

SOC PROJECT 2

VPN BRUTE FORCE DETECTION AND INVESTIGATION USING SPLUNK

BY:

**MOSHOOD MARIAM OMOSHALEWA
(RILEWA)**

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Section 1: Project Documentation

Project Objective

The purpose of this project is to simulate a real Security Operations Center (SOC) investigation using Splunk. The goal is to detect, investigate, and validate a VPN brute force authentication attack and document the findings as a security incident.

This project focuses on identifying authentication abuse that may lead to account compromise by analyzing VPN authentication activity and detecting suspicious login behavior.

Data Source

The data used for this project was obtained from a TryHackMe room. The room provided downloadable VPN authentication logs, which were used directly for this investigation without modification.

- Log type: VPN authentication logs
- Format: JSON
- Source: TryHackMe

Tools Used

- Splunk (local installation)

Splunk was used for log ingestion, validation, analysis, and investigation.

Investigation Focus

The investigation focuses on:

- Authentication abuse
- Potential account compromise
- Repeated failed login attempts
- Identifying suspicious authentication patterns

The objective is to detect failed authentication attempts, analyze their behavior, and determine whether the activity indicates malicious intent.

Stage 1: Log Ingestion and Validation

Log Ingestion

The VPN authentication logs were ingested into Splunk by uploading the downloaded JSON file.

The screenshot shows the 'Add Data' wizard in Splunk. The current step is 'Select Source'. A file named 'VPN-logs-1663593355154.json' has been selected and uploaded successfully. The interface includes a 'Select File' button, a 'Drop your data file here' area, and an 'FAQ' section with links about indexing, sources, and remote data.

Validation Checks

After ingestion, the following validations were performed:

- Confirmed that logs were visible in Splunk
- Confirmed that fields were parsed correctly
- Verified that the source type was JSON
- Queried the logs using the VPN logs index to ensure data accessibility

The screenshot shows the 'Set Source Type' step of the 'Add Data' wizard. The 'Timestamp' source type is selected. A table below displays 8 log entries from the 'VPN-Logs' index. The table columns include _time, action, Company, EventTime, extracted_index, port, protocol, Source_Country, and Source_ip. The first entry is highlighted.

	_time	action	Company	EventTime	extracted_index	port	protocol	Source_Country	Source_ip
1	1/1/22 7:58:42.000 AM	built	CyberT	2022-01-01T07:58:42	VPN_Logs	443	tcp	United States	167.132.179.121
2	1/1/22 5:26:59.000 PM	teardown	CyberT	2022-01-01T17:26:59	VPN_Logs	443	tcp	United States	167.132.179.121
3	1/1/22 7:10:01.000 AM	built	CyberT	2022-01-01T07:10:01	VPN_Logs	443	tcp	United States	151.164.65.80
4	1/1/22 5:45:39.000 PM	teardown	CyberT	2022-01-01T17:45:39	VPN_Logs	443	tcp	United States	151.164.65.80
5	1/1/22 8:52:55.000 AM	built	CyberT	2022-01-01T08:52:55	VPN_Logs	443	tcp	United States	107.14.105.104
6	1/1/22 4:07:19.000 PM	teardown	CyberT	2022-01-01T16:07:19	VPN_Logs	443	tcp	United States	107.14.105.104
7	1/1/22 7:58:44.000 AM	built	CyberT	2022-01-01T07:58:44	VPN_Logs	443	tcp	United States	151.164.57.163
8	1/1/22	teardown	CyberT	2022-01-01T18:21:24	VPN_Logs	443	tcp	United States	151.164.57.163

Initial Log Review

The VPN logs were reviewed in table format to understand the structure and available fields.

The screenshot shows the Splunk Enterprise search interface. The search bar contains the query: `index=vpn_logs | table *`. The results indicate `2,862 events` (before 1/28/26 2:34:07.000 PM) with `No Event Sampling`. The Statistics tab is selected, showing a table with columns: Company, EventTime, Source_Country, Source_Ip, UserName, action, date_hour, date_mday, date_minute, date_month, date_second, date_wday, date_year, date_zone, eventtype. Two rows of data are visible: one for CyberT (EventTime: 2022-01-14T07:08:19, action: built) and another for Andrey (EventTime: 2022-01-14T10:01:27, action: teardown). The interface includes a navigation bar with Save As, Create Table View, and Close buttons, and a footer with Time range: All time, Job, and Smart Mode.

Action Analysis

A statistical count of authentication actions was performed using action-based aggregation. The results showed three distinct actions:

- Built: 1,297 events
- Failed: 274 events
- Teardown: 1,291 events

The screenshot shows the Splunk Enterprise search interface. The search bar contains the query: `index=vpn.logs | stats count by action`. The results indicate `2,862 events` (before 1/28/26 2:44:40.000 PM) with `No Event Sampling`. The Statistics tab is selected, showing a table with columns: action, count. Three rows of data are visible: built (count: 1297), failed (count: 274), and teardown (count: 1291). The interface includes a navigation bar with Save As, Create Table View, and Close buttons, and a footer with Time range: All time, Job, and Smart Mode.

Action meanings:

- Failed indicates authentication or connection failure
- Built indicates a successful VPN connection
- Teardown indicates a VPN session termination

For this investigation, the primary focus is on failed authentication events, as they are most relevant for detecting brute force or unauthorized access attempts.

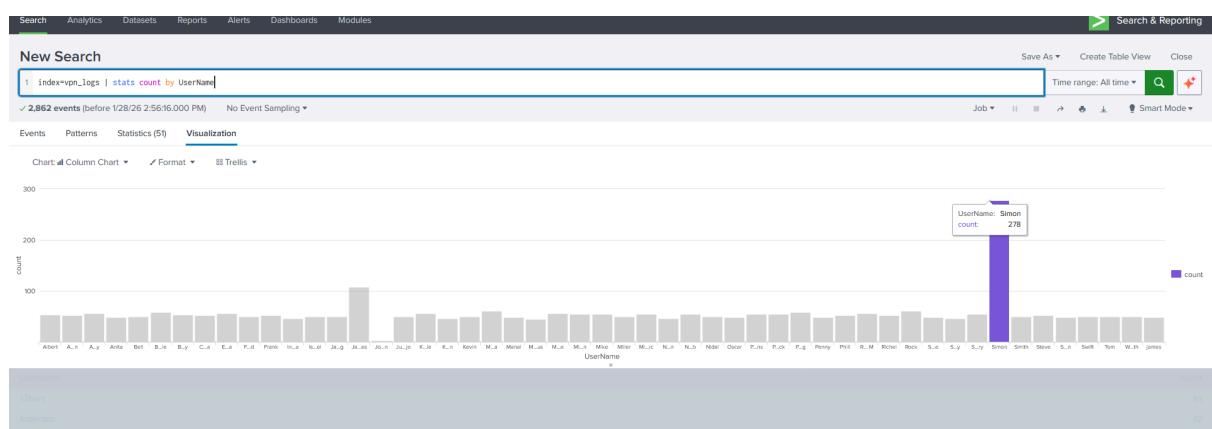
Stage 2: Suspicious Authentication Analysis

Username Activity Analysis

Statistics were generated to count authentication events by username. This step was performed to identify abnormal or suspicious user behavior.

The analysis showed that the username “Simon” had the highest number of events, with a total count of 278. No other user had a comparable volume of activity.

This immediately marked the account as suspicious and required deeper investigation.

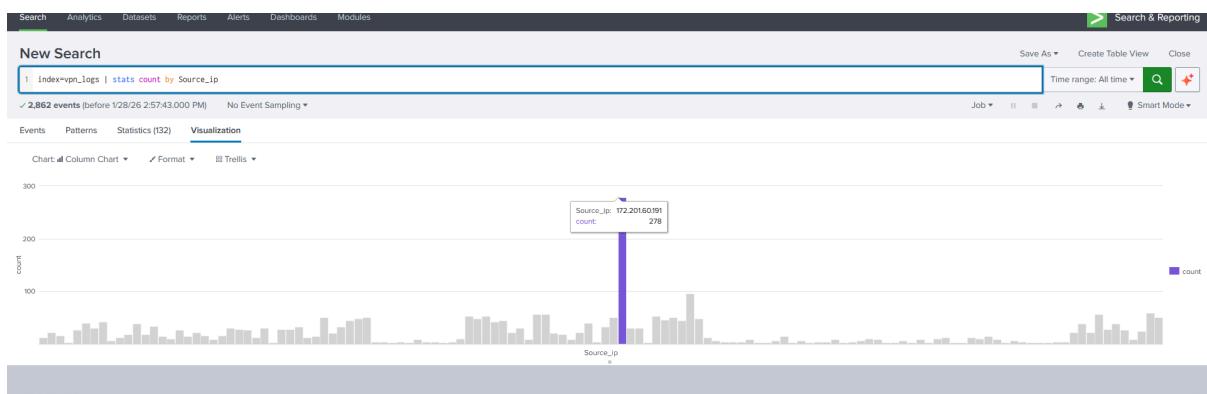


Source IP Analysis

Statistics were also generated to count events by source IP address.

The source IP 172.201.60.199 recorded 278 events, matching the total activity count of the user Simon. This confirms that all authentication attempts for Simon originated from a single IP address.

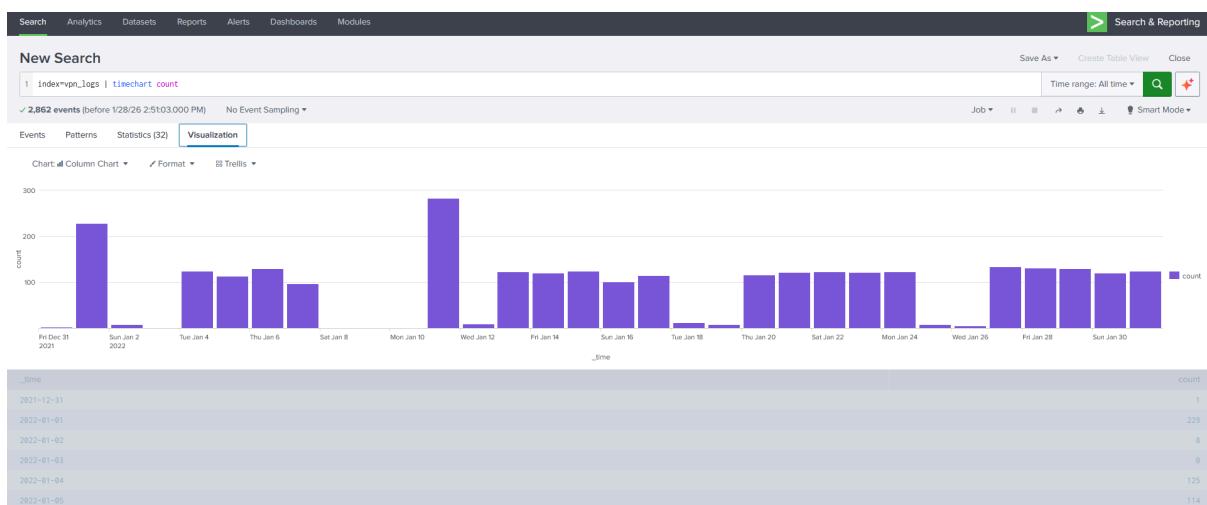
The source IP therefore became directly associated with the suspicious activity.



Time-Based Activity Analysis

A time chart was reviewed to observe authentication activity over time.

The highest concentration of events occurred on Tuesday, January 11th, where authentication activity was significantly higher than on other days. This spike in activity indicated abnormal behavior consistent with automated or repeated login attempts.



Combined Username, IP, and Action Analysis

Further statistics were generated combining:

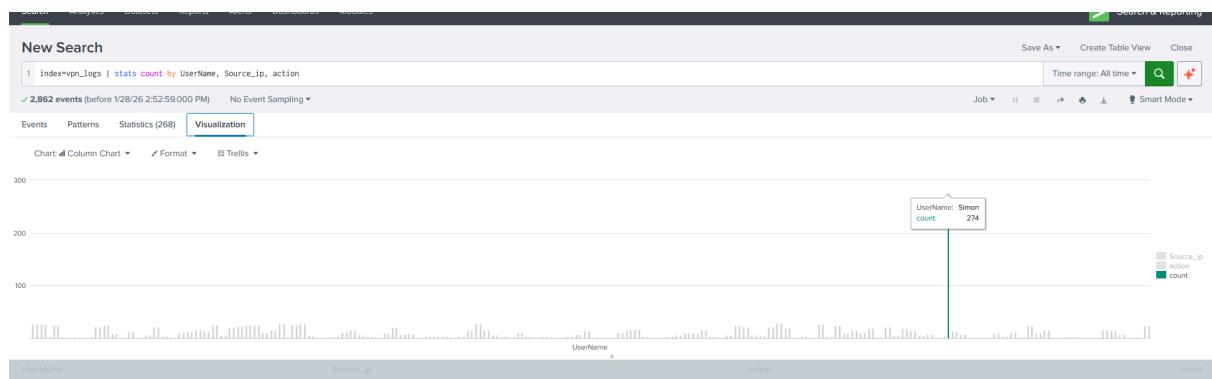
- Username
- Source IP
- Action

This analysis showed:

- Username: Simon
- Source IP: 172.201.60.199
- Action: Failed
- Event count: 274

Out of the total 278 events associated with Simon, 274 were failed authentication attempts.

This confirms a high-volume failed login pattern targeting a single account from a single IP address.



Failed Authentication Burst Analysis

To understand how the failed attempts occurred, failed actions were analyzed over a 5-minute time span.

Results showed:

- Between 07:25 and 07:30 on the same day, there were 144 failed attempts
- At 07:30, an additional 129 failed attempts
- At 07:35, 1 failed attempt

The screenshot shows a search interface with the following details:

- Search Query:** `index:vpn_logs action=failed | stats count by UserName, Source_ip, action`
- Results:** 274 events (before 1/28/26 3:03:21:000 PM) No Event Sampling
- Statistics:** Events (274), Patterns, Statistics (1), Visualization
- Format:** Show: 20 Per Page, Format, Preview On
- Table Headers:** UserName, Source_ip, action, count
- Table Data:**

UserName	Source_ip	action	count
Simon	172.201.68.191	failed	274

The screenshot shows a search interface with the following details:

- Search Query:** `index:vpn_logs action=failed | bin _time span=5m | stats count by UserName, _time | sort - count`
- Results:** 274 events (before 1/28/26 3:05:05:000 PM) No Event Sampling
- Statistics:** Events (274), Patterns, Statistics (3), Visualization
- Format:** Show: 20 Per Page, Format, Preview On
- Table Headers:** UserName, _time, count
- Table Data:**

UserName	_time	count
Simon	2022-01-11 07:25:00	144
Simon	2022-01-11 07:30:00	129
Simon	2022-01-11 07:35:00	1

This pattern indicates rapid, repeated authentication attempts within short time intervals, consistent with brute force behavior.

Source Context Review

Additional fields were reviewed to understand the context of the source activity.

The analysis showed:

- Source country: Canada
- Source state: Alberta
- Destination port: 443
- Protocol: TCP
- Username: Simon

This confirmed that the activity originated from a single geographic location and followed a consistent connection pattern.

The screenshot shows a Splunk search interface with the following details:

- Search Bar:** Index=vpn_logs action=failed | stats dc(UserName) as uniqueUserName by src_ip | sort -uniqueUserName
- Results Summary:** 274 events (before 1/28/26 3:06:46.000 PM) No Event Sampling
- Event View:** Two log entries are displayed in a table format:

i	Time	Event
>	1/1/22 7:35:27:000 AM	{ [-] Company: CyberT EventTime: 2022-01-11T07:35:27 Source_Country: Canada Source_ip: 172.201.69.191 UserName: Simon action: failed index: VPN_Logs port: 443 protocol: tcp source_state: Alberta } Show as raw text host = VPN_Connections source = VPN-logs-1663593355154.json sourcetype = _json
>	1/1/22 7:33:27:000 AM	{ [-] Company: CyberT EventTime: 2022-01-11T07:33:27 Source_Country: Canada Source_ip: 172.201.69.191 UserName: Simon action: failed index: VPN_Logs port: 443

Successful Authentication Review

After identifying failed attempts, the investigation checked whether the same user later achieved successful authentication.

The user Simon recorded four successful (built) authentication events after the failed attempts.

These successful connections occurred as follows:

- January 11th at 07:35 AM
- January 12th at 08:35 AM
- January 13th at 08:35 AM
- January 15th at 08:35 AM

This indicates that after repeated failed attempts, authentication was eventually successful.

The screenshot shows a Splunk search interface with the following details:

- Search Bar:** Index=vpn_logs UserName=Simon action=build | sort -_time
- Results Summary:** 4 events (before 1/28/26 3:19:55.000 PM) No Event Sampling
- Time Range:** All time
- Event List:** Four events are listed, each showing a timestamp, event details, and raw JSON data.

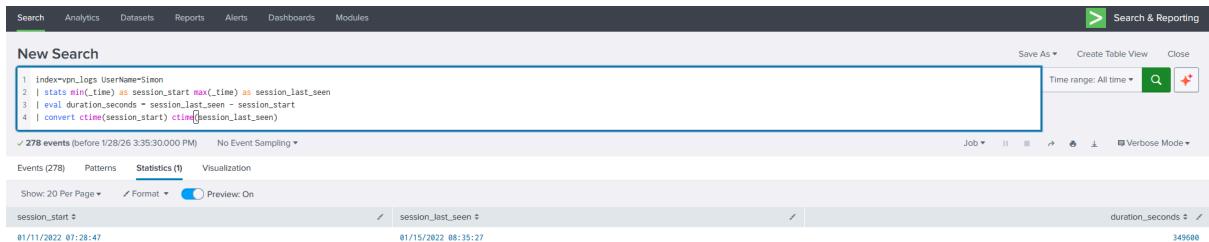
Time	Event
1/11/22 7:35:27 000 AM	{ [-] Company: CyberIT EventTime: 2022-01-11T07:35:27 Source_Country: Canada Source_ip: 172.201.60.191 UserName: Simon action: build index: VPNLogs port: 443 protocol: tcp source_state: Alberta } Show as raw text host = VPN_Connections source = VPN-logs-1663593355154.json sourcetype = _json
1/12/22 8:35:27 000 AM	{ [-] Company: CyberIT EventTime: 2022-01-12T08:35:27 Source_Country: Canada Source_ip: 172.201.60.191 UserName: Simon action: build index: VPNLogs port: 443 protocol: tcp source_state: Alberta } Show as raw text host = VPN_Connections source = VPN-logs-1663593355154.json sourcetype = _json
1/13/22 8:35:27 000 AM	{ [-] Company: CyberIT EventTime: 2022-01-13T08:35:27 }

First and Last Activity Analysis

The user's activity timeline was reviewed:

- First observed event: January 11th at 07:28
- Last observed event: January 15th at 08:35

The total observed duration of activity was 349600 seconds (as reported in the logs).



A screenshot of a search interface, likely from a tool like Splunk or Logstash. The top navigation bar includes 'Search', 'Analytics', 'Datasets', 'Reports', 'Alerts', 'Dashboards', and 'Modules'. On the right, there are buttons for 'Save As', 'Create Table View', and 'Close', along with a search bar and a date range selector set to 'All time'. The main area is titled 'New Search' and contains the following search command:

```
1 index=vpn_logs UserName=Simon
2 | stats min(_time) as session_start max(_time) as session_last_seen
3 | eval duration_seconds = session_last_seen - session_start
4 | convert ctime(session_start) ctime(session_last_seen)
```

Below the search bar, it says '✓ 278 events (before 1/26 3:35:30.000 PM)' and 'No Event Sampling'. There are tabs for 'Events (278)', 'Patterns', 'Statistics (1)', and 'Visualization'. The 'Statistics' tab is selected. Below the tabs, it says 'Show: 20 Per Page' and has a 'Format' dropdown and a 'Preview: On' toggle. The results table has columns for 'session_start' and 'duration_seconds'. The first row shows:

session_start	duration_seconds
01/11/2022 07:28:47	349600

Section 2: Security Incident Report

Incident Name

VPN Brute Force Authentication Attack on User Account

Incident Type

Authentication Abuse
Brute Force Login Attempt
Potential Account Compromise

Affected Account(s)

- Username: Simon

Affected System(s)

- VPN Service
- Remote Access Infrastructure

Detection Method

- Manual log analysis using Splunk
- VPN authentication logs ingested from a TryHackMe lab dataset
- Detection based on abnormal authentication failure patterns and successful login following repeated failures

Data Source

- VPN authentication logs (JSON format)
- Source: TryHackMe lab environment
- Logs ingested and indexed in Splunk (index=vpn_logs)

Incident Summary

A high volume of failed VPN authentication attempts targeting a single user account (Simon) was observed over multiple days. Following these repeated failures, successful VPN authentication events were recorded from the same source IP address. This activity is consistent with a brute force authentication attack that resulted in a potential account compromise.

Incident Timeline

- **January 11**
 - Initial failed VPN authentication attempts observed for user Simon
 - Rapid spike in failed login attempts within short time windows
 - High concentration of failures between approximately 07:25 and 07:35
- **January 11**
 - First successful VPN authentication (“action=build”) recorded after repeated failures
- **January 12**
 - Multiple additional successful VPN authentication events recorded at similar times
- **January 13**
 - Another successful VPN session observed for the same user
- **January 15**
 - Last recorded activity for user Simon
 - Indicates continued access or testing after initial compromise

Observed Indicators

Authentication Activity

- Total events for user Simon: 278
- Failed authentication attempts: 274
- Successful authentication attempts: 4

Source IP

- IP Address: 172.201.60.199
- Source Country: Canada
- Source State: Alberta
- Protocol: TCP
- Destination Port: 443

Analysis Findings

- The volume and frequency of failed authentication attempts indicate automated or scripted activity rather than normal user behavior
- All failed attempts and subsequent successful authentications originated from the same source IP
- Successful authentication events occurred after sustained brute force activity
- Timing patterns suggest persistence rather than accidental login failures

- Activity spanning multiple days increases confidence in malicious intent

Risk Assessment

- **Likelihood of Account Compromise:** High
- **Impact:**
 - Unauthorized VPN access
 - Potential access to internal network resources
 - Increased risk of lateral movement if access was not revoked

Incident Severity: Medium to High

Rationale:

- Single user targeted
- High failure volume
- Confirmed successful authentication after brute force behavior

Recommended Response Actions

- Force password reset for affected user account
- Terminate all active VPN sessions associated with the account
- Block or closely monitor the identified source IP address
- Enforce multi-factor authentication (MFA) for VPN access
- Review VPN and internal logs for signs of post-authentication activity
- Implement alerting for excessive failed authentication attempts

Incident Status

- Investigation completed
- Incident validated
- Remediation actions recommended