Defensive Security Project
by: Peerapat Phatpanichot (Win)

Table of Contents

This document contains the following resources:

Monitoring Environment

Scenario

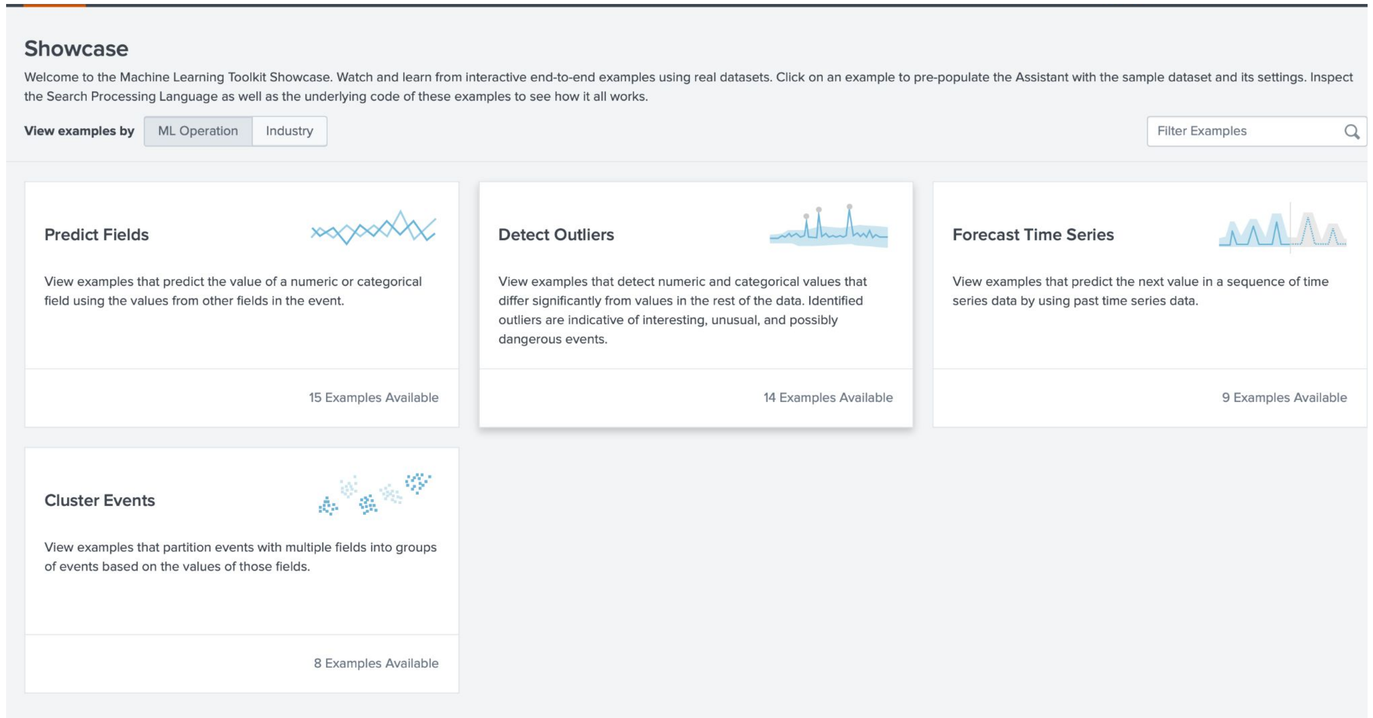
In this project, we developed and implemented a defensive monitoring solution using Splunk to protect Virtual Space Industries (VSI) from potential cyberattacks by their competitor, JobeCorp, focusing on analyzing and alerting for suspicious activities on Windows and Apache servers.

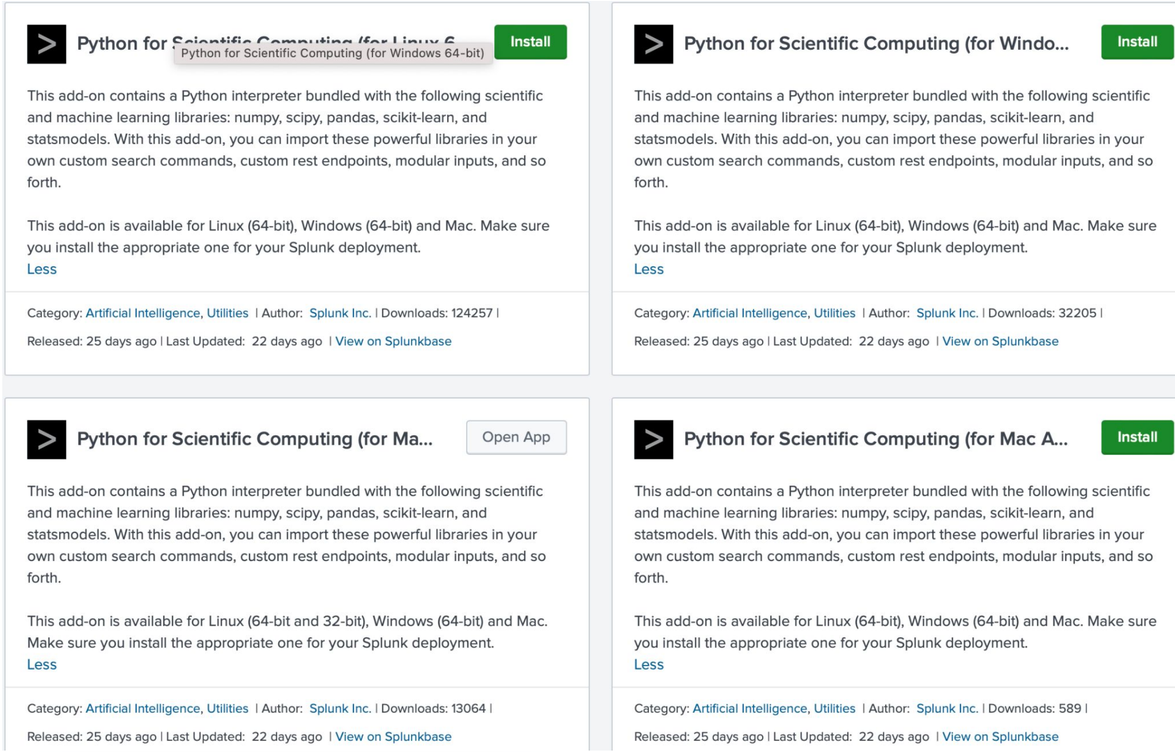
[“Splunk Machine Learning Tool Kit ” App]

Title: Splunk Machine Learning Toolkit (MLTK)

Content:

- **Description**: The Splunk Machine Learning Toolkit provides powerful machine learning capabilities within Splunk. It includes SPL commands, custom visualizations, and various ML assistants that enable you to apply machine learning to your own data.
- **Features**:
  - Predictive analytics (linear and logistic regression).
  - Anomaly detection (numeric and categorical outliers).
  - Time series forecasting.
  - Clustering and other advanced ML algorithms.
- **Why MLTK?**: Enhances Splunk's native monitoring capabilities with advanced predictive and anomaly detection features, making it invaluable for security and operational monitoring.

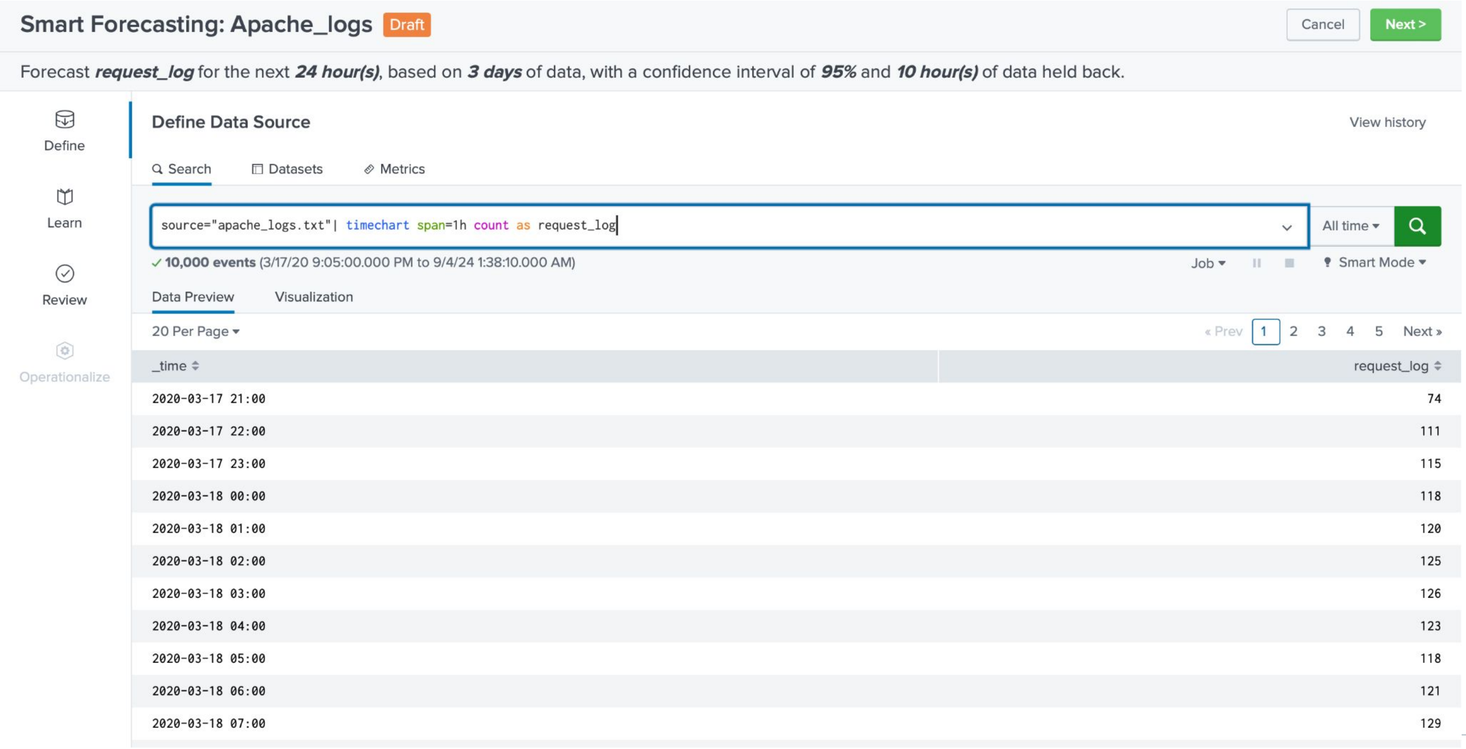




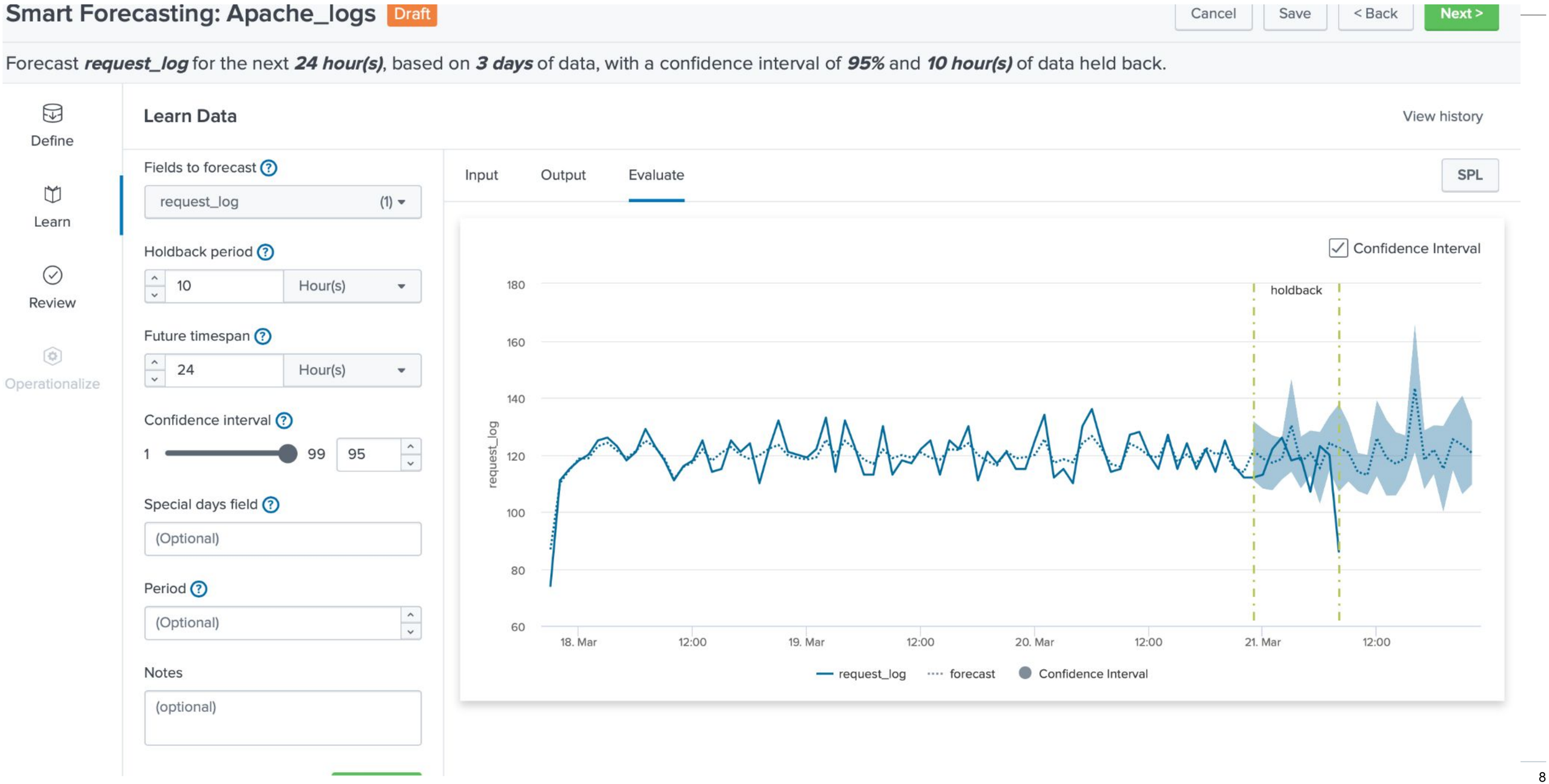
Splunk Machine Learning Toolkit (MLTK)

Use Case: Forecasting web traffic using Apache logs to predict potential future spikes or drops in request volume, helping to anticipate and mitigate potential server overloads or downtime.

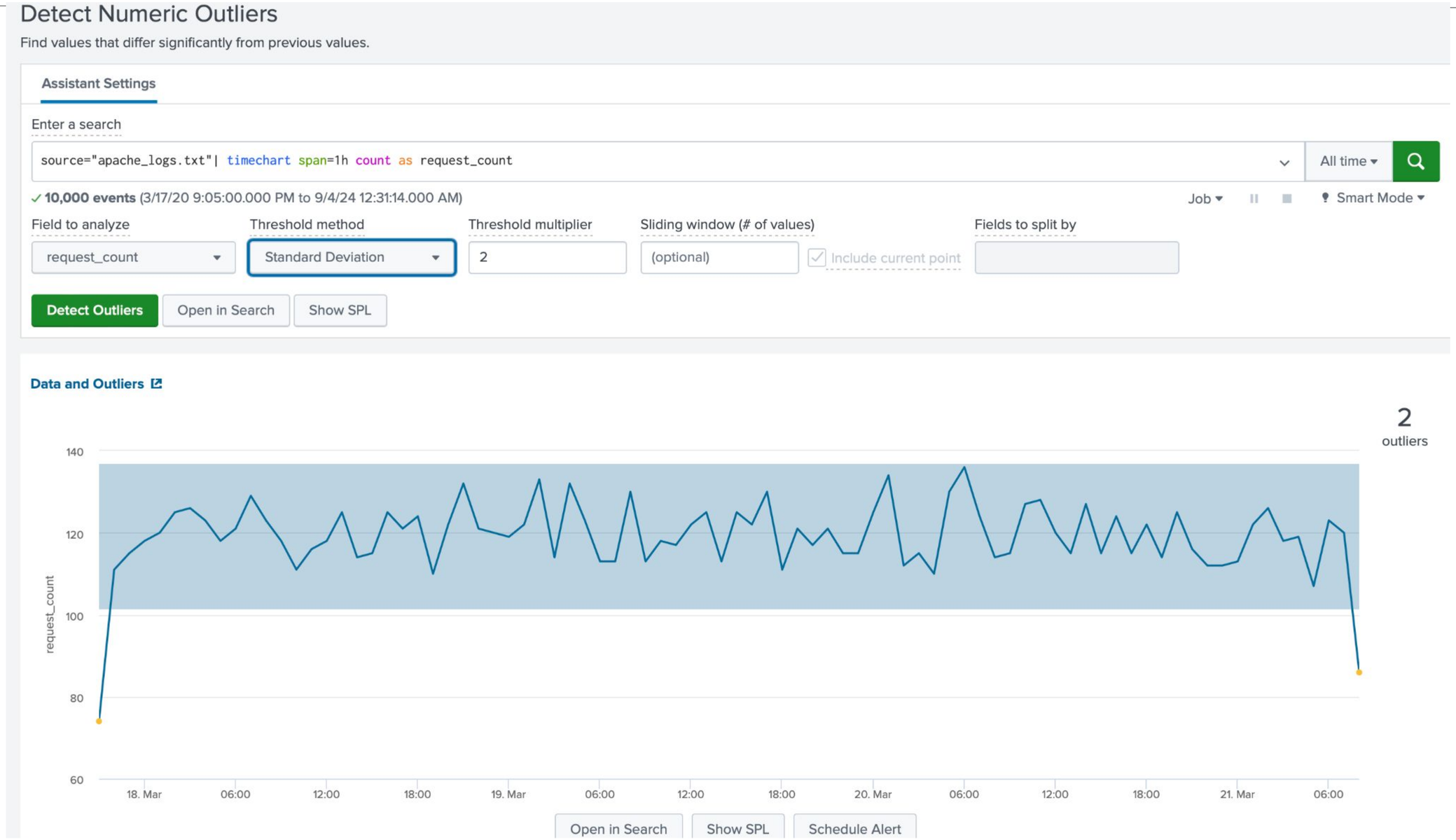
- **Scenario Overview**:
  - **Problem**: Sudden traffic changes can lead to performance degradation or outages.
  - **Solution**: Using the Smart Forecasting Assistant, VSI can forecast traffic patterns and prepare for expected high-traffic periods.
  - **Benefit**: Proactively scaling resources or adjusting security measures based on forecasted data, enhancing reliability and performance.



Splunk Machine Learning Toolkit (MLTK)



Splunk Machine Learning Toolkit (MLTK)



Logs Analyzed

1 Windows Logs

- Contains security events and logs from VSI's Windows server.
- Logs include fields like `signature_id`, `user`, `status`, and `severity`.
- Data captures login attempts, system changes, and security breaches.
- Used to establish baselines and monitor for abnormal activities.
- Helps identify failed logins, account deletions, and unauthorized access.

2 Apache Logs

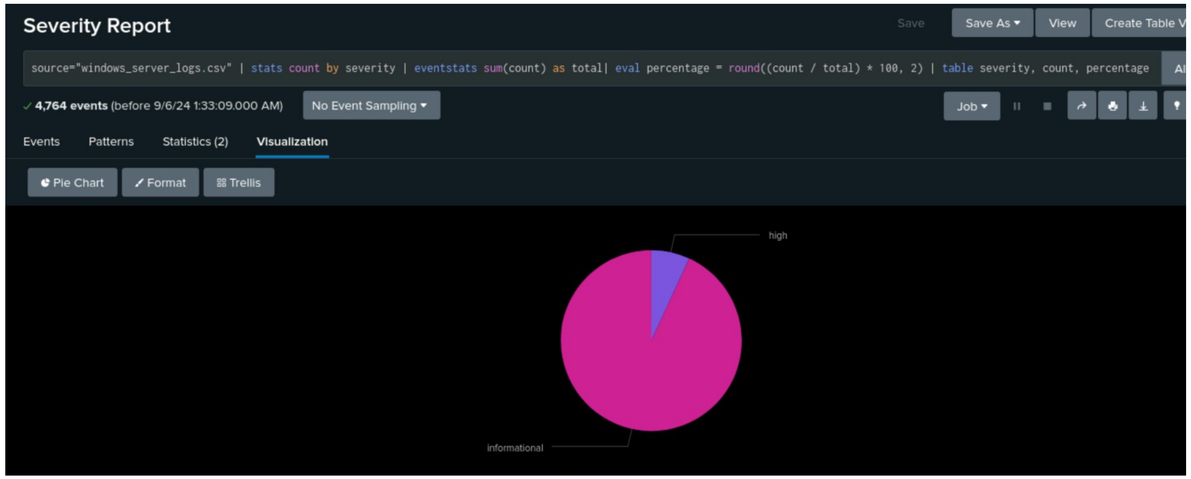
- Captures HTTP requests to VSI's public-facing website.
- Logs include fields like `method`, `status`, `clientip`, and `useragent`.
- Tracks GET and POST requests, indicating user interactions and access points.
- Monitors referrer domains to detect potential malicious traffic sources.
- Provides insights into response codes, identifying server errors and attack attempts(apache_logs).

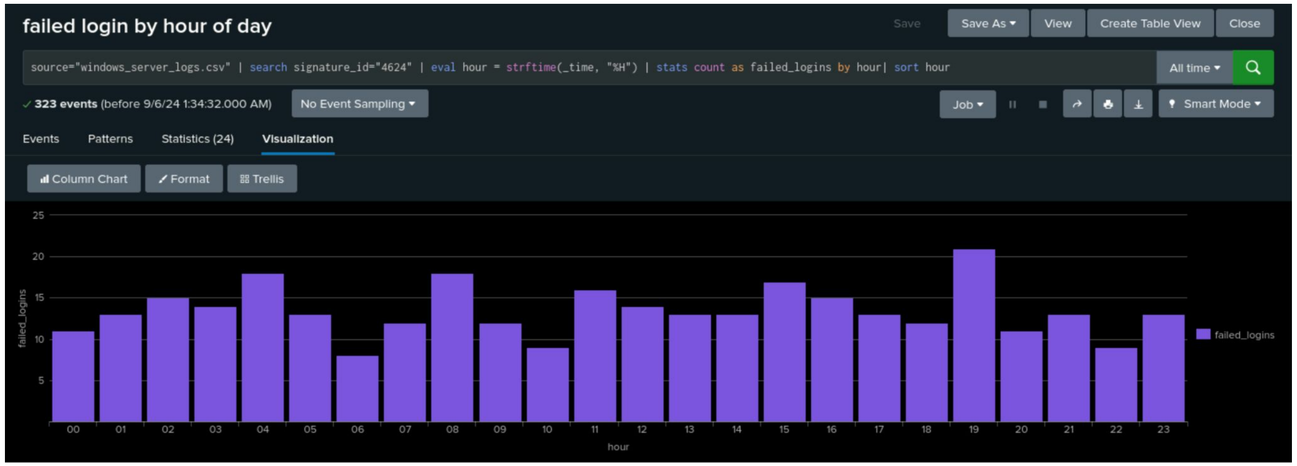
Windows Logs

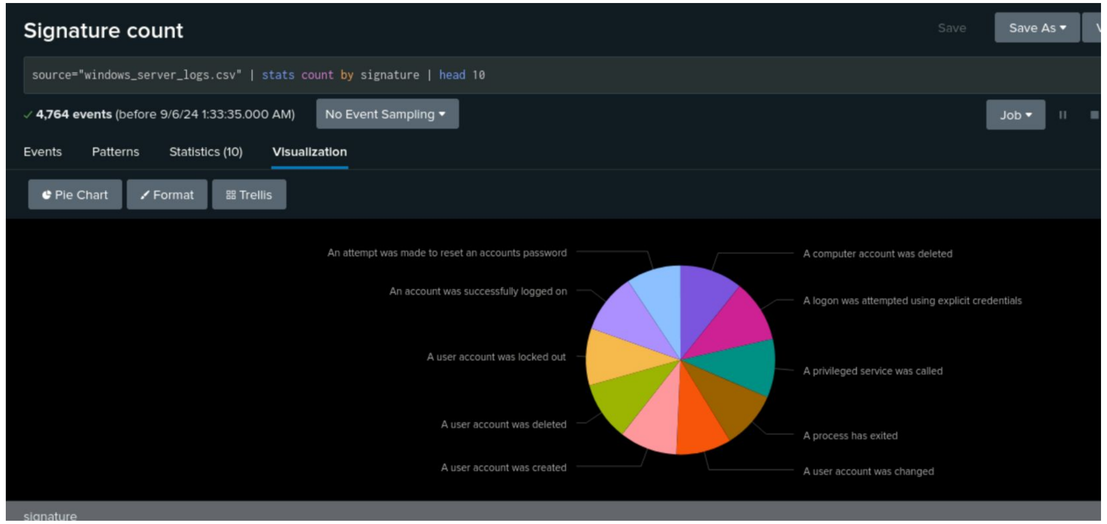
Reports—Windows

Report Name	Report Description
Severity Report	Displays the distribution of events based on severity, highlighting high and informational severity events.
Failed Login by Hour of Day	Shows the count of failed login attempts for each hour of the day, identifying peak times of unsuccessful access attempts.
Top 10 Most Lockout Accounts	Identifies the top 10 user accounts with the highest number of lockouts, indicating potential security concerns or brute force attempts.
Signature Count	Provides a count of various event signatures, including password reset attempts, successful logins, account deletions, and more, to identify frequent activities.

Images of Reports—Windows







Alerts—Windows

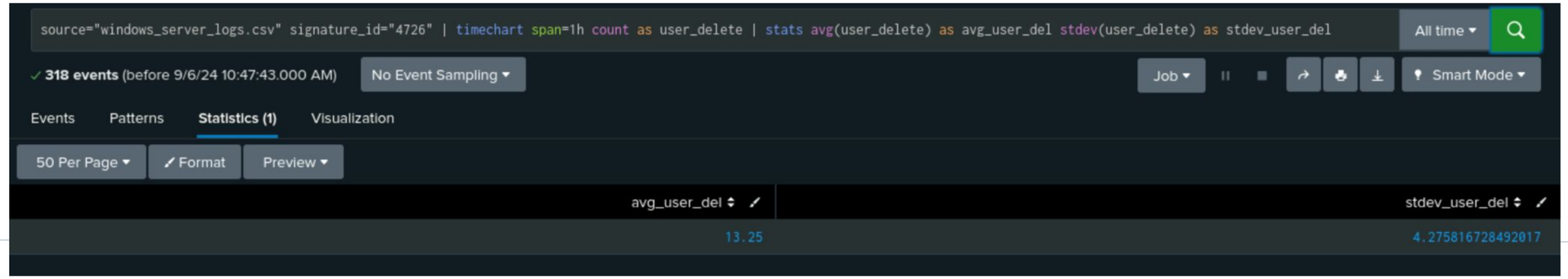
Alert Name	Alert Description	Alert Baseline	Alert Threshold
Alert for Hourly Failed Window Activity	Monitors failed login attempts on Windows systems to detect abnormal or potentially malicious activity.	5.92 failed logins per hour (calculated average of failed logins).	> 11 failed logins per hour.

JUSTIFICATION: The baseline was determined based on the calculated average of failed logins per hour, which is 5.92. The threshold is set at 11 using the formula avg + (2*stdev).

Alerts—Windows

Alert Name	Alert Description	Alert Baseline	Alert Threshold
ALERT for hourly count of a user account delete	This alert monitors the hourly count of user account deletions to detect suspicious activities that exceed normal thresholds.	13.25 (average count of user deletions per hour)	>22 deletions per hour

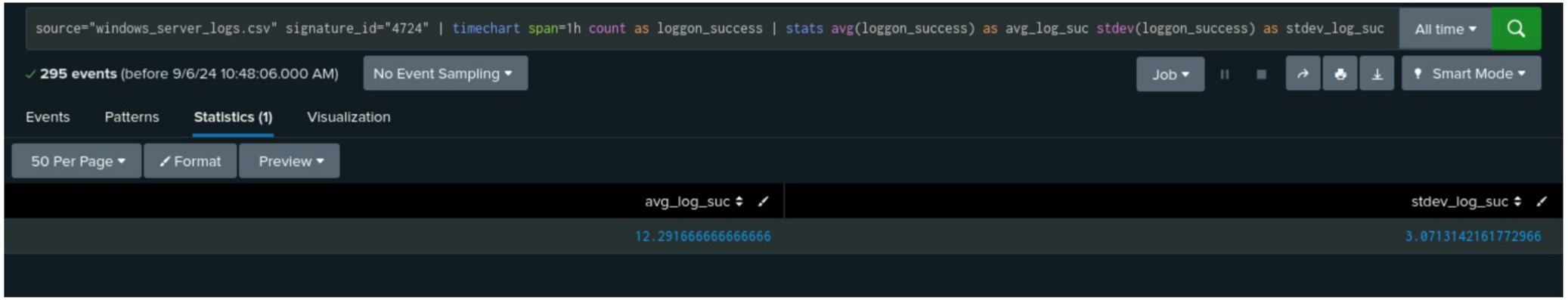
JUSTIFICATION: The baseline of 13.25 was calculated based on the average hourly deletions, providing a typical activity measure. The threshold is set at a higher value (22) to identify unusual spikes using the formula avg + (2*stdev).



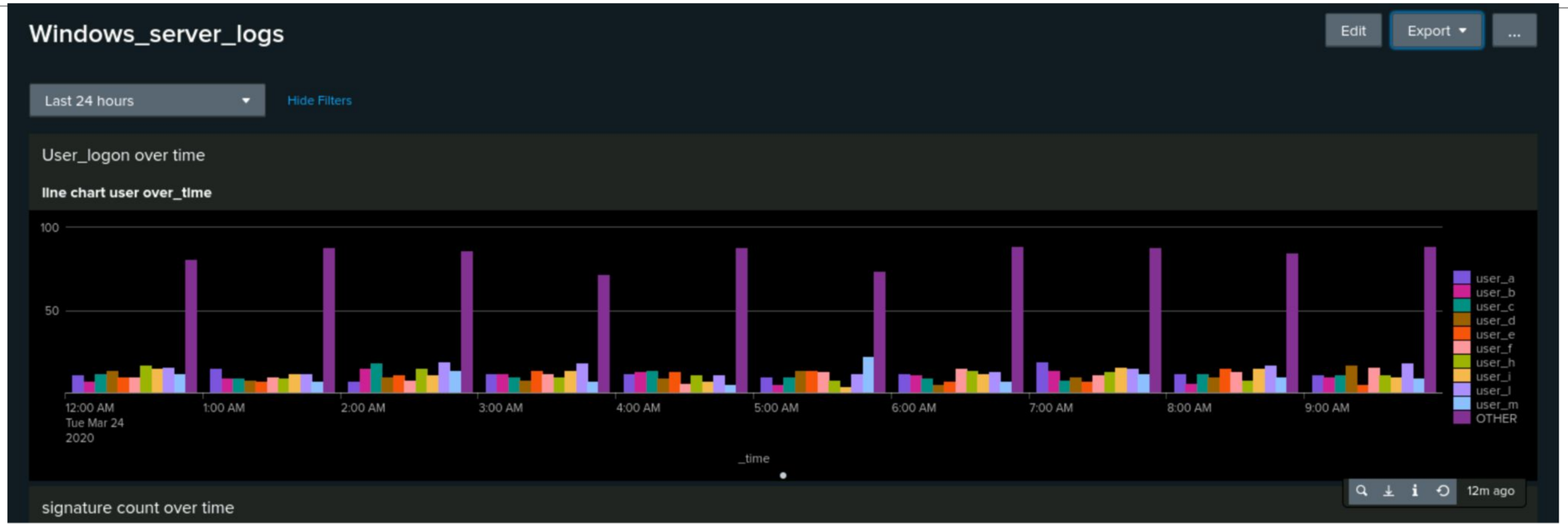
Alerts—Windows

Alert Name	Alert Description	Alert Baseline	Alert Threshold
An account successfully logged on ALERT WINDOWS	This alert monitors the number of successful login events on Windows servers.	13	19

JUSTIFICATION: The baseline value of 12.29 was calculated as the average number of successful login events per hour, and the threshold of 19 is set to alert when the count significantly exceeds the baseline using the formula avg + (2*stdev).



Dashboards—Windows



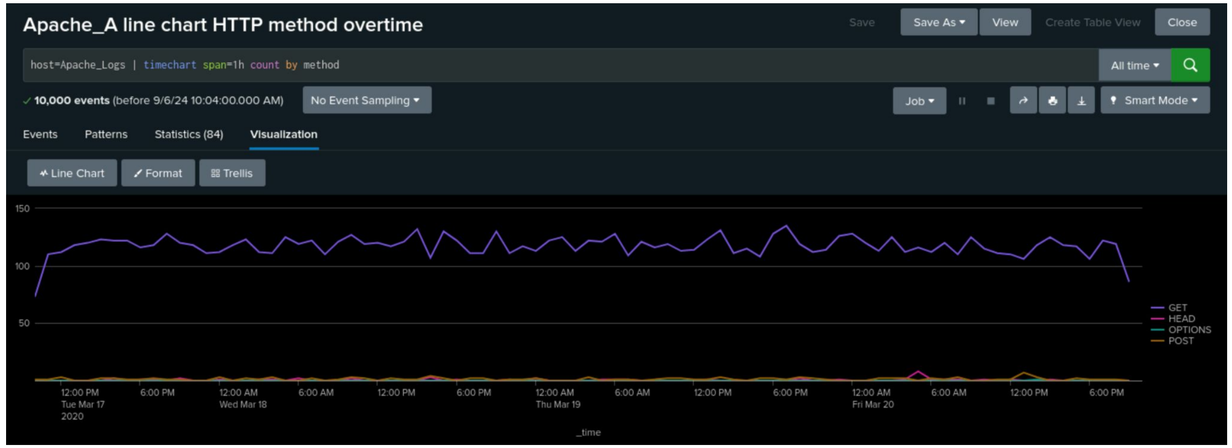
Dashboards—Windows

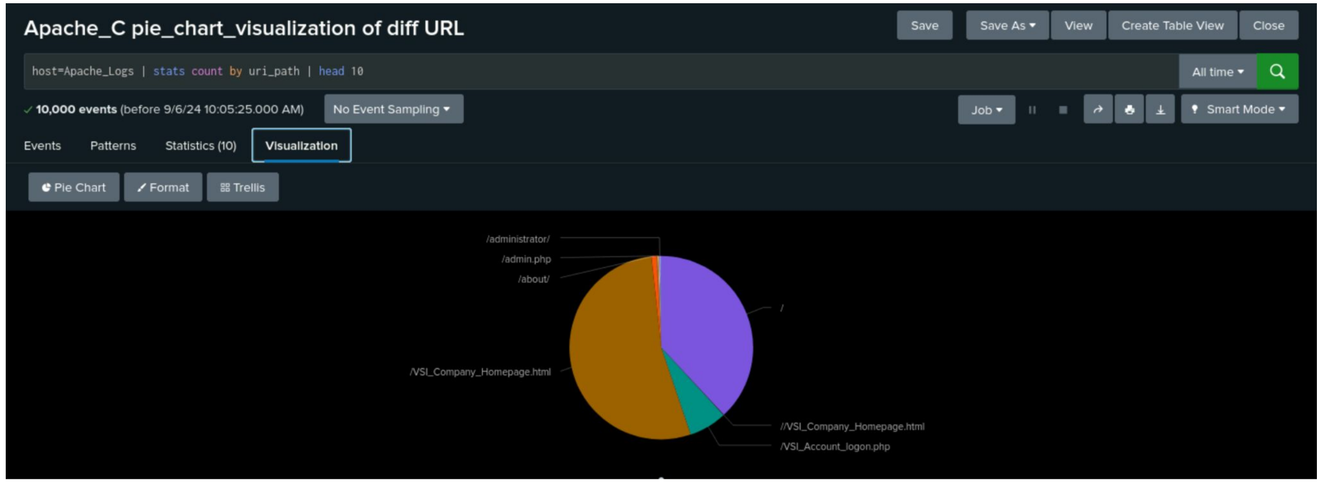
Apache Logs

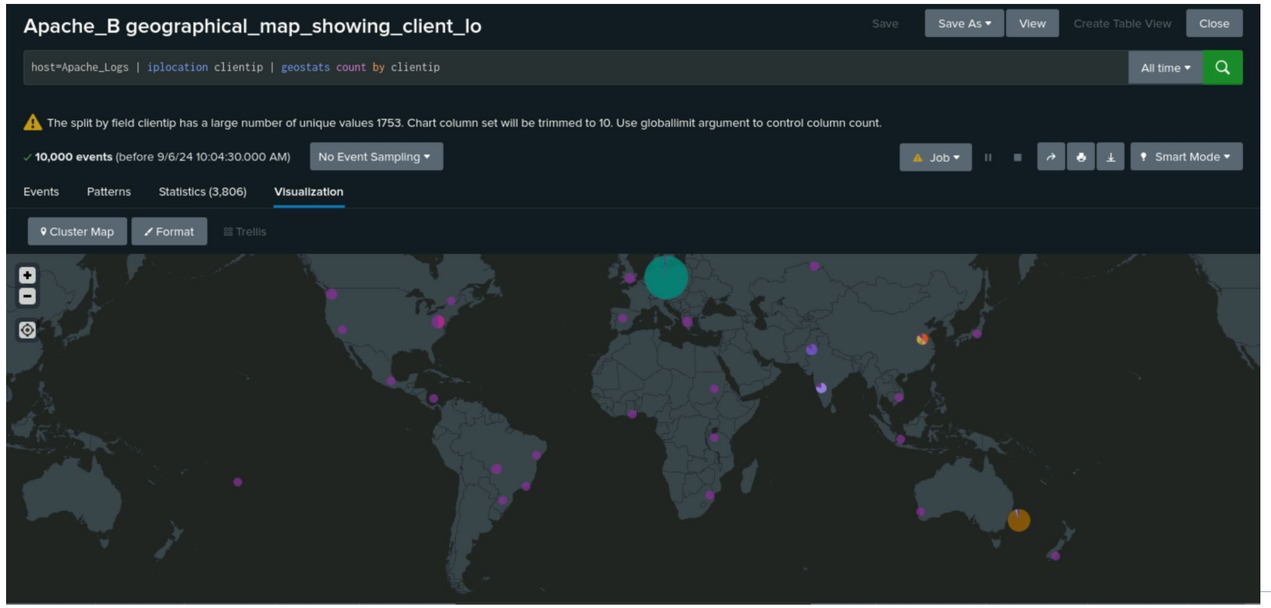
Reports—Apache

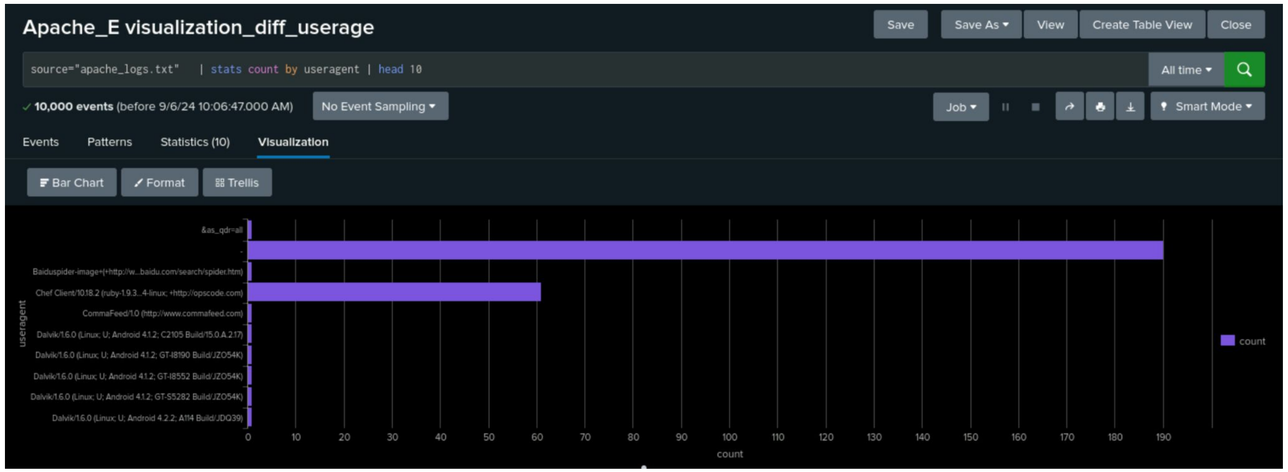
Report Name	Report Description
Apache_A Line Chart HTTP Method Overtime	Displays the count of different HTTP methods (GET, POST, HEAD, OPTIONS) over time, highlighting periods of unusual activity indicative of a potential attack.
Apache_C Pie Chart Visualization of Diff URL	Shows the distribution of requests to various URIs, identifying which pages were targeted the most, indicating possible attack vectors on sensitive endpoints.
Apache_B Geographical Map Showing Client Locations	Maps the geographical distribution of client IP addresses, highlighting suspicious international activity and identifying regions with high request volumes.
Apache_E Visualization Diff Userage	Bar chart showing user access counts, helping identify abnormal user activity patterns that may indicate unauthorized access attempts or brute force attacks.

Images of Reports—Apache









Alerts—Apache

Alert Name	Alert Description	Alert Baseline	Alert Threshold
APACHElog_Hourly_Activity_from_anyCOUNTRY_NOT_US	This alert monitors hourly activity from countries outside the United States, triggering when abnormal levels of traffic are detected.	100	> 120.

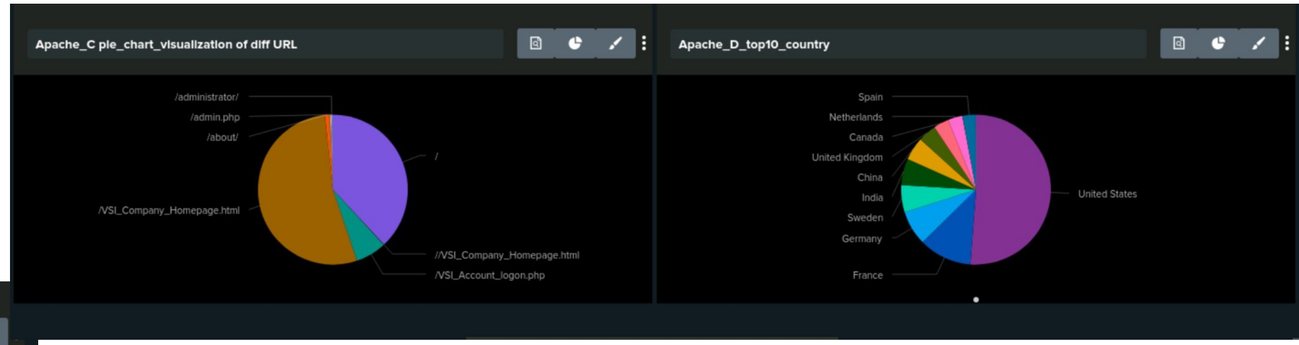
JUSTIFICATION: The baseline is set based on typical hourly traffic from non-US countries. The threshold of 120 after skimming through the calculations activity counts

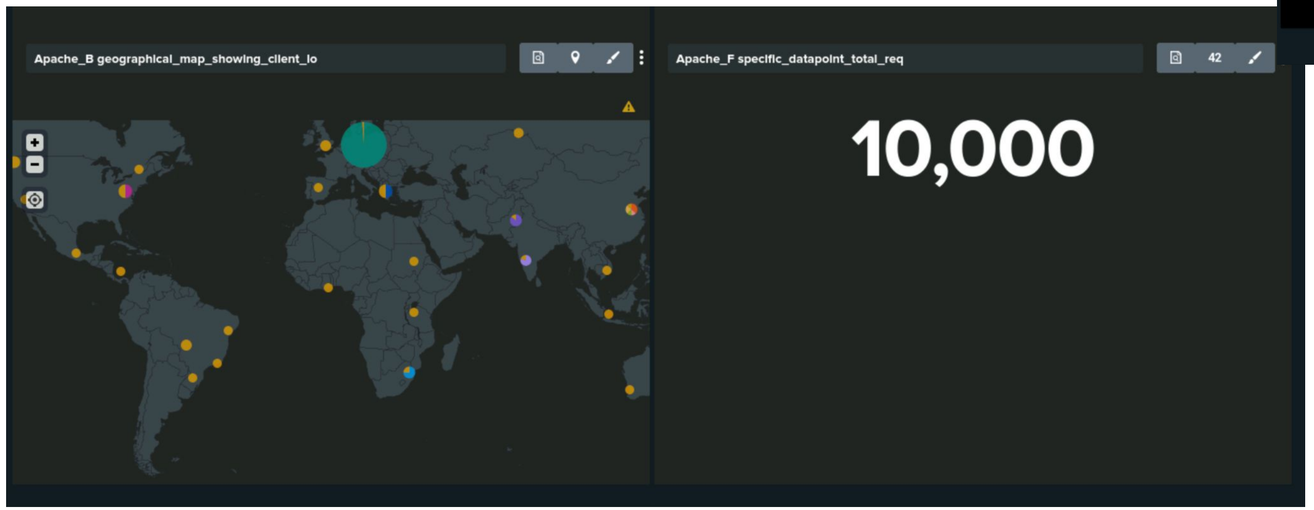
Alerts—Apache

Alert Name	Alert Description	Alert Baseline	Alert Threshold
Apache hourly count of HTTP POST method	This alert monitors the hourly count of HTTP POST requests to detect unusual activity that may indicate potential attacks or data exfiltration attempts.	2	> 4

JUSTIFICATION: The baseline is set according to typical HTTP POST traffic, and the threshold of 4 was chosen to capture anomalies as the average was 1.2 and stdev was also around 1.2 so after using the formula avg + (2*stdev), I came up with this conclusion using avg as baseline and threshold as the result of the formula

Dashboards—Apache





Attack Analysis

Attack Summary—Windows

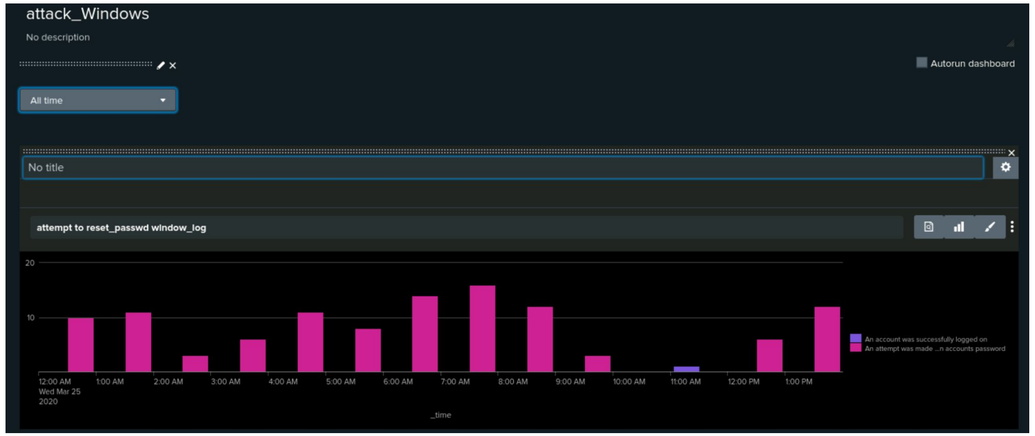
The reports highlighted a significant volume of failed login attempts, account deletions, and suspicious user activities, indicating potential security breaches and unauthorized access attempts mainly from user_a and user_k.

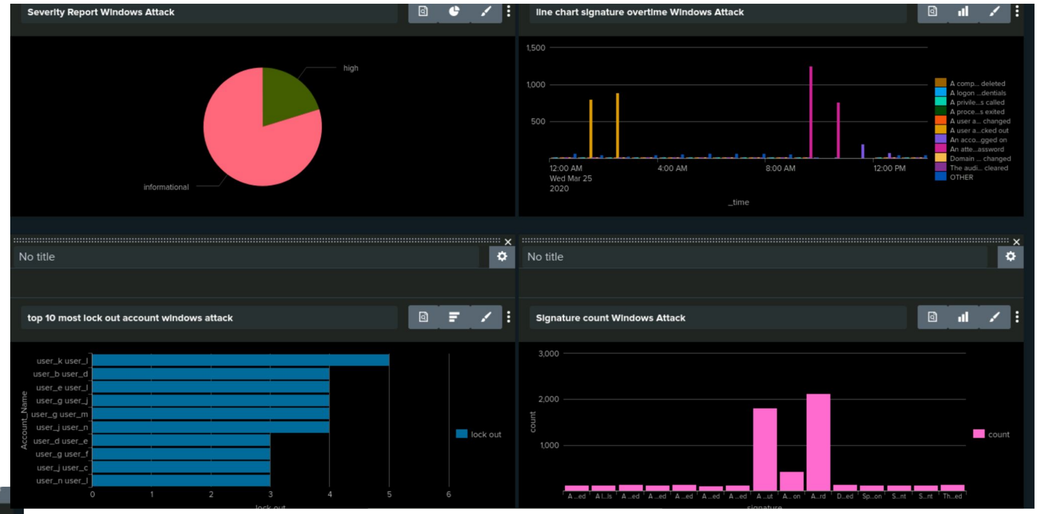
Attack Summary—Windows

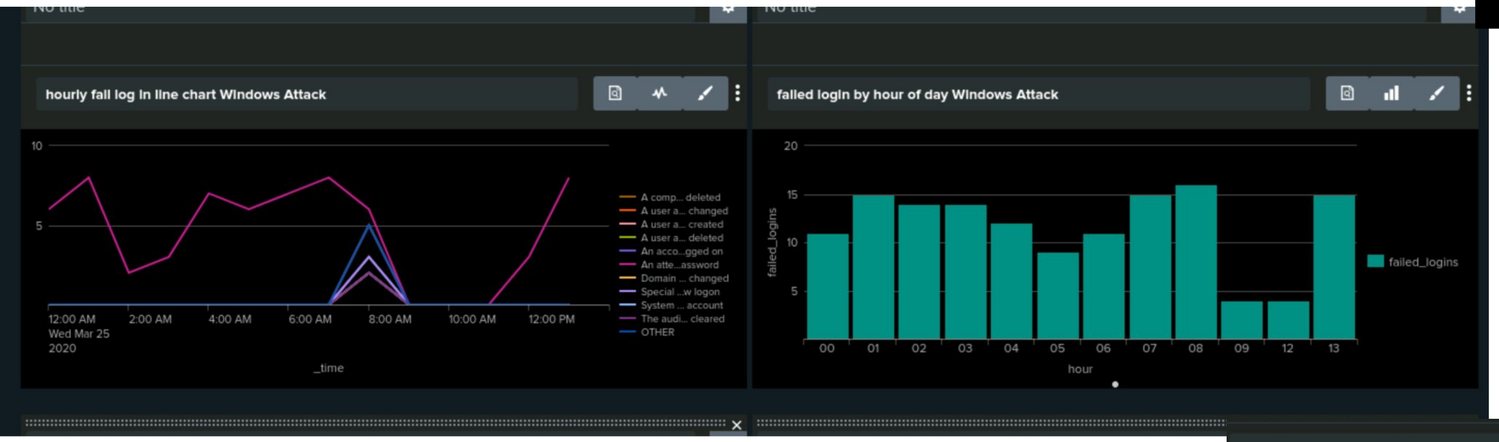
Summarize your findings from your alerts when analyzing the attack logs. Were the thresholds correct?

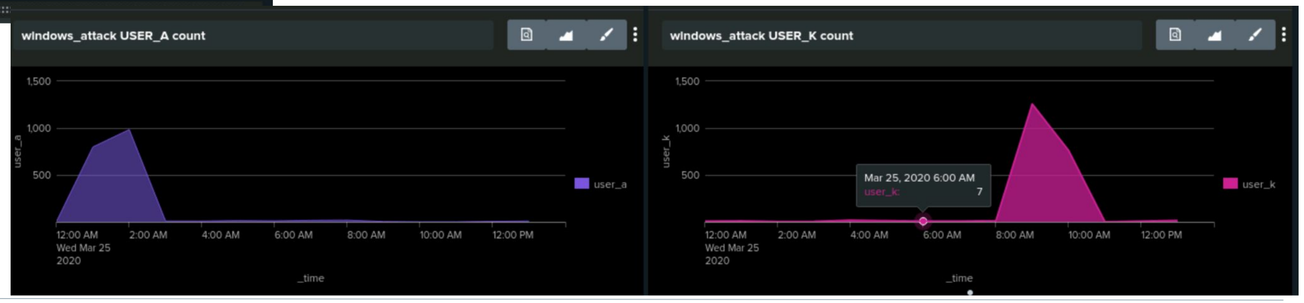
- The alerts effectively detected anomalies like high failed logins and account deletions. The thresholds were generally accurate, capturing abnormal activities, but some could be fine-tuned for better precision.

Attack Summary—Windows-Dashboard

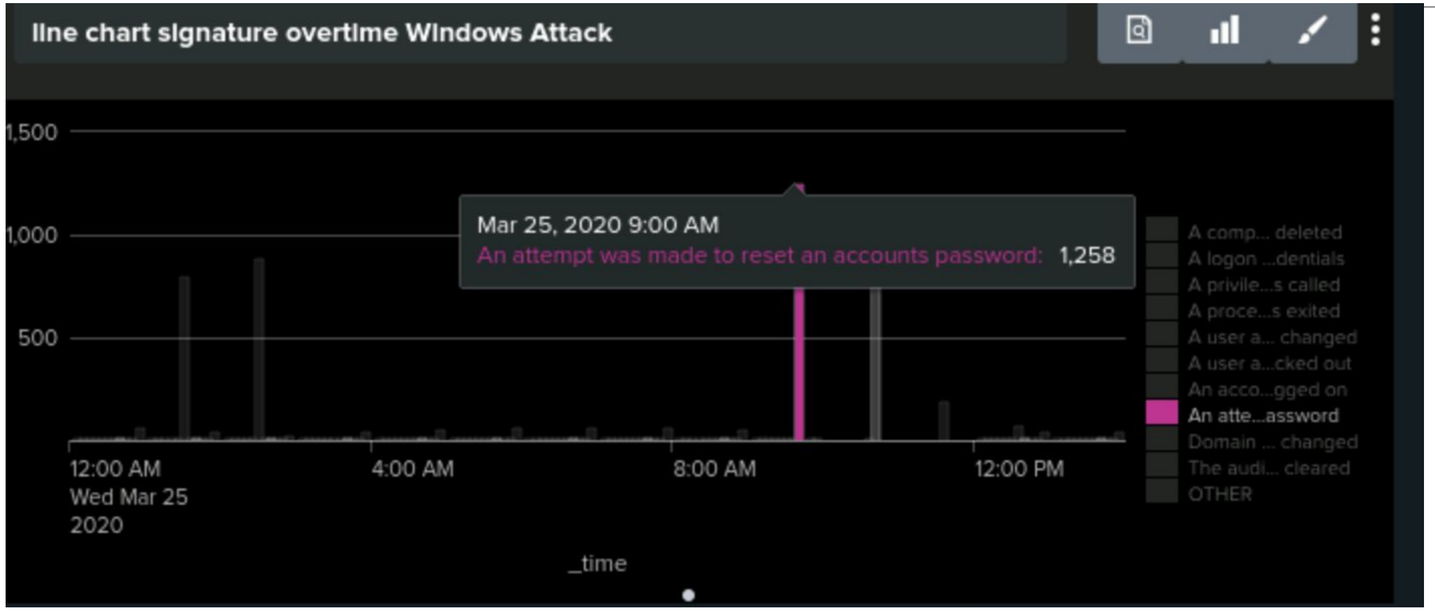


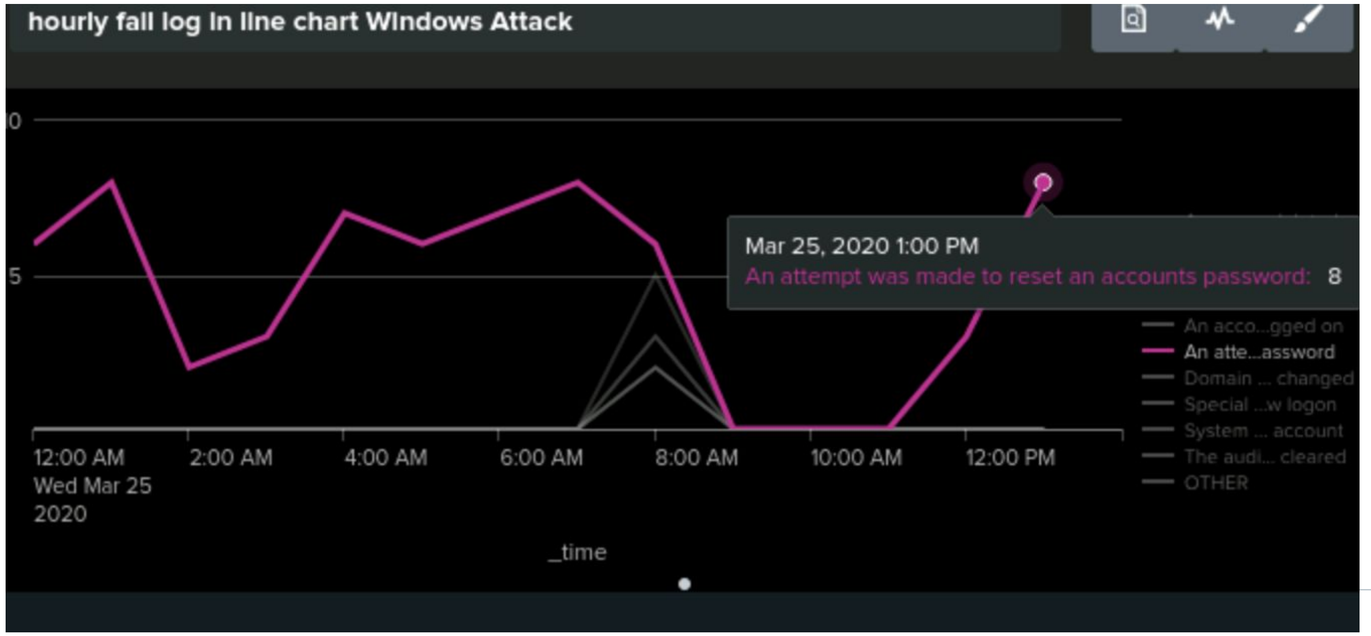


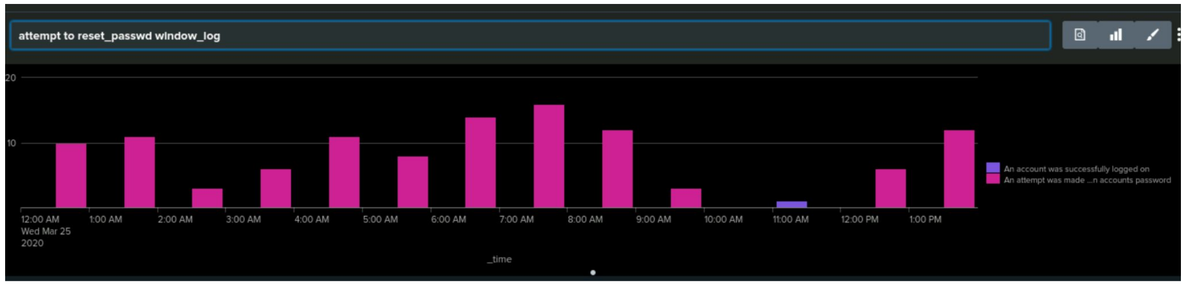


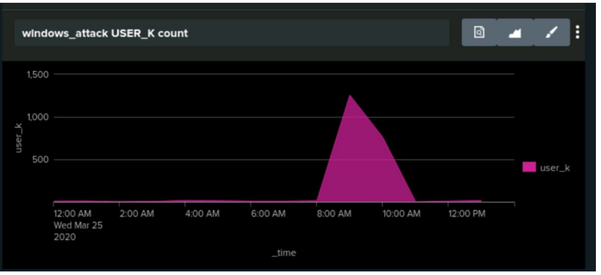


Screenshots of Attack Logs









Attack Summary—Apache

The attack focused on exploiting web application vulnerabilities using high volumes of GET and POST requests targeting sensitive pages, indicating unauthorized access attempts.

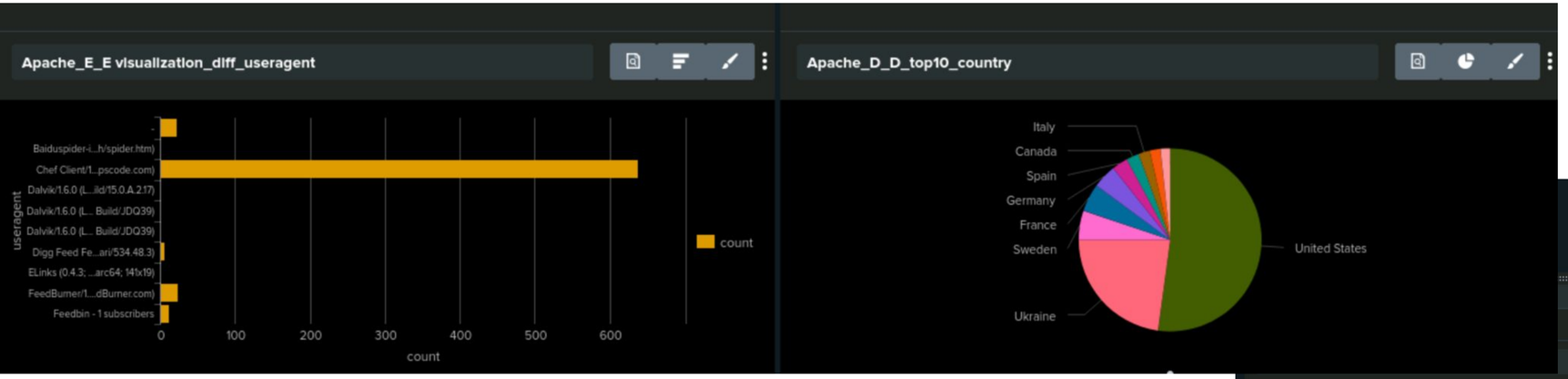
Attack Summary—Apache

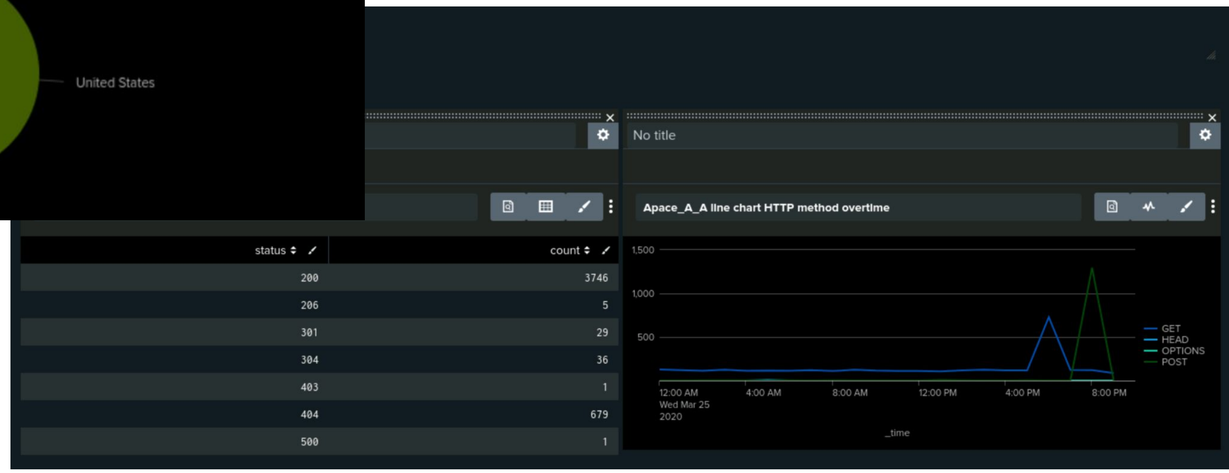
Summarize your findings from your alerts when analyzing the attack logs. Were the thresholds correct?

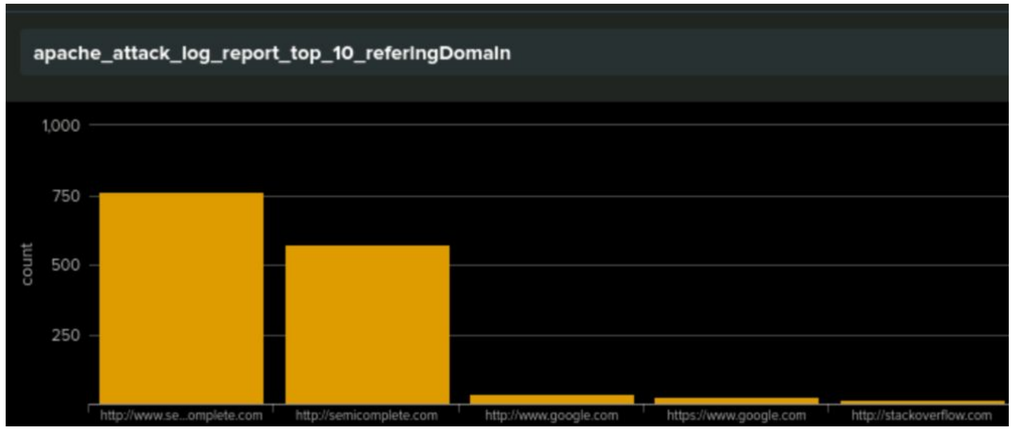
The alerts identified unusual spikes in HTTP POST and non-US activity, validating that the thresholds were appropriately set to detect suspicious behavior.

The attack involved a high volume of HTTP POST and GET requests originating from multiple international locations, indicating a potential automated attack targeting specific endpoints on the server.

Attack Summary—Apache







Summary and Future Mitigations

Project 3 Summary

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

  The attack primarily targeted sensitive URIs such as administrative and login pages using methods like GET and POST at specific times, indicating attempts at unauthorized access and exploitation of web vulnerabilities.

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

  To protect VSI, implement strict access controls on sensitive URIs, enhance monitoring and alerting for unusual activity, enforce strong authentication measures (e.g., MFA), and regularly update and patch web applications to close known vulnerabilities.