148.42

Determining The Elapsed Time Between Events

Fully Qualified Domain Name of the System that Defaced the Web Server:
prankglassinebracket.jumpingcrab.com

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Overall APT picture

DNS:
prankglassinebracket.jumpingcrab.com
Other Domains:
wynecorpinc.com
wayncorpinc.com
waynecorinc.com
waynecrpinc.com,
wayneorpinc.com,
www.po1s0n1vy.com
wanecorpinc.com
po1s0n1vy.com

IP:40.80.148.42

Vulnerability Scan
Acunetix

POST
3791.exe

MD5: AAE3F5A29935E6ABCC2C2754D12A9AF0

Compromised Password Login

imreallynotbatman.com
IP: 192.168.250.70

IP:
23.22.63.114

GET

poisonivy-is-coming-for-you-batman.jpeg

Brute Force Password Attempt

Hostname:
we1149srv.waynecorpinc.local

Phishing Email

SHA256: 9709473ab351387aab9e816eff3910b9f28a7a70202e250ed46dba8f820f34a8
File Name: MirandaTateScreensaver.scr.exe

Domain:
waynecorpinc.local

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In summary

Use the data you have

- If you see gaps in coverage, consider expanding them
- Stream (wire data) and sysmon are good for detecting things AV or other security technologies may miss

Find web sites of value and save them for when you need them

Learn the Splunk commands

At search, if you don’t see the data you are looking for, find those additional fields

Use time picker to narrow the field of search

- Performance improvements and fewer results to examine

Pivot down on interesting fields and keep pivoting as needed

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Next steps

If you would like to work with this data set or practice the exercises from this workshop further, now you can!

- https://www.splunk.com/blog/2018/05/10/boss-of-the-soc-scoring-server-questions-and-answers-and-dataset-open-sourced-and-ready-for-download.html
- http://explore.splunk.com/BOTS_1_0_datasets

Looking for a Sandbox with the Data Sets?

- https://www.splunk.com/blog/2018/05/03/introducing-the-security-datasets-project.html
- http://live.splunk.com/splunk-security-dataset-project

If you load BOTS v1 data, the Boss of the SOC Investigation Workshop for Splunk app can be installed to practice some of the techniques used today

- This app is already embedded in the dataset project
- https://splunkbase.splunk.com/app/3985/

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BOSS Platform

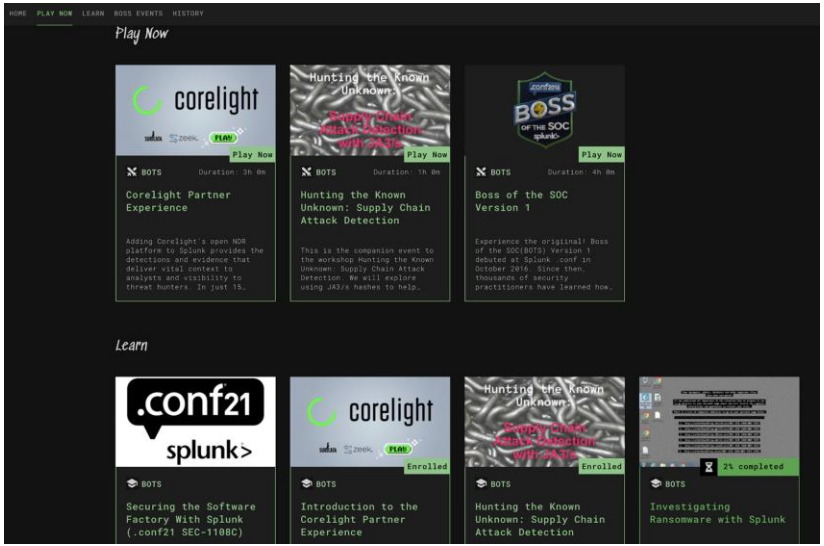
https://bots.splunk.com

24x7 Access

Login with Splunk.com account (just like Splunkbase)

Used for all BOTS competition events

More content to be added



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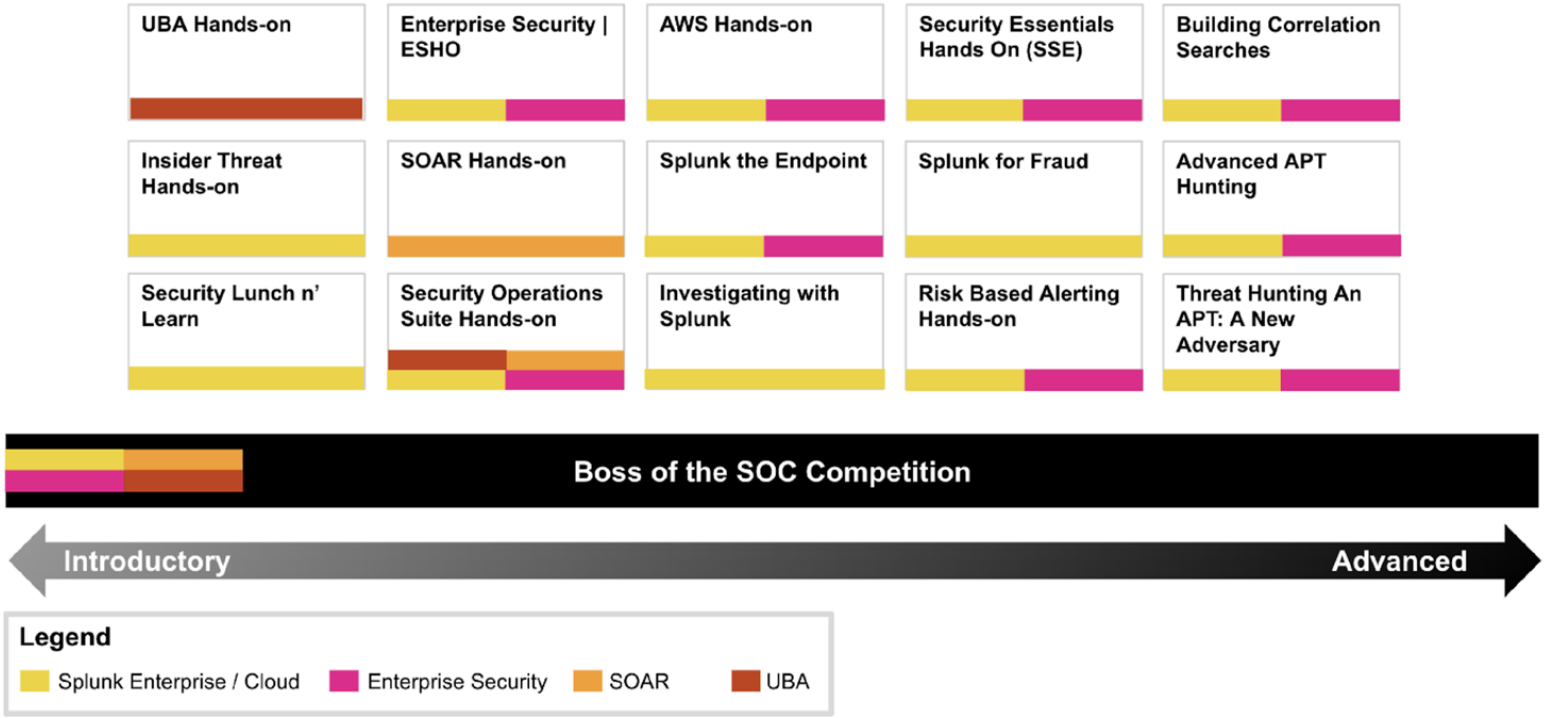
Splunk for security workshops



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Level 2
Room 204

Harness a Bold New Era: Transform Data Centre and Service Provider Connectivity

Level 2
Room 203

Securing User to Application and Everything in Between

Level 2
Melbourne Room 2

Unlocking Digital Resilience through Unified Observability

The HUB
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