

# Log Analysis with Splunk

## Overview

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**Room URL:** <https://tryhackme.com/room/splunkforloganalysis-aoc2025-x8fj2k4rqp>

**Difficulty:** Medium

**Category:** SOC Monitoring

**Date Completed:** 12/3/2025

## Objectives

- Ingest and interpret custom log data in Splunk
  - Create and apply custom field extractions
  - Use Search Processing Language (SPL) to filter and refine search results
  - Conduct an investigation within Splunk to uncover key insights
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## Introduction

As King Malhare's forces tightened their grip on Wareville, the TBFC SOC team faced their most critical challenge yet: reconstructing the attack on their web infrastructure to identify the perpetrators and recover McSkidy. The attackers had left a digital footprint across thousands of log entries, but without the right tools and techniques, finding the needle in the haystack would be impossible. Enter **Splunk**, a powerful log aggregation and analysis platform that transforms raw

event data into actionable intelligence. In this challenge, you'll harness Splunk's capabilities to trace the attack chain from initial reconnaissance through ransomware deployment, uncovering the attacker's IP address, tactics, and the extent of the data breach. By analyzing web traffic patterns and firewall logs, you'll piece together the complete story of how King Malhare's Bandit Bunnies compromised the web server and established command-and-control communications—intelligence that will prove crucial in the race to save Christmas itself.

## What is Splunk

**Splunk** is a leading Security Information and Event Management (SIEM) platform that ingests, indexes, and analyzes machine-generated data from across an organization's IT infrastructure. It collects logs from web servers, firewalls, endpoints, applications, and network devices, making it possible to search, visualize, and correlate events across multiple sources in real-time.

## Why Splunk is Critical for Security Analysts

- **Unified Log Aggregation:** Splunk centralizes logs from disparate sources (web traffic, firewall events, system logs) into a single searchable index, eliminating the need to manually check individual systems.
- **Advanced Search Capabilities:** Using Splunk's powerful query language (SPL - Splunk Processing Language), analysts can filter, correlate, and aggregate massive datasets to identify patterns that would be impossible to spot manually.
- **Threat Investigation & Forensics:** Splunk enables rapid timeline reconstruction, allowing analysts to trace attacker activities chronologically from reconnaissance through exploitation and data exfiltration.
- **Data-Driven Incident Response:** By quantifying attack metrics (bytes transferred, failed login attempts, suspicious user agents), Splunk provides evidence-based insights that support both immediate response and post-incident reporting.

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# Essential Splunk Search Queries for Attack Investigation

## 1. Initial Data Discovery & Index Verification

**Query:** `index=main`

**Purpose:** Establishes baseline awareness of all indexed data and identifies available source types. This foundational search reveals the scope of available logs and confirms that both web traffic and firewall data have been successfully ingested.

**Key Insight:** Selecting "All time" in the time range dropdown ensures you capture the complete attack timeline.

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## 2. Timeline Analysis - Identifying the Attack Window

**Query:** `index=main sourcetype=web_traffic | timechart span=1d count`

**Purpose:** Visualizes event distribution across days to identify abnormal traffic spikes. This query creates a histogram showing daily log volume, which typically reveals when the attack occurred.

**Output Enhancement:** Append `| sort by count | reverse` to sort days by event count in descending order, placing the attack day at the top.

**Investigative Value:** Answers the critical question: "When did the attack happen?" Enables analysts to tighten time ranges for more focused investigation.

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## 3. Anomaly Detection - Suspicious User Agent Filtering

**Query:** `index=main sourcetype=web_traffic user_agent!=\"*Mozilla*\" user_agent!=\"*Chrome*\" user_agent!=\"*Safari*\" user_agent!=\"*Firefox*\"`

**Purpose:** Eliminates legitimate browser traffic and surfaces suspicious automated tools and scripts used by attackers. User agents like `curl`, `wget`, `sqlmap`, and `Havij` immediately stand out as non-standard.

**Why It Works:** Legitimate users access web servers via standard browsers; attackers use command-line tools and specialized exploitation frameworks that generate distinctive user agent strings.

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## 4. Identifying the Primary Attacker IP

**Query:** `sourcetype=web_traffic user_agent!=\"*Mozilla*\" user_agent!=\"*Chrome*\" user_agent!=\"*Safari*\" user_agent!=\"*Firefox*\" | stats count by client_ip | sort -count | head 5`

**Purpose:** Quantifies malicious requests by source IP and ranks them, identifying the primary attacker. The `-` in `sort -count` sorts in descending order.

**Output:** Lists the top 5 IPs responsible for suspicious activity. The highest-count IP (198.51.100.55 in this investigation) is typically the attacker.

**Investigative Advantage:** Focuses subsequent queries on a single attacker IP, reducing noise and enabling deep-dive analysis of their attack progression.

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## 5. Reconnaissance Phase - Configuration File Probing

**Query:** `sourcetype=web_traffic client_ip="198.51.100.55" AND path IN ("/.env", "/*phpinfo*", "/*.git*") | table _time, path, user_agent, status`

**Purpose:** Detects initial footprinting attempts where attackers probe for exposed configuration files (`.env`, `.git` directories) and PHP info pages. These requests typically receive **404, 403, or 401** responses.

**Attack Context:** This represents the reconnaissance phase—attackers gathering information about the target without attempting exploitation yet.

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## 6. Enumeration Phase - Path Traversal & Open Redirect Attempts

**Query:** `sourcetype=web_traffic client_ip="198.51.100.55" AND path="*..\\..\\*" OR path="*redirect*" | stats count by path`

**Purpose:** Identifies attempts to exploit path traversal vulnerabilities (e.g., `../../../../etc/passwd`) and open redirect flaws. The `stats count by path` aggregation shows which sensitive files were targeted and how many times.

### Output in This Challenge:

- 658 attempts to access `/etc/passwd`
- 633 URL redirect attack attempts

**Significance:** Confirms the attacker moved from passive scanning to active vulnerability testing.

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## 7. SQL Injection Attack Detection

**Query:** `sourcetype=web_traffic client_ip="198.51.100.55" AND user_agent IN ("*sqlmap*", "*Havij*") | table _time, path, status`

**Purpose:** Identifies automated SQL injection tools (`sqlmap`, `Havij`) and their payloads. Pay attention to **504 status codes**, which often indicate successful time-based SQL injection (the server delays responding, confirming the injection worked).

**Attacker Behavior:** Demonstrates the exploitation phase where automated tools attempt to extract database contents or escalate privileges.

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## 8. Data Exfiltration - Sensitive File Download Attempts

**Query:** `sourcetype=web_traffic client_ip="198.51.100.55" AND path IN ("*backup.zip*", "*logs.tar.gz*") | table _time, path, user_agent`

**Purpose:** Detects attempts to download large compressed files containing backups and logs. Tools like `curl`, `wget`, and `zgrab` are commonly used for file extraction.

**Threat Implication:** Signals preparation for double-extortion ransomware attacks—attackers gather sensitive data both for encryption and blackmail purposes.

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## 9. Remote Code Execution (RCE) & Webshell Execution

**Query:** `sourcetype=web_traffic client_ip="198.51.100.55" AND path IN ("*bunnylock.bin*", "*shell.php?cmd=*") | table _time, path, user_agent, status`

**Purpose:** Identifies successful webshell uploads and command execution. Requests like `/shell.php?cmd=./bunnylock.bin` confirm the attacker achieved full RCE and executed ransomware payloads.

**Critical Finding:** A successful RCE represents the "Action on Objective"—the point where the attacker has moved from reconnaissance to active system compromise.

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## 10. Command & Control (C2) Communication - Outbound Connections

**Query:** `sourcetype=firewall_logs src_ip="10.10.1.5" AND dest_ip="198.51.100.55" AND action="ALLOWED" | table _time, action, protocol, src_ip, dest_ip, dest_port, reason`

**Purpose:** Pivots to firewall logs to confirm post-exploitation activity. Shows the compromised web server (10.10.1.5) establishing outbound connections to the attacker's C2 server. The `action="ALLOWED"` and `reason="C2_CONTACT"` fields confirm malicious communication.

**Investigative Power:** Proves the web server is under active attacker control and communicating with external command infrastructure.

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## 11. Data Exfiltration Volume - Bytes Transferred to C2

**Query:** `sourcetype=firewall_logs src_ip="10.10.1.5" AND dest_ip="198.51.100.55" AND action="ALLOWED" | stats sum(bytes_transferred) by src_ip`


**Purpose:** Quantifies the total data exfiltrated from the compromised server to the attacker's C2 infrastructure. Uses the `sum()` aggregation function to calculate total bytes.

**Output in This Investigation:** **126,167 bytes** transferred—evidence of substantial data theft.

**Reporting Value:** This metric is crucial for incident reporting, damage assessment, and understanding the scope of the breach.

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## Walk Through

1. Enable the splunk online instance (Logs are already ingested upon vm starting)
2. What is the attacker IP found attacking and compromising the web server?
  1. Search term `index=main` & timeframe `All Time`
    1. 2 source types. `web_traffic` & `firewall_logs`
    2. Webserver local ip `10.10.1.5`
  2. `index=main sourcetype=web_traffic` to view just web traffic
  3. `index=main sourcetype=web_traffic | timechart span=1d count` to visualize the timeline  
 [splunk1.png](#)
  4. Reverse the query to show the days with the max number at the beginning `Search`  
`query: index=main sourcetype=web_traffic | timechart span=1d count | sort by count | reverse`
  5. Using the events tab to see data about the events and interesting fields
  6. `client_ip` revealed `198.51.100.55` with `7,876` entries
3. Which day was the peak traffic in the logs? (Format: YYYY-MM-DD)

1. Using the three interesting fields displayed the year, month, and day with the peak traffic `date_year` `date_month` `date_mday`
2. `October 12, 2025`
4. What is the count of Havij user\_agent events found in the logs?
  1. This can be found in the `user_agent` interesting field.
  2. `993`
5. How many path traversal attempts to access sensitive files on the server were observed?
  1. Filtering out benign values by adding `user_agent!=*Mozilla* user_agent!=*Chrome* user_agent!=*Safari* user_agent!=*Firefox*` to the query
    1. This query would be used to help narrow down suspicious IP's
 

```
sourcetype=web_traffic user_agent!=*Mozilla* user_agent!=*Chrome* user_agent!=*Safari* user_agent!=*Firefox* | stats count by client_ip | sort -count | head 5
```
    2. Reconnaissance `sourcetype=web_traffic client_ip="198.51.100.55" AND path IN ("/.env", "/*phpinfo*", "/*.git*") | table _time, path, user_agent, status`
      1. `curl` & `wget` were met with `404` `401` and `403`
      2. [splunk2.png](#)
    3. Vulnerability testing `sourcetype=web_traffic client_ip="198.51.100.55" AND path="*.*" OR path="*redirect"`
      - This shows what the attackers were trying to access
    4. `sourcetype=web_traffic client_ip="198.51.100.55" AND path=".." OR path="redirect" | stats count by path`
      - This displays how many attempts there were for each path.
        - [splunk3.png](#)
        - `658` attempts to access `/etc/passwd`
        - `633` url redirects
  6. Examine the firewall logs. How many bytes were transferred to the C2 server IP from the compromised web server?
    1. `sourcetype=firewall_logs src_ip="10.10.1.5" AND dest_ip="198.51.100.55" AND action="ALLOWED" | table _time, action, protocol, src_ip, dest_ip, dest_port, reason`
      - view the c2 events
    2. `sourcetype=firewall_logs src_ip="10.10.1.5" AND dest_ip="198.51.100.55" AND action="ALLOWED" | stats sum(bytes_transferred) by src_ip`
      - count the bytes transferred
      - [splunk4.png](#)

## Lessons Learned

- **Mastered Splunk-based incident response:** Successfully used log aggregation, timeline analysis, and multi-source correlation to reconstruct a sophisticated attack chain spanning reconnaissance, exploitation, and data exfiltration.
  - **Applied threat hunting methodology:** Filtered out benign traffic, identified anomalous patterns through user agent and IP analysis, and traced attacker activities chronologically across web and firewall logs to quantify damage and confirm command-and-control communications—critical skills for detecting and responding to advanced threats like King Malhare's ransomware campaign.
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## Resources

[TryHackMe](#)

[Splunk](#)

[Splunk Cheat Sheet](#)

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