

# **Python Project: Automated Security Log Parser**

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## 1. Introduction

This document serves as a technical guide for the Automated Security Log Parser. The primary function of this script is to perform rapid security auditing on Linux authentication logs (/var/log/auth.log).

The script transforms dense, unstructured system logs into a clear, actionable security report by:

- **Parsing:** Extracting critical data points like Timestamps, Usernames, and Executed Commands.
- **Alerting:** Automatically flagging suspicious keywords (e.g., nmap, /etc/shadow) and failed authentication attempts.
- **Tracking:** Monitoring the lifecycle of user accounts (Creation/Deletion) and privilege escalation attempts (su, sudo).

## 2. Target Audience

This guide and tool are designed for:

- **Security Analysts:** Professionals needing to quickly audit user activity and identify potential breaches without manually reading thousands of lines.
- **System Administrators:** Users requiring a "Red Flag" alert system for unauthorized administrative changes.
- **Cybersecurity Students:** Individuals learning how to process system logs and implement security logic using Python.

## 3. Requirements

To successfully execute this script, the following requirements must be met:

1. **Operating System:** Linux (Debian/Kali) with rsyslog installed.
2. **Environment:** Python interpreter.
3. **Privileges:** Root/Sudo privileges are mandatory to read the protected /var/log/auth.log file.
4. **Dependencies:** Standard Python libraries (os, sys).

## 4. Operational Guide

**Step 1 Execution & Initialization:** The script must be run with elevated privileges to access the system logs. *Command:*

```
$ python Python_log_parser.py
```

**Step 2 Automated File Validation:** Upon start, the script utilizes the os library to perform a safety check. It verifies that the target log file (/var/log/auth.log) exists. If the file is missing (e.g., rsyslog is not installed), it halts execution and provides the specific remediation command (sudo apt-get install rsyslog).

**Step 3 Real-Time Parsing Loop:** The script initiates a read loop, iterating through the log file line-by-line. It automatically filters out empty lines or incomplete entries using try/except blocks to ensure stability during processing.

**Step 4 Red Flag Detection:** Every line is scanned against a predefined "Blacklist" of suspicious keywords. High-risk commands like nc (netcat), nmap, or attempts to read sensitive files like /etc/shadow trigger an immediate **"RED FLAG DETECTED"** alert in the output.

**Step 5 User & Privilege Auditing:** The tool categorizes events into distinct security contexts:

- **New Users:** Detects and reports the creation of new accounts.
- **Privilege Escalation:** Tracks every usage of sudo and su, calculating successful sessions versus failed authentication attempts.

**Step 6 Summary & Statistics:** At the conclusion of the analysis, the script generates a statistical summary, providing a quick-glance view of the system's security posture (Total Failed Logins, Total Sudo Sessions, etc.).

```
[!] 2026-02-06T11:14:13.716784-05:00 | SUDO SESSION: : session opened for user root by kali
[!] 2026-02-06T11:14:13.719338-05:00 | SUDO SESSION: : session closed for user root
[*] 2026-02-06T11:14:13.728905-05:00 | PWD=/home/kali/Desktop/projects | USER=root | CMD=COMMAND=/usr/bin/sed -i s/^#\s*xjpg/jpg/ /etc/scalpel/scalpel.conf
[!] 2026-02-06T11:14:13.729022-05:00 | SUDO SESSION: : session opened for user root by kali
[!] 2026-02-06T11:14:13.732128-05:00 | SUDO SESSION: : session closed for user root
[*] 2026-02-06T11:14:13.741375-05:00 | PWD=/home/kali/Desktop/projects | USER=root | CMD=COMMAND=/usr/bin/sed -i s/^#\s*xpng/png/ /etc/scalpel/scalpel.conf
[!] 2026-02-06T11:14:13.741539-05:00 | SUDO SESSION: : session opened for user root by kali
[!] 2026-02-06T11:14:13.744545-05:00 | SUDO SESSION: : session closed for user root
[*] 2026-02-06T11:14:13.752427-05:00 | PWD=/home/kali/Desktop/projects | USER=root | CMD=COMMAND=/usr/bin/sed -i s/^#\s*xgif/gif/ /etc/scalpel/scalpel.conf
[!] 2026-02-06T11:14:13.752546-05:00 | SUDO SESSION: : session opened for user root by kali
[!] 2026-02-06T11:14:13.756411-05:00 | SUDO SESSION: : session closed for user root
[*] 2026-02-06T11:14:13.764357-05:00 | PWD=/home/kali/Desktop/projects | USER=root | CMD=COMMAND=/usr/bin/sed -i s/^#\s*xpdf/pdf/ /etc/scalpel/scalpel.conf
[!] 2026-02-06T11:14:13.764465-05:00 | SUDO SESSION: : session opened for user root by kali
[!] 2026-02-06T11:14:13.766838-05:00 | SUDO SESSION: : session closed for user root
[*] 2026-02-06T11:14:13.774168-05:00 | PWD=/home/kali/Desktop/projects | USER=root | CMD=COMMAND=/usr/bin/sed -i s/^#\s*xdoc/doc/ /etc/scalpel/scalpel.conf
[!] 2026-02-06T11:14:13.774247-05:00 | SUDO SESSION: : session opened for user root by kali
[!] 2026-02-06T11:14:13.776717-05:00 | SUDO SESSION: : session closed for user root
[*] 2026-02-06T11:14:13.784189-05:00 | PWD=/home/kali/Desktop/projects | USER=root | CMD=COMMAND=/usr/bin/sed -i s/^#\s*xzip/zip/ /etc/scalpel/scalpel.conf
[!] 2026-02-06T11:14:13.784288-05:00 | SUDO SESSION: : session opened for user root by kali
[!] 2026-02-06T11:14:13.787566-05:00 | SUDO SESSION: : session closed for user root
[*] 2026-02-06T11:14:13.796662-05:00 | PWD=/home/kali/Desktop/projects | USER=root | CMD=COMMAND=/usr/bin/sed -i s/^#\s*xrar/rar/ /etc/scalpel/scalpel.conf
[!] 2026-02-06T11:14:13.796825-05:00 | SUDO SESSION: : session opened for user root by kali
[!] 2026-02-06T11:14:13.799428-05:00 | SUDO SESSION: : session closed for user root
[!] 2026-02-06T11:15:13.486828-05:00 | SUDO SESSION: : session closed for user root

PARSING SUMMARY
Failed Auth Alerts: 1
Total Sudo Sessions: 167
Total Su Sessions: 0
```

## 5. Purpose & Automation

The goal is to transform a messy, dense log file into a readable security report.

1. **Noise Reduction:** Raw logs are often cluttered with system IDs (uid=0) and repetitive data. The script uses string manipulation to sanitize the output, presenting only the essential information (Who, What, When).
2. **Proactive Monitoring:** Instead of waiting for a manual review, the script proactively hunts for indicators of compromise (IOCs) using keyword matching.
3. **Resilience:** By implementing robust error handling (try...except IndexError), the script is designed to skip over malformed log lines rather than crashing, ensuring the audit completes even on corrupted files.

## 6. Technical Analysis

The script relies on four core logic blocks to manage the workflow:

**1. Function Log Ingestion & Safety:** Ensures the script only runs in a valid environment. Uses `os.path.exists` to check for the file.

```
# Checks if file exists
if not os.path.exists('/var/log/auth.log'):
    print(f"{ERR} Error: file not found please download rsyslog using: sudo apt-get install rsyslog")
    sys.exit()
```

**2. Function Keyword Detection (Blacklist):** Identifies high-priority threats immediately. **Logic:** Iterates through a list of dangerous strings (`suspicious_words`) and checks if they appear in the current line.

```
suspicious_words = ['etc/shadow', 'nmap', 'nc', 'cat /etc/passwd', 'chmod 777', 'john']
```

```
# Checks for suspicious words
for word in suspicious_words:
    if word in line:
        print(f"{RED}{BOLD}!! SECURITY ALERT !!{NC} Time=[{GRAY}{timestamp}{NC}] | Pattern: {WHITE}'{word}'{NC}")
```

```
!! SECURITY ALERT !! Time=[2026-02-06T09:27:39.888819-05:00] | Pattern: 'nmap'
```

**3. Function Data Sanitization:** Cleans up the log output for human readability. **Logic:** Uses chained `.replace()` methods to remove technical noise like (`uid=0`) and `.strip()` to remove whitespace.

```
elif "pam_unix(su:session)" in line:
    try:
        rootgrep = line.split('pam_unix(su:session)')[1].strip()
        clean_msg = rootgrep.replace('uid=0', '')
        print(f"{WARN} {GRAY}{timestamp}{NC} | {YELLOW}SU SESSION:{NC} {WHITE}{clean_msg}{NC}")
        su_usage_count += 1
    except IndexError:
        pass
```

**4. Function Event Categorization:** distinguishing between normal administrative tasks and potential threats. **Logic:** Uses `if/elif` statements to route different log types (New User vs. Sudo vs. Failed Login) to specific processing blocks.

```
if 'COMMAND' in line:
    try:
        area = splitting[7]
        user = splitting[3]
        command = " ".join(splitting[11:])
        # Logic: [Action] Time | Path | User | Command
        print(f"{INFO} {GRAY}{timestamp}{NC} | {CYAN}{area}{NC} | {WHITE}USER={user}{NC} | {WHITE}CMD={command}{NC}")
    except IndexError:
        continue

# 2. Monitor user authentication changes.
elif "new user: name=" in line:
    try:
        usernameD = line.split('name=')[1].split(',')[0]
        usernameC = usernameD.split(',')[0]
        print(f"{OK} {GRAY}{timestamp}{NC} | {GREEN}ACCOUNT CREATED:{NC} {WHITE}{usernameC}{NC}")
    except IndexError:
        pass

elif "delete user" in line:
    try:
        username = line.split('user')[2].strip()
        print(f"{WARN} {GRAY}{timestamp}{NC} | {RED}ACCOUNT DELETED:{NC} {WHITE}{username}{NC}")
    except IndexError:
        pass

elif "password changed" in line:
    try:
        usergrep = line.split('password')[1].strip()
        print(f"{INFO} {GRAY}{timestamp}{NC} | {CYAN}CREDENTIAL CHANGE:{NC} {WHITE}{usergrep}{NC}")
    except IndexError:
        pass

elif "pam_unix(su:session)" in line:
    try:
        rootgrep = line.split('pam_unix(su:session)')[1].strip()
        clean_msg = rootgrep.replace('uid=0', '')
        print(f"{WARN} {GRAY}{timestamp}{NC} | {YELLOW}SU SESSION:{NC} {WHITE}{clean_msg}{NC}")
        su_usage_count += 1
    except IndexError:
        pass

elif "pam_unix(sudo:session)" in line:
    try:
        rootgrep2 = line.split('pam_unix(sudo:session)')[1].strip()
        clean_msg2 = rootgrep2.replace('uid=0', '').replace('tty=dev/pts/1', '').replace(':', '').strip()
        print(f"{WARN} {GRAY}{timestamp}{NC} | {YELLOW}SUDO SESSION:{NC} {WHITE}{clean_msg2}{NC}")
        sudo_usage_count += 1
    except IndexError:
        pass

elif "pam_unix(sudo:auth)" in line:
    try:
        arrange = line.split('kali', 1)[1]
        clean_msg3 = arrange.replace('uid=1000', '').replace('euid=0', '').replace('tty=dev/pts/1', '').replace(':', '').strip()
        print(f"{ERR} {GRAY}{timestamp}{NC} | {RED}{BOLD}AUTH FAILURE:{NC} {WHITE}{clean_msg3}{NC}")
        failed_attempts += 1
    except IndexError:
        pass

# Final Statistics
```

## **7. Technical Skills Gained**

Through the development of this project, I developed the following technical skills:

- **Python String Manipulation:** learned how to use `split()`, `join()`, and `replace()` to parse complex, unstructured text data.
- **Security Logic Implementation:** Learned to translate security concepts (Blacklisting, Privilege Tracking) into functional code.
- **Robust Error Handling:** Implemented `try...except` blocks to prevent script crashes when encountering unexpected data formats..

## **8. Summary**

This project resulted in a lightweight yet powerful Security Auditing tool. By combining string manipulation with real-time log parsing logic, it allows an analyst to instantly identify Red Flags and track user activity without manually sifting through thousands of lines of raw data. It demonstrates a strong ability to automate security tasks using Python.