

Defensive Security Project

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Monitoring Environment

Scenario

- We developed a comprehensive baseline for monitoring network activity within a company using Splunk, focusing on two key areas:
 - Apache web server logs and activity within a Windows environment.

By analyzing log data, including login failures, suspicious activity, and signature-based patterns, we were able to establish an effective baseline for creating alerts and generating reports.

This baseline was then used to assess attack logs and gain insights into ongoing network activity, helping to identify and investigate potential security incidents.

Logs Analyzed

1

Windows Logs

Event Severity and Failures:

- Logs track the severity of events and failed login attempts, helping identify issues like brute force attacks or misconfigurations.

Successful Logins:

- Records successful logins, user IDs, and timestamps, highlighting unusual login patterns that could indicate suspicious behavior.

User Account Changes:

- Tracks account lockouts, password resets, and deletions, which can point to malicious activity or system mismanagement.

Logon Attempts:

- Captures failed logins, signaling potential brute force attacks or unauthorized access attempts.

Signature and User Activity:

- Logs user activities (e.g., password resets), allowing you to detect suspicious behavior and correlate events with specific users.

2

Apache Logs

HTTP Methods:

- Logs HTTP request methods (e.g., **GET**, **POST**) and their counts, helping identify potential attacks like DDoS or brute force.

Referrer Data:

- Tracks where requests are coming from, helping spot suspicious or unexpected traffic sources.

HTTP Response Codes:

- Records server response codes (e.g., 404, 500), with high 404 counts possibly indicating probing or reconnaissance.

International Traffic:

- Tracks the geographical origin of traffic, highlighting suspicious activity from unusual locations.

URI Data:

- Logs the exact endpoints being accessed, helping identify targeted resources or exploited vulnerabilities.

Windows Logs

Reports—Windows

Designed the following reports:

Report Name	Report Description
Report Analysis for Severity	<ul style="list-style-type: none">Logs track the severity of events (High or Informational)
Report Analysis for Failed Activities	<ul style="list-style-type: none">Logs failed login attempts, helping identify issues like brute force attacks or misconfigurations.
Report for Signature analysis	<ul style="list-style-type: none">Logs user activities (e.g., password resets), allowing you to detect suspicious behavior and correlate events with specific users.

Severity

Level of high severity events during normal operations

New Search

Save As ▾ Create Table View Close

```
source="windows_server_logs.csv" host="Windows_server_logs" sourcetype="csv" | stats count as total by severity | eventstats sum(total) as grand_total | eval percentage = (total / grand_total) * 100
```

All time ▾ Q

✓ 4,764 events (before 2/11/25 12:19:26.000 AM) No Event Sampling ▾ Job ▾ II ■ ↻ ⏪ ⏴ Verbose Mode ▾

Events (4,764) Patterns Statistics (2) Visualization

Show: 100 Per Page ▾ Format ▾ Preview: On

severity	total	grand_total	percentage
high	329	4764	6.905961376994123
informational	4435	4764	93.09403862300589

Signature ID's

signature	signature_id
A user account was deleted	4726
A process has exited	4689
Special privileges assigned to new logon	4672
A logon was attempted using explicit credentials	4648
A privileged service was called	4673
The audit log was cleared	1102
Domain Policy was changed	4739
An attempt was made to reset an accounts password	4724
System security access was granted to an account	4717
An account was successfully logged on	4024
A user account was changed	4738
A user account was locked out	4740
A user account was created	4729
A computer account was deleted	4743
System security access was removed from an account	4718

Logs in Windows previews to the attack gives us the main ID's of activities in the logs

Baseline Success and Failures

Successful vs. failed activities during normal operations

New Search

source="windows_server_logs.csv" host="Windows_server_logs" sourcetype="csv" | stats count as total by status | eventstats sum(total) as grand_total | eval percentage = (total / grand_total) * 100

All time 

✓ 4,764 events (before 2/11/25 12:40:00.000 AM) No Event Sampling ▾ Job ▾        Verbose Mode ▾

Events (4,764) Patterns Statistics (2) Visualization

Show: 100 Per Page ▾ Format ▾ Preview: On

status	total	grand_total	percentage
failure	142	4764	2.980688497061293
success	4622	4764	97.0193115029387

Alerts—Windows

Designed the following alerts:

Alert Name	Alert Description	Alert Baseline	Alert Threshold
User Account Deleted	Looks for user account deleted events	threshold set to greater than 13.5	13 >
Failed Windows Activity	Checks for failures in Windows logs	baseline average showed greater than 5.9	Alert was set to greater than 6
Successful Logins	Checks for too many successful logins	determined average was 14	Alert was set to greater than 14

User Account Deleted

Alert to notify SOC of abnormal user account deletions

Edit Alert

Edit Alert

Trigger Actions

+ Add Actions ▾

When triggered

Send email

To: SOC@VSI-company.com

Remove

Comma separated list of email addresses.
Email addresses represented by tokens are
validated only at the time of the search.
[Show CC and BCC](#)

Priority: Normal ▾

Subject: Splunk Alert: User account deleted

The email subject, recipients and message
can include tokens that insert text based on
the results of the search. [Learn More](#)

Message: Sig ID 4726_account deleted
greater than 13.5 events per hour

Settings

Alert: User Account Deleted

Description: threshold per hour greater than 13.5

Alert type: Scheduled

Run every hour ▾

At: 0 minutes past the hour

Expires: 24 day(s) ▾

Trigger Conditions

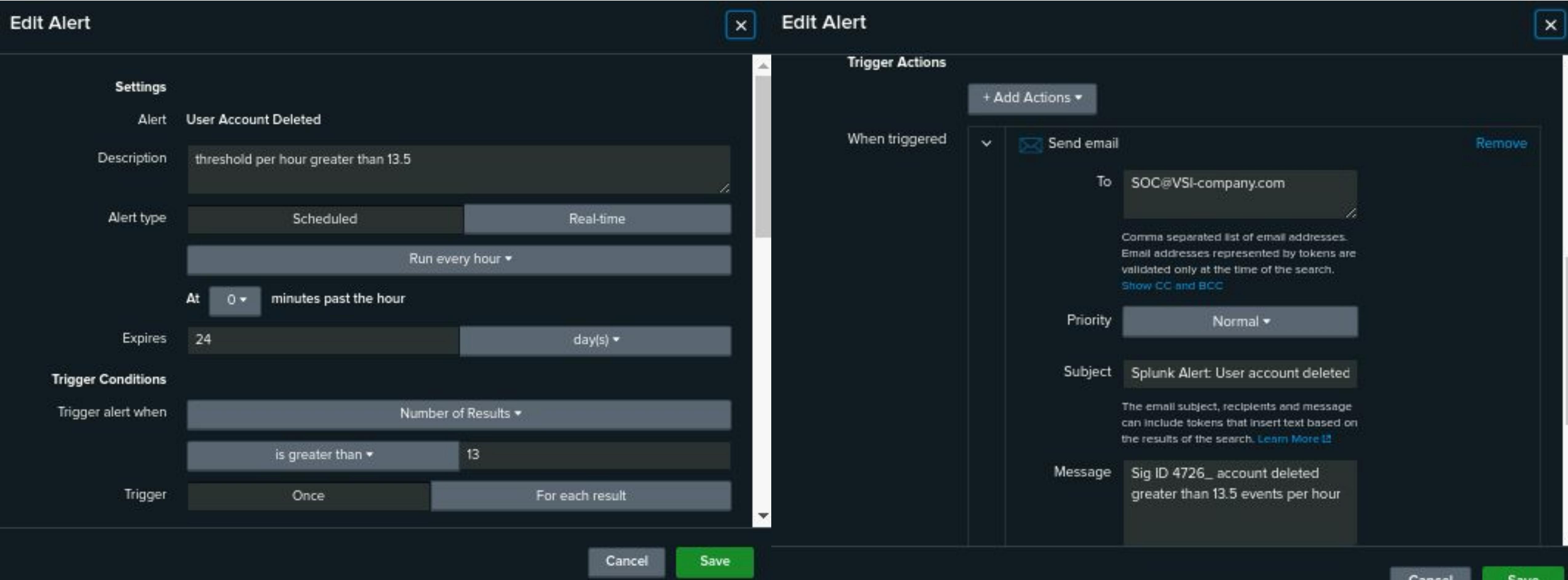
Trigger alert when: Number of Results ▾

is greater than ▾: 13

Trigger: Once For each result

Cancel Save

Cancel Save



Failed Windows activity

Alert to notify SOC of abnormal failed Windows activity

Save As Alert

Settings

Title: Failed Events - failures per hour

Description: Greater than 5.9 failures per hour (average)

Permissions: Shared in App

Alert type: Scheduled
Run every hour ▾

At 0 minutes past the hour

Expires 24 day(s) ▾

Trigger Conditions

Cancel Save

Save As Alert

validated only at the time of the search.
[Show CC and BCC](#)

Priority: High ▾

Subject: Splunk Alert: Too Many Failures

The email subject, recipients and message can include tokens that insert text based on the results of the search. [Learn More](#) ▾

Message: Alert generated due to: too many failures over the set threshold were found.

Include:

- Link to Alert
- Link to Results
- Search String
- Inline [Table](#) ▾
- Trigger Condition
- Attach CSV

Cancel Save

Successful Logins

Alert to notify SOC of abnormal successful logins

Edit Alert

Edit Alert

Trigger Actions

+ Add Actions ▾

When triggered

Send email

To: SOC@VSI-company.com

Comma separated list of email addresses.
Email addresses represented by tokens are
validated only at the time of the search.
Show CC and BCC

Priority: Normal ▾

Subject: Splunk Alert: User account Login L

The email subject, recipients and message
can include tokens that insert text based on
the results of the search. [Learn More](#)

Message: The alert condition was triggered.
too many logins per hour

Settings

Alert: Account logins per hour

Description: threshold per hour greater than 14

Alert type: Scheduled (selected) Real-time

Run every hour ▾

At: 0 minutes past the hour

Expires: 24 day(s) ▾

Trigger Conditions

Trigger alert when: Number of Results ▾

is greater than ▾ 14

Trigger: Once For each result

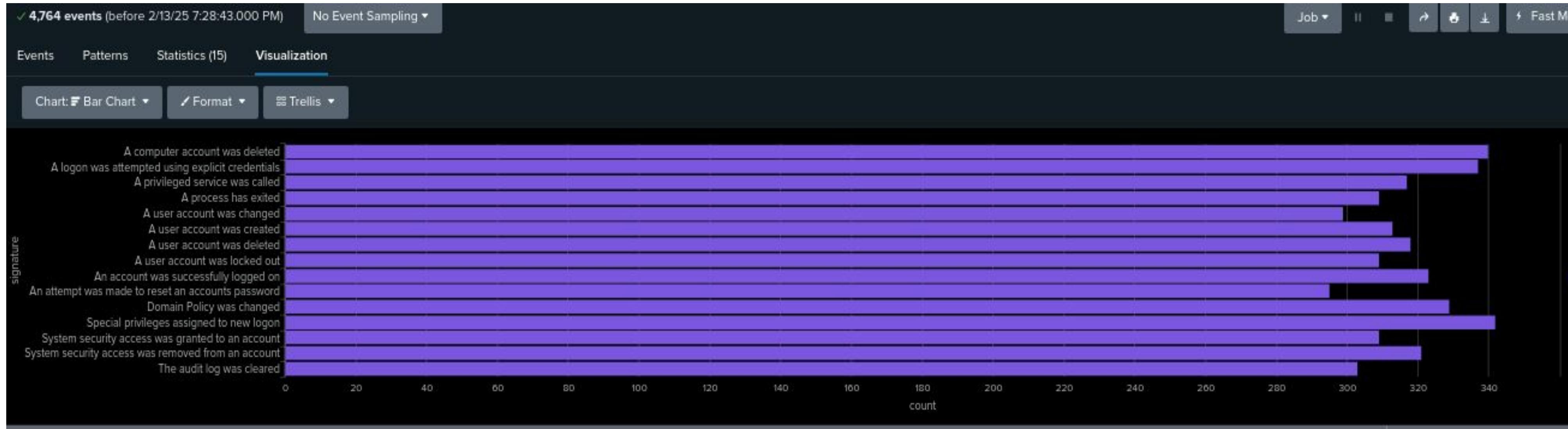
Cancel Save

Cancel Save

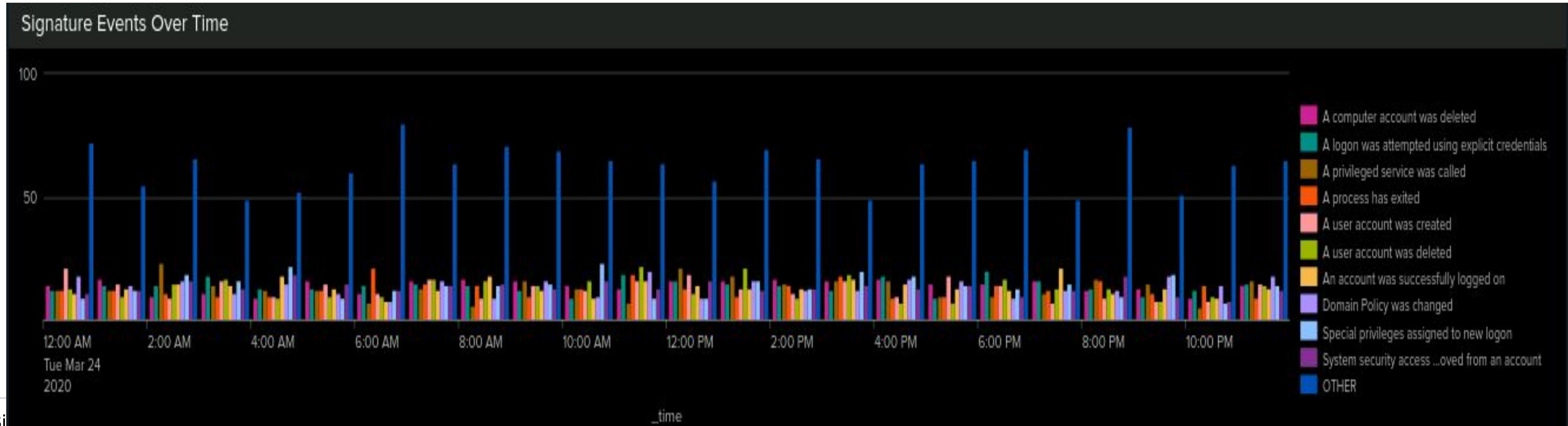
This screenshot shows the 'Edit Alert' interface in Splunk. On the left, the 'Settings' section is visible, containing fields for the alert name ('Account logins per hour'), description ('threshold per hour greater than 14'), alert type ('Scheduled' selected), run frequency ('Run every hour'), and expiration ('24 days'). Below this is the 'Trigger Conditions' section, which defines the alert triggers based on the number of results being greater than 14. On the right, the 'Trigger Actions' section is shown, specifically the 'Send email' action. It is configured to send an email to 'SOC@VSI-company.com' with a priority of 'Normal' and a subject of 'Splunk Alert: User account Login L'. The message body is set to 'The alert condition was triggered. too many logins per hour'. At the bottom, there are 'Cancel' and 'Save' buttons.

Dashboards—Windows

Signature Activity



Based on the signature's activities we can see their total frequency and the hourly frequency of such activities before the attack



Dashboards—Windows

User Activity



These graphs give us an insight on the total activity per user before the attack and the hourly activity per hour

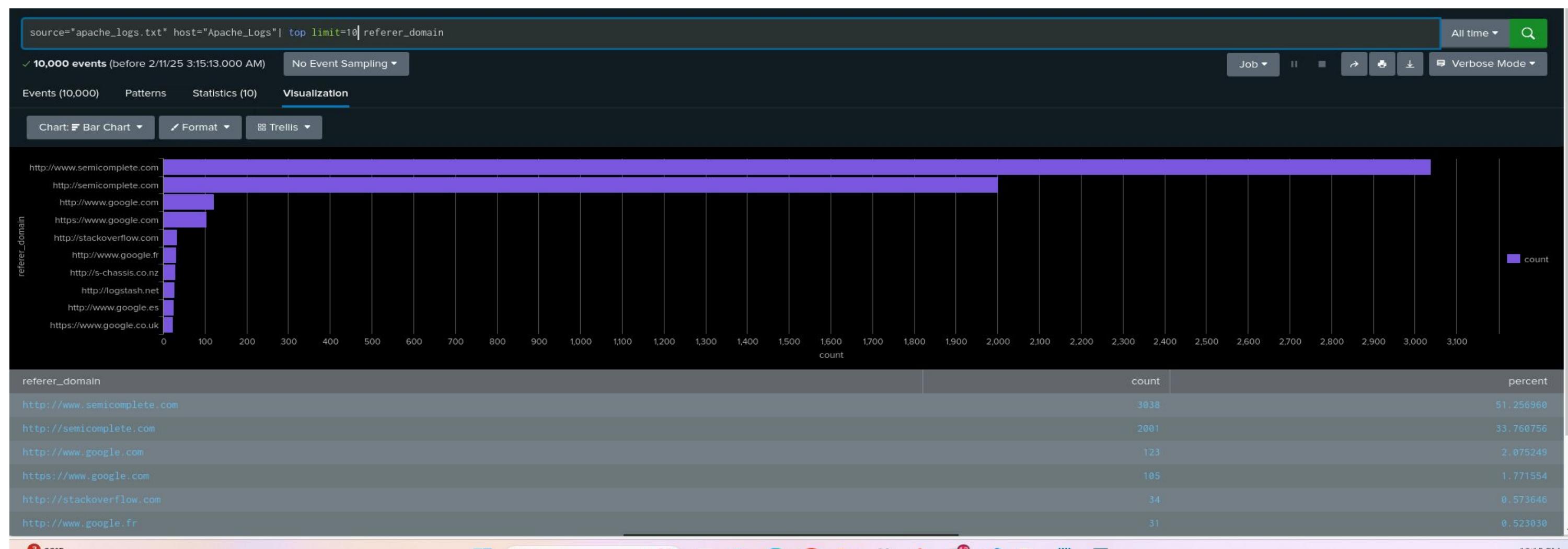
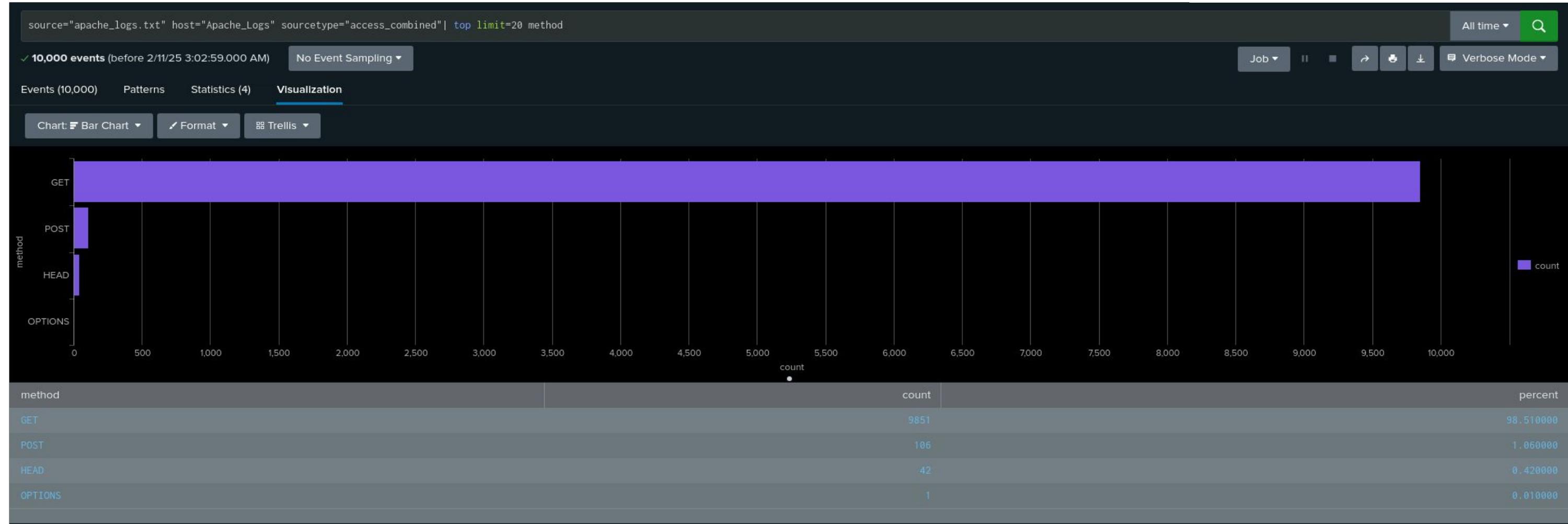
Apache Logs

Reports—Apache

Designed the following reports:

Report Name	Report Description
Different HTTP Methods Report	<ul style="list-style-type: none">● This report shows a table of different HTTP methods that gives a better look at the type of HTTP activity that is being requested against the VSI web server.
Top 10 Referred Domains Report	<ul style="list-style-type: none">● This report generates the top 10 domains can be identified as suspicious referrers that may be used for malicious purposes.
HTTP Response Code Report	<ul style="list-style-type: none">● This report shows suspicious levels of HTTP responses.

Images of Reports—Apache



To see the activities of the Apache's server before the attack we made graphs that measures the HTTP requests and top domains

Alerts—Apache

Designed the following alerts:

Alert Name	Alert Description	Alert Baseline	Alert Threshold
Hourly Activity Based on Countries	Showcase the activity in the server relative to the country	73.095	74

JUSTIFICATION: We took the average alerts per hour and used that as the baseline. We raised it to create the threshold.

Alerts—Apache

Designed the following alerts:

Alert Name	Alert Description	Alert Baseline	Alert Threshold
Hourly Alert for HTTP POST activity	The activity will showcase POST request activities in the server	100	150

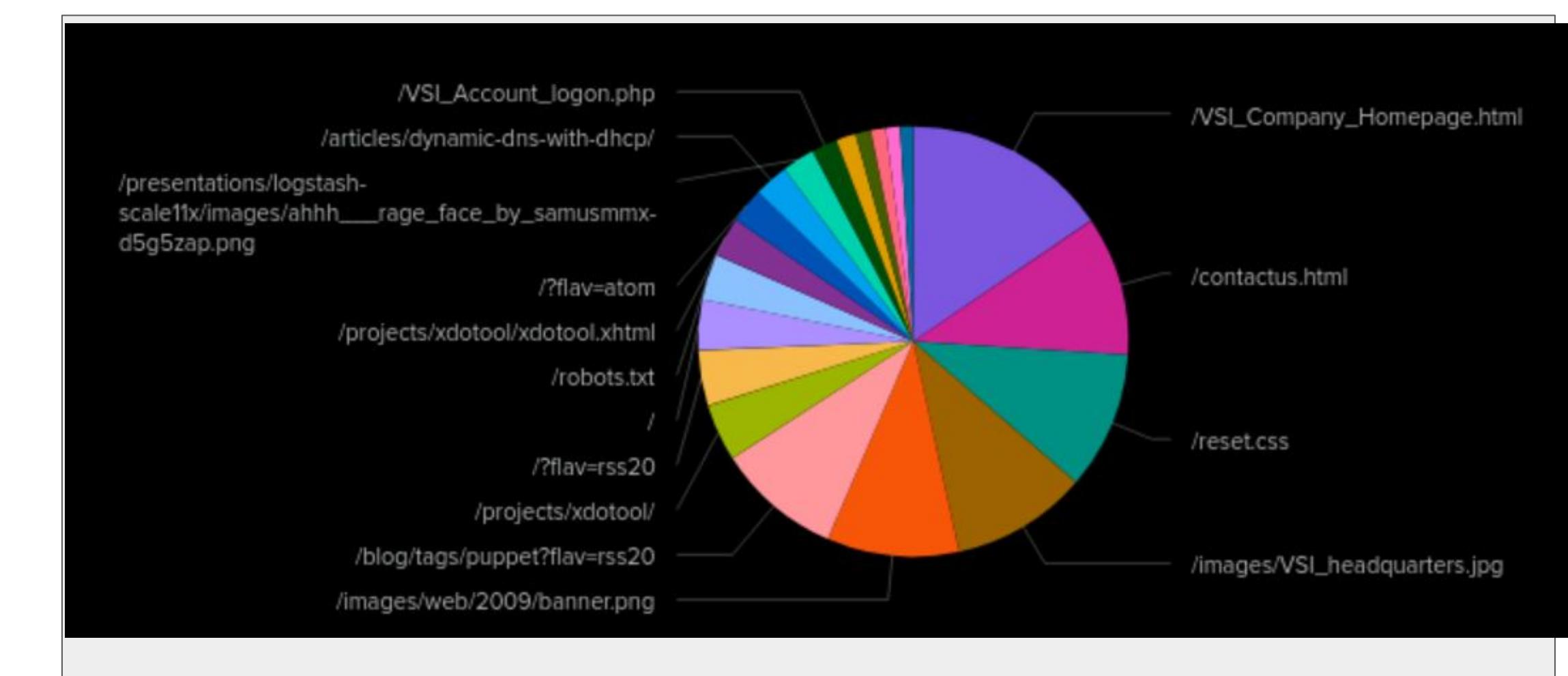
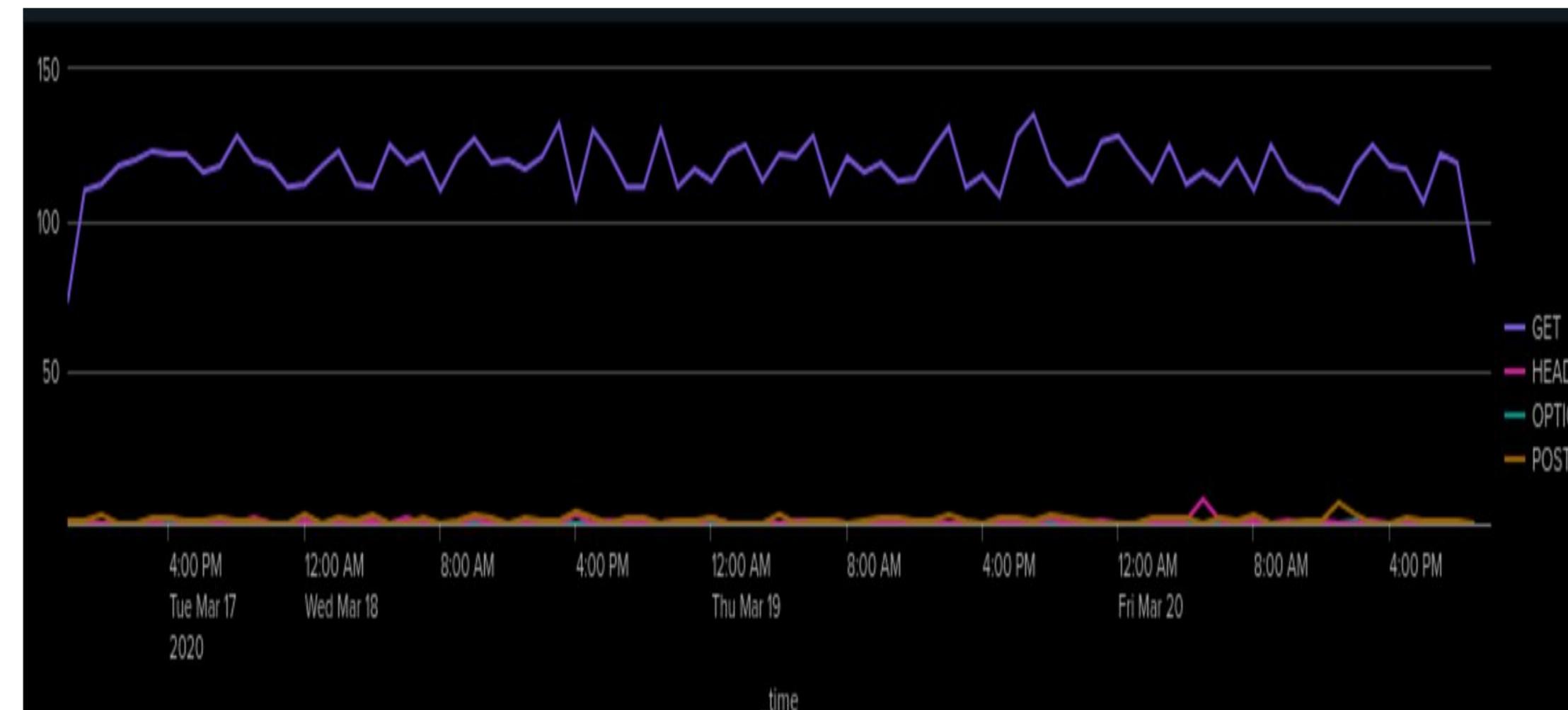
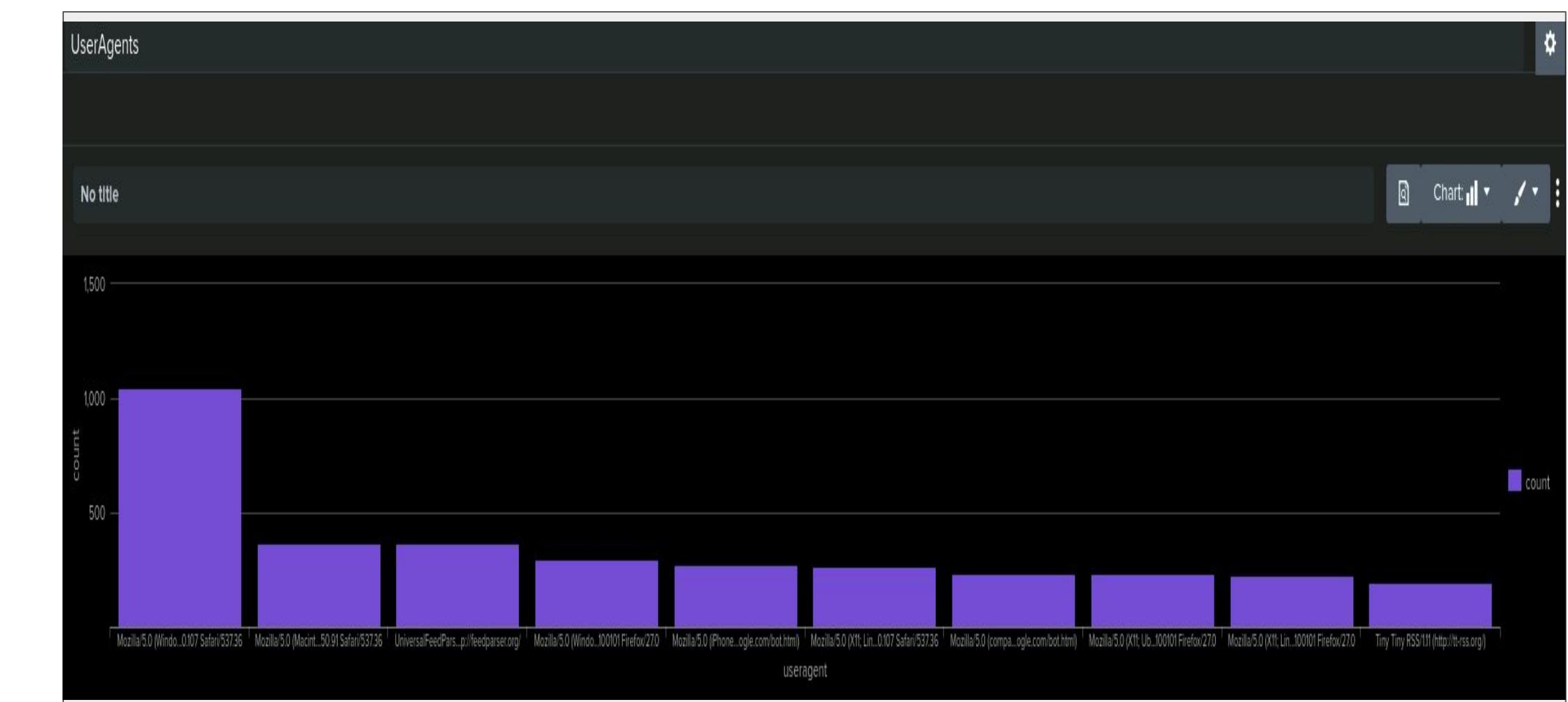
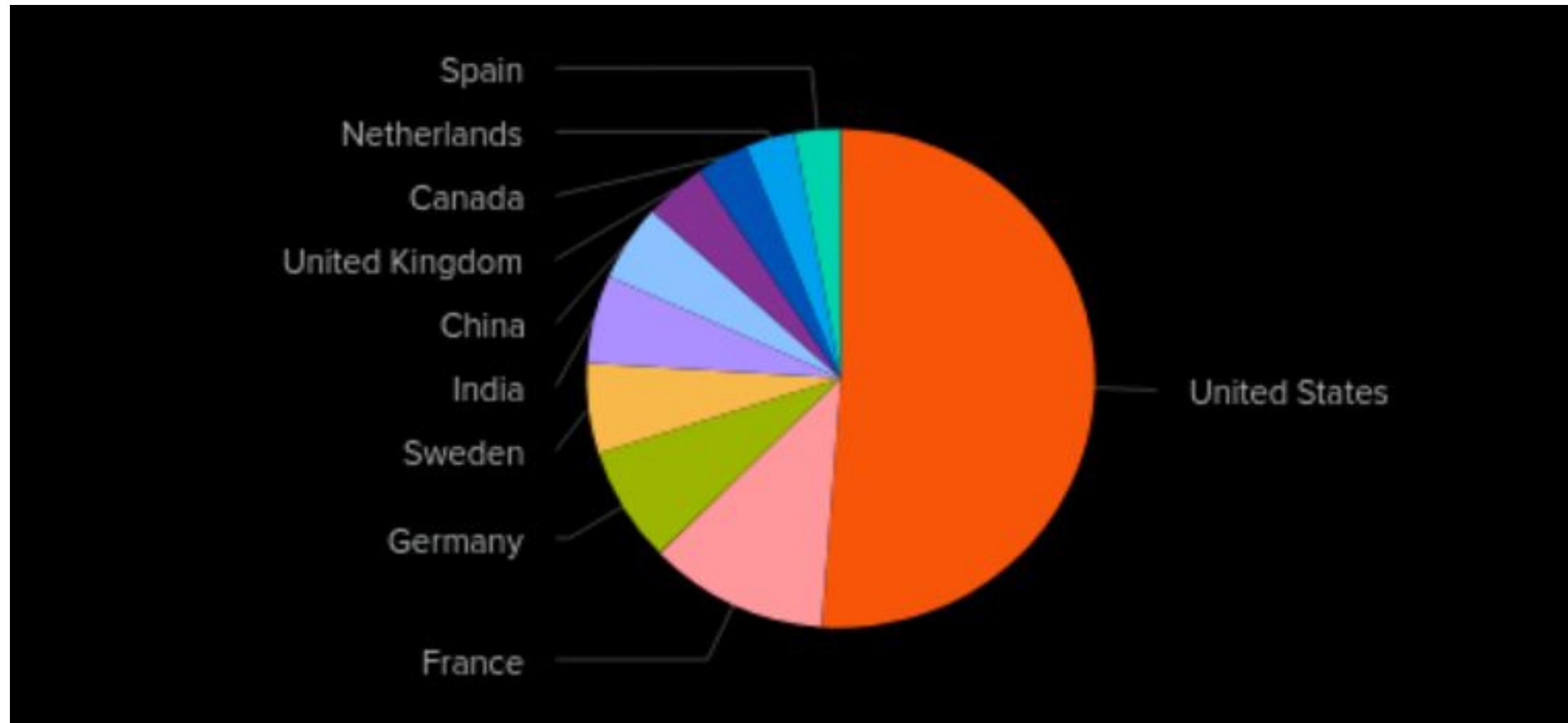
JUSTIFICATION: The average POST request went from 75 to a 100

Dashboards-Apache



Besides the top domains and the requests, we wanted to have a clear picture from where the traffic was coming from through the following graph

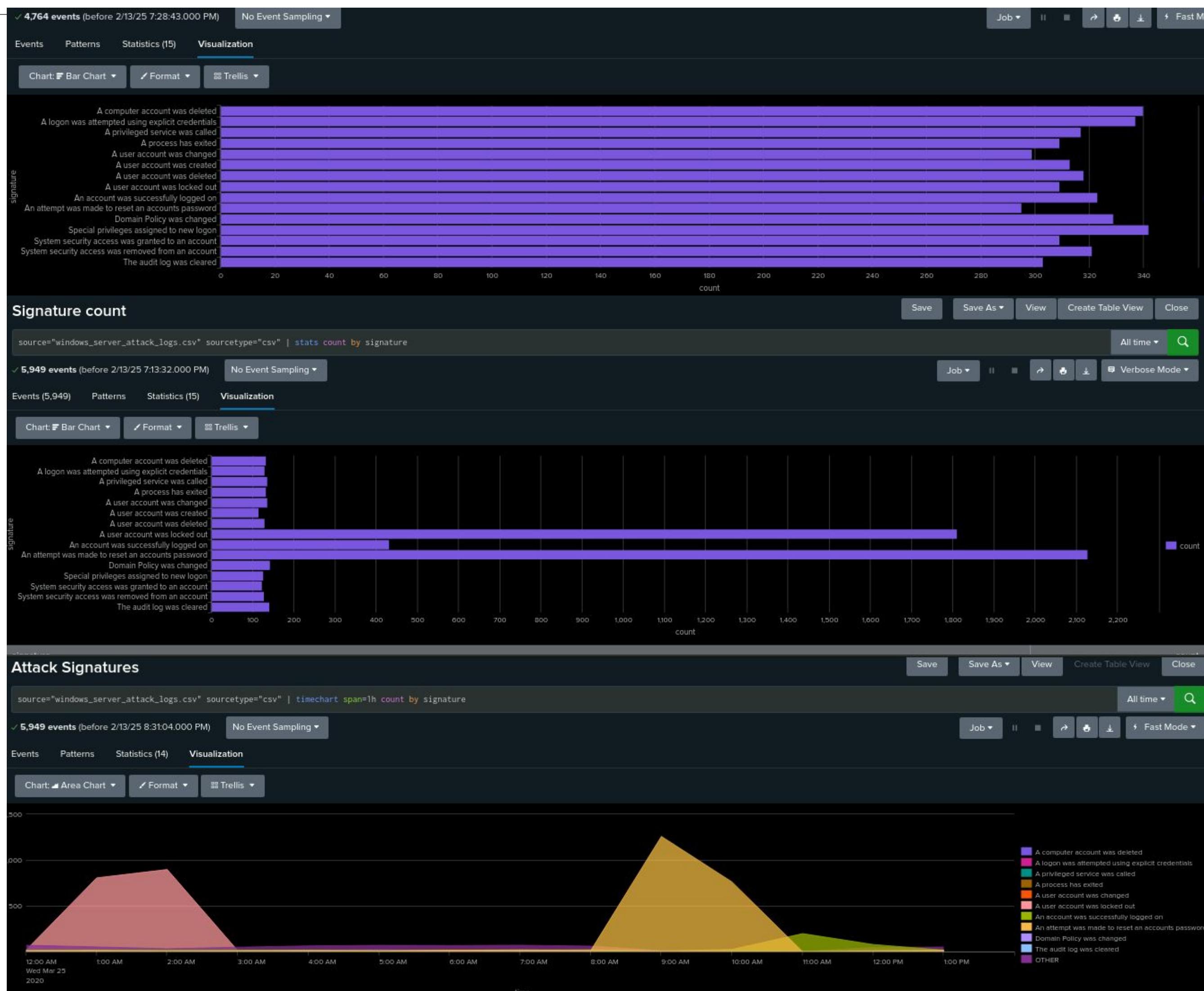
Dashboards—Apache



Attack Analysis

Attack Summary—Windows Signature Data

Windows Signature
Baseline:



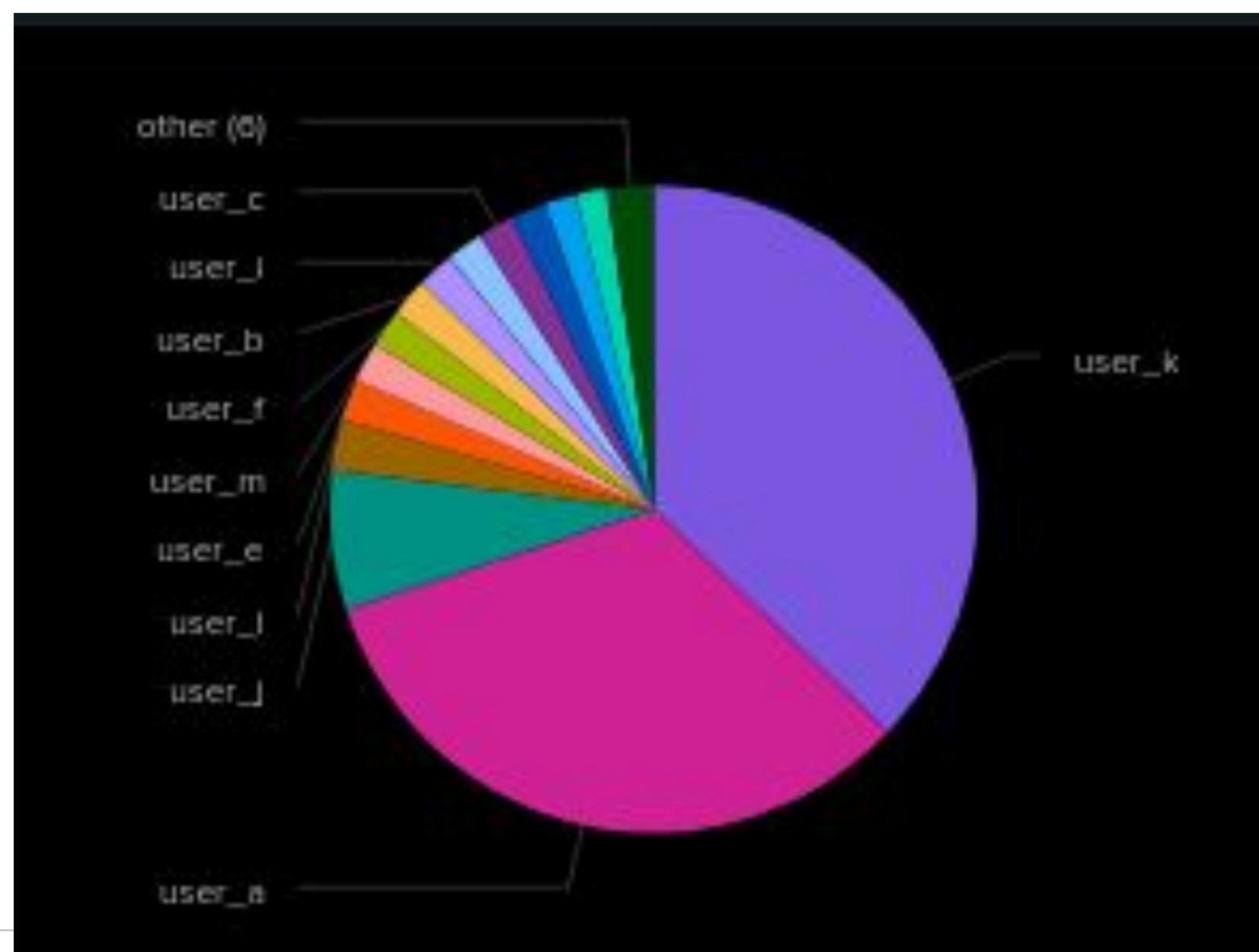
Windows Attack Signature:

The above images show a comparison between 2 different charts against the established baseline. The top image is the baseline of all signatures and the two images below show various spikes in the data against the established baseline. This indicates there was a possible attack.

Screenshots of Windows User Attack Logs



The area chart here shows the number of events per user over a span of ~12hrs. As you can see, the chart indicates that 2 users have an increase number of events from 12am-3am(user A) and an increase in the number of events from 8:00am-11:00am(user k).



The pie chart indicates that User A and user K were both attempting separate events at different times. These two charts together show a direct correlation between the pie chart data and the data for users. Together, they confirm that there was suspicious activity occurring on these 2 user accounts.

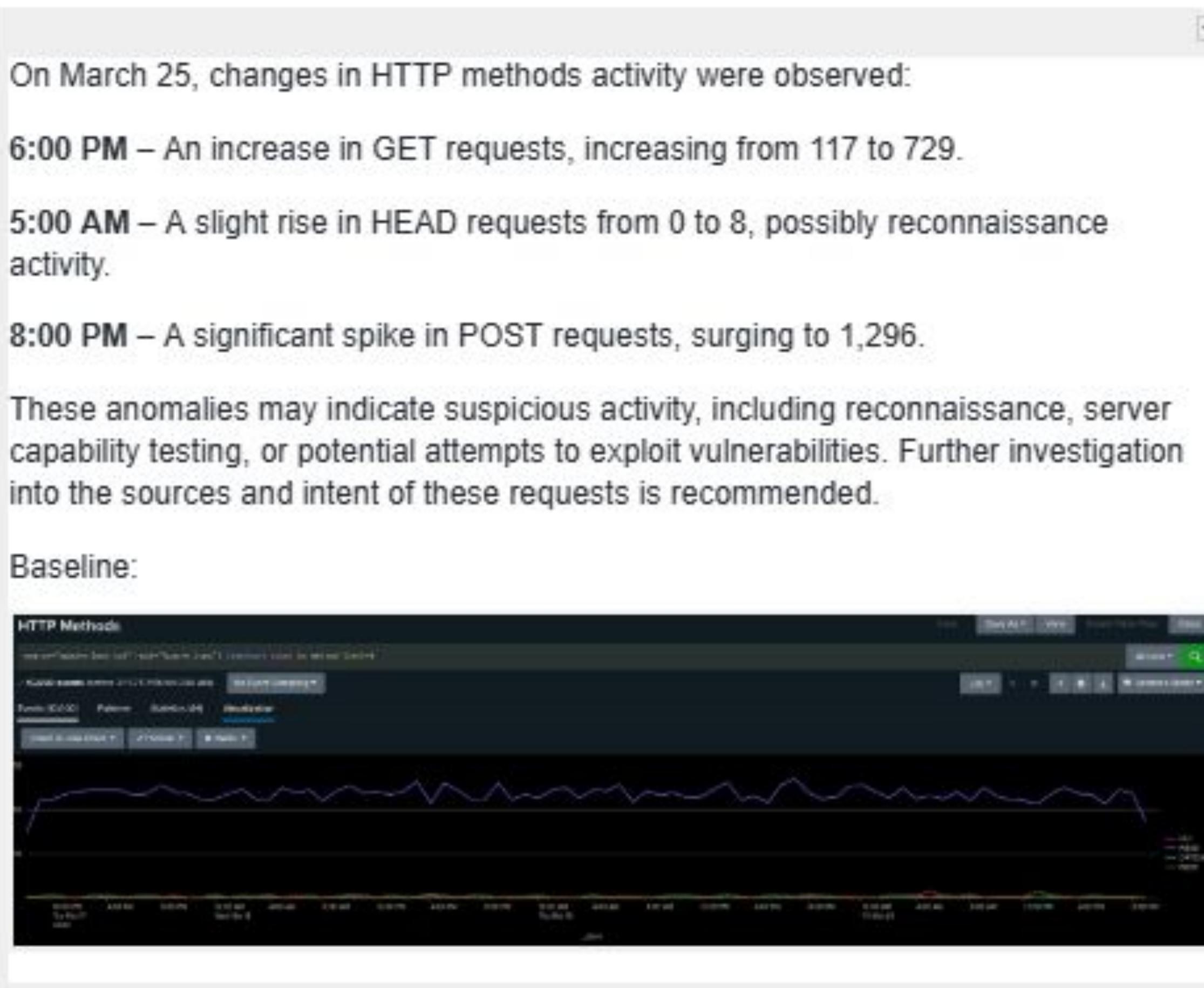
Attack Summary-

- What signatures stand out?
 - Password resets and User account lockouts
- What time did it begin and stop for each signature?
 - User accounts were locked out - 25 March 2020 00:00-03:00
 - An attempt was made to reset an accounts password - 25 March 2020 08:00-11:00
- What is the peak count of the different users?
 - User A - 984
 - User K - 1256
- When did it occur?
 - User A was logging in over 1600 times between 0100-0300
 - User K was logging in over 1900 times between 0900-1100
- The graphs provides an illustration of the significant number of attacks via Brute Force and password reset attempts were made. Resulting in user lockout.

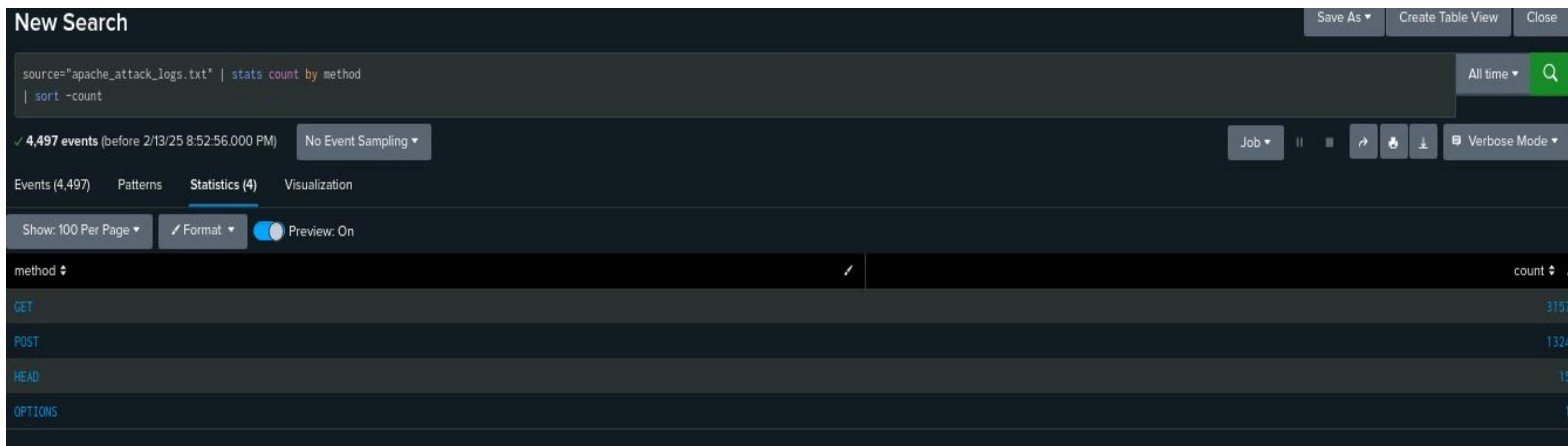
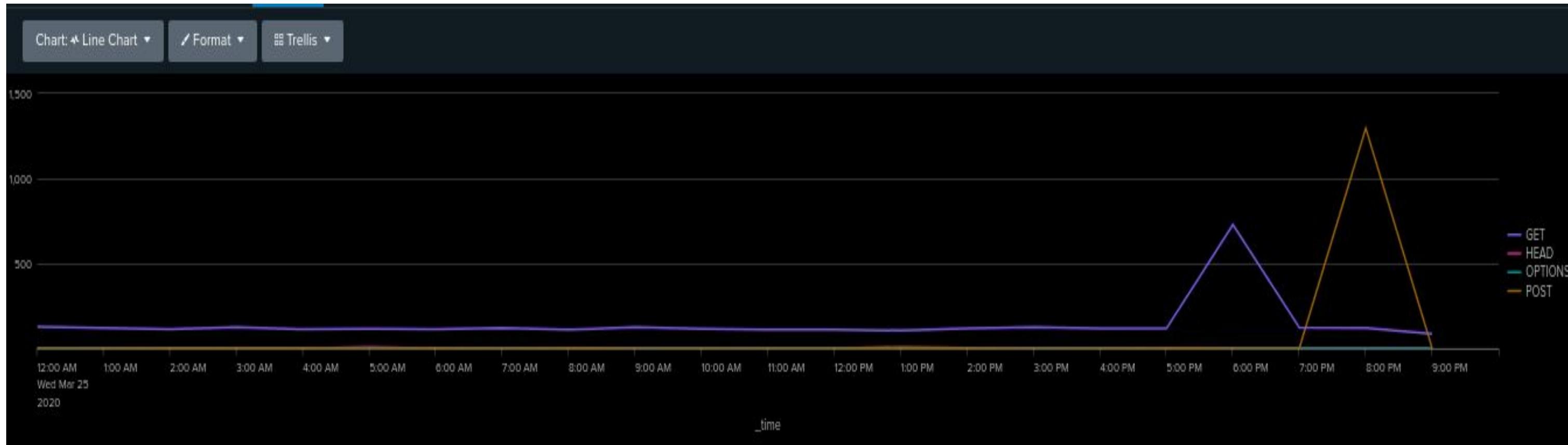
Attack Summary—Apache

Report Analysis for Methods

- Did you detect any suspicious changes in HTTP methods? If so, which one?



Attack Summary—Apache



After the attack we can see the spike on GET and POST requests between 5 pm and 9 pm

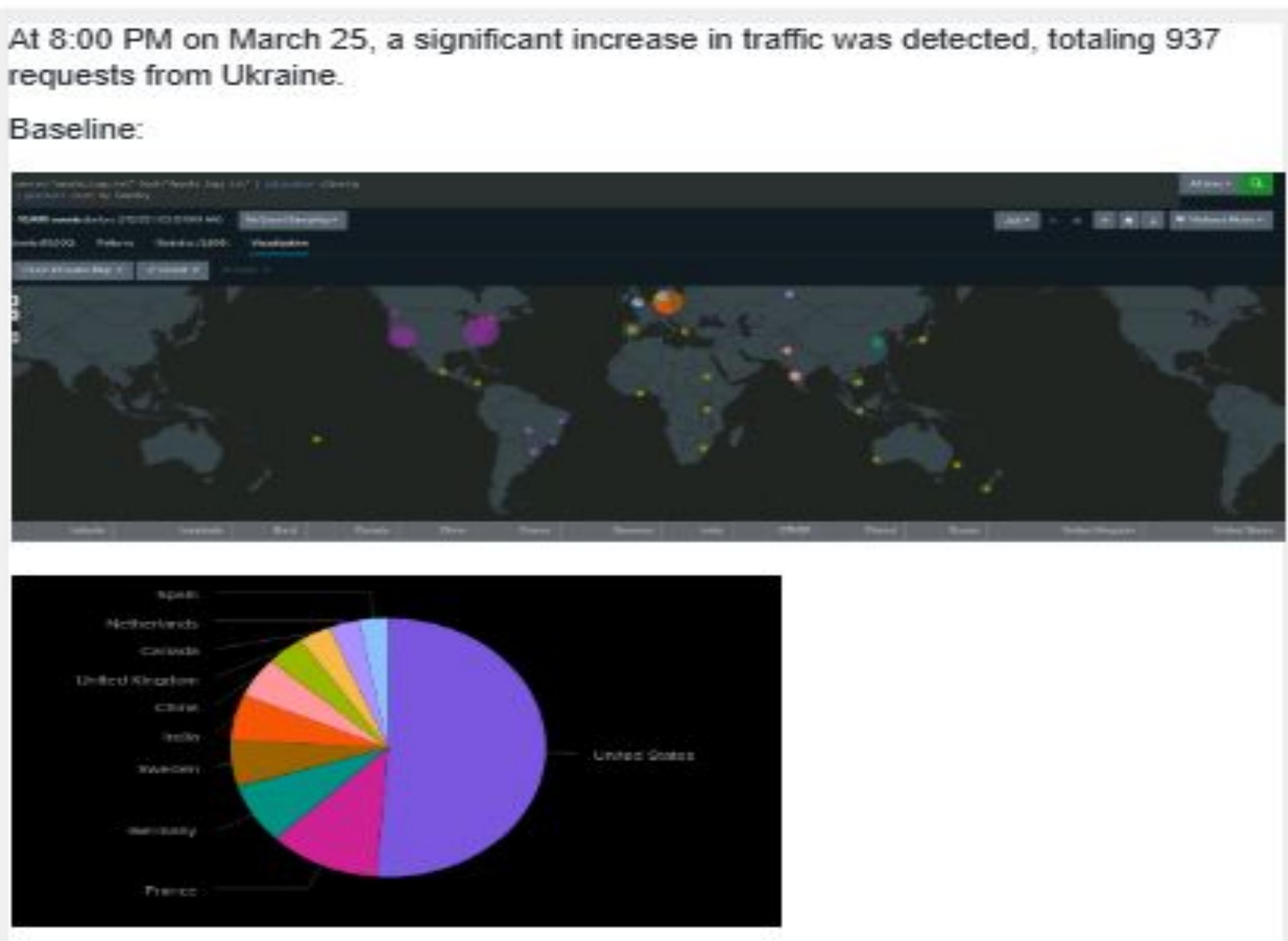
Attack Summary—Apache Geographical

Alert Analysis for International Activity

- Did you detect a suspicious volume of international activity?

At 8:00 PM on March 25, a significant increase in traffic was detected, totaling 937 requests from Ukraine.

Baseline:

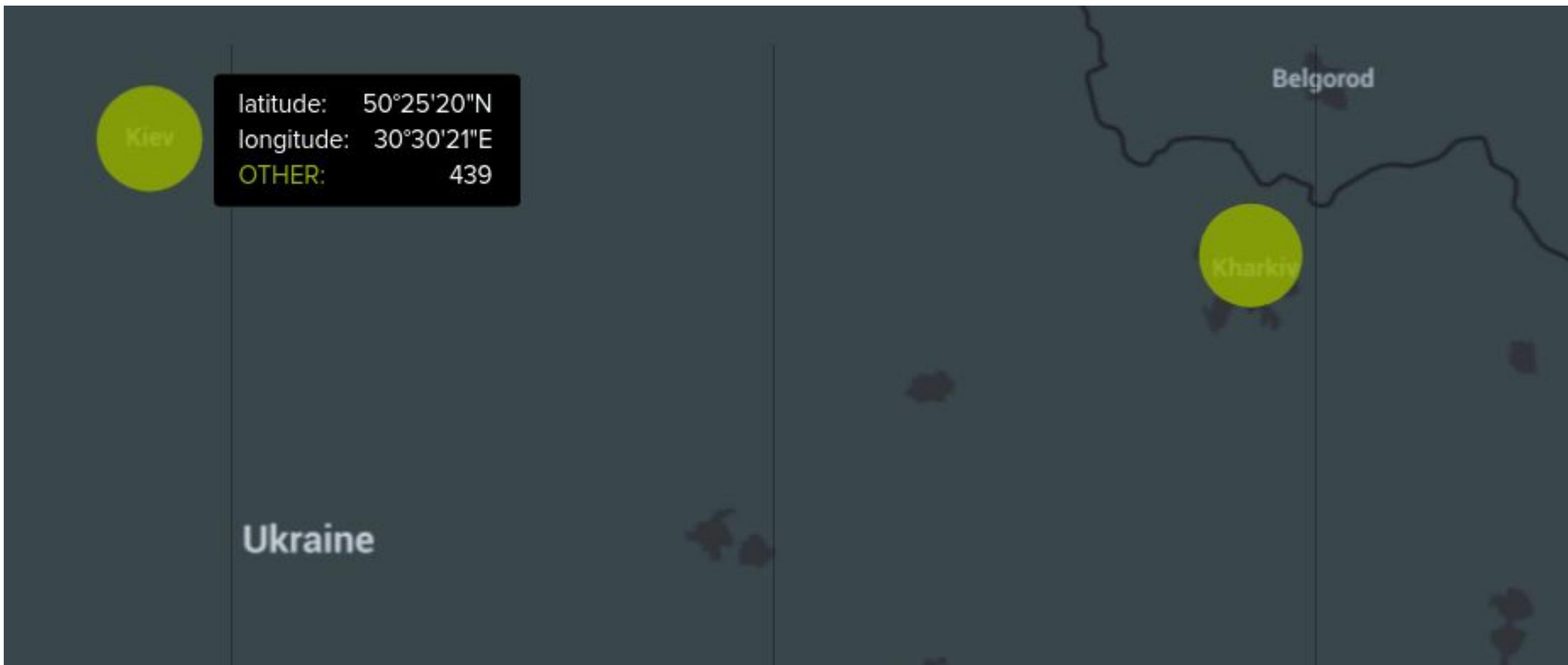


Attack Summary—Apache Geographical

Ukraine in the cities of Kiev and Kharkiv

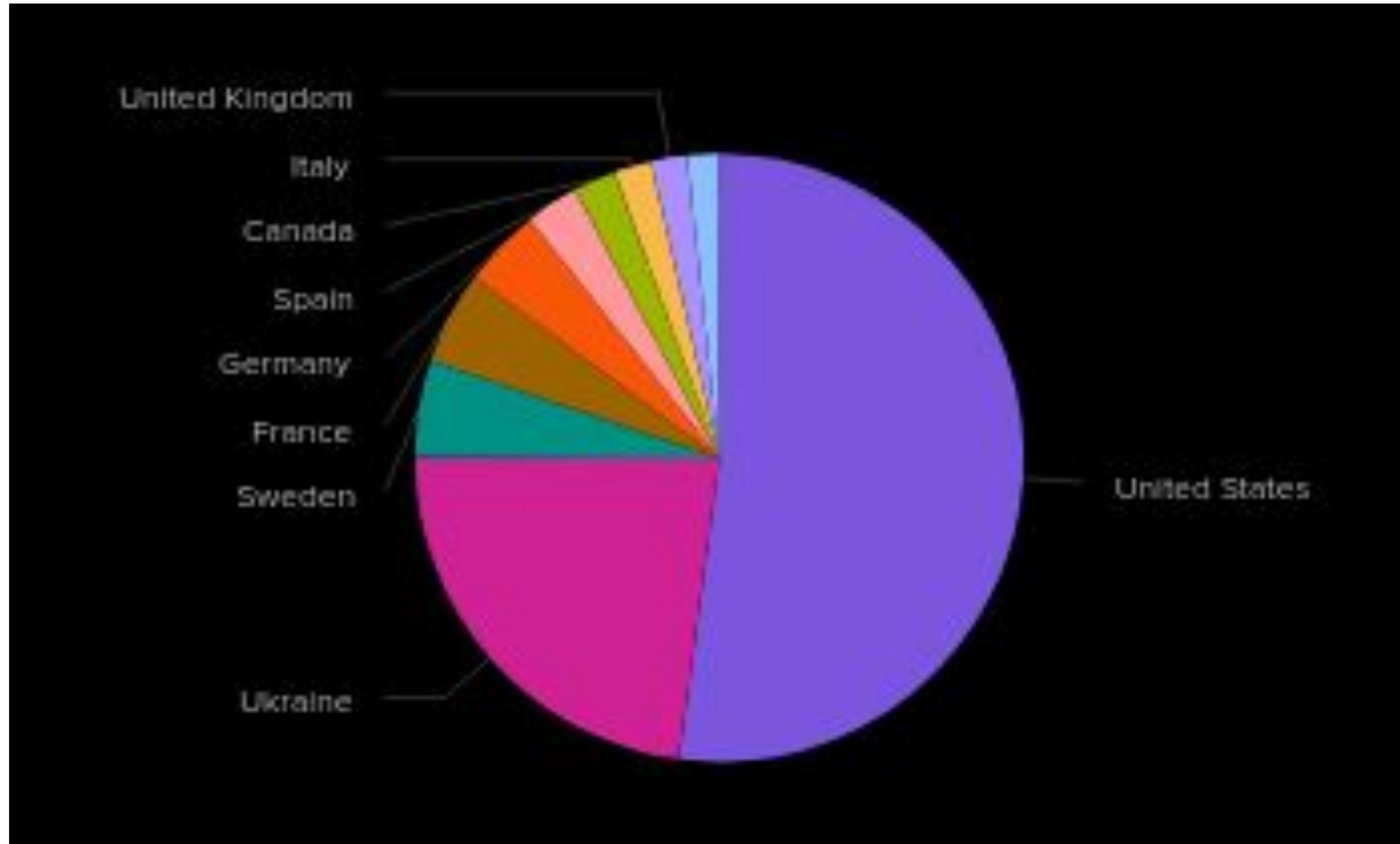
Kiev has 439 events

And Kharkiv has 432 events



Attack Summary—Apache Geolocation

Country	count	percent
United States	2000	44.474094
Ukraine	877	19.501890
Sweden	198	4.402935
France	190	4.225039



After the attack we can clearly see a spike in traffic from Ukraine, making it the most reasonable location from where the attacks were made

Screenshots of Non US-IP alert

- Would your alert be triggered for this activity?

Yes because the limit was set at 73.

Hourly Activity of non US IPs

Triggered: Yes, Enabled

Alert Type: Send email

Trigger Condition: Number of Results is > 73, 0m

Send Email

- After reviewing, would you change the threshold that you previously selected?

No I would not change the hourly activity because it effectively captures usual activity. I may increase to 100 if too many false positives come in.

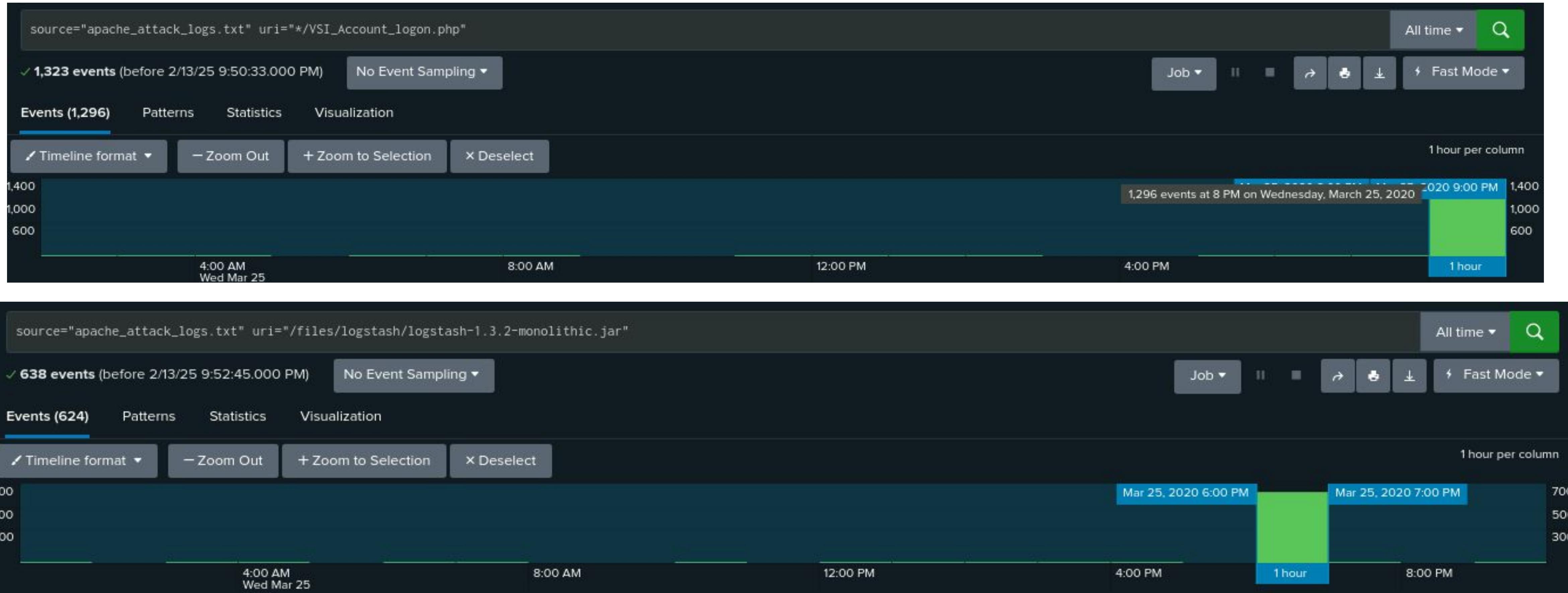
Attack Summary—URI's

Upon analyzing the uri logs we found that:

URI "/VSI_Account_logon.php" - Between 8:00 PM and 9:00 PM was pinged 1296 times

URI "/files/logstash/logstash-1.3.2-monolithic.jar" - Between 6:00 PM and 7:00 PM was attempted access 624 times

Attack Summary—URI's



Attack Summary—URI's

- Based on the URI being accessed, what could the attacker potentially be doing?

This raises the possibility of a brute force attack, where numerous login attempts are being made in an effort to gain unauthorized access.

There are known vulnerabilities associated with Logstash 1.3.2:

1. **CVE-2014-4326**: This vulnerability allows remote attackers to execute arbitrary commands via a crafted event in specific output plugins, such as `zabbix.rb` or `nagios_nsca.rb`.
[nvd.nist.gov](https://nvd.nist.gov/vuln/detail/CVE-2014-4326)
2. **CVE-2021-23358**: This issue pertains to the `underscore` package used in Logstash versions up to 1.3.2. It allows arbitrary code injection via the `template` function when a variable property is passed as an argument without proper sanitization.
[nvd.nist.gov](https://nvd.nist.gov/vuln/detail/CVE-2021-23358)

This should be patched immediatley.

Summary and Future Mitigations

Project 3 Summary

- What were your overall findings from the attack that took place?

Brute force attack on apache servers, trying to exploit different web urls to gain access to resources; that can be seen through increase in 404 errors.

Recon was conducted through a series of GET requests

Potential Exploit on Logstash 1.2.3

- To protect VSI from future attacks, what future mitigations would you recommend?

Frequent software updates, applying SIEM tools with finer tuning alerts perhaps hourly or 30-min intervals to better identify or monitor suspicious activity, enforce 2-factor authentication.