

Security Operations Center (SOC) Lab

Complete Installation & Configuration Guide

Automated Threat Detection and Response Platform

Splunk SIEM • Shuffle SOAR • Suricata IDS • Zeek Network Monitor

OpenAI AI Analysis • Jira Ticketing • Slack Notifications

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Executive Summary

This guide provides comprehensive documentation for building an enterprise-grade Security Operations Center (SOC) lab environment. The infrastructure integrates multiple security tools to create an automated threat detection and incident response platform that achieves a 98% reduction in mean time to respond (MTTR).

Architecture Overview

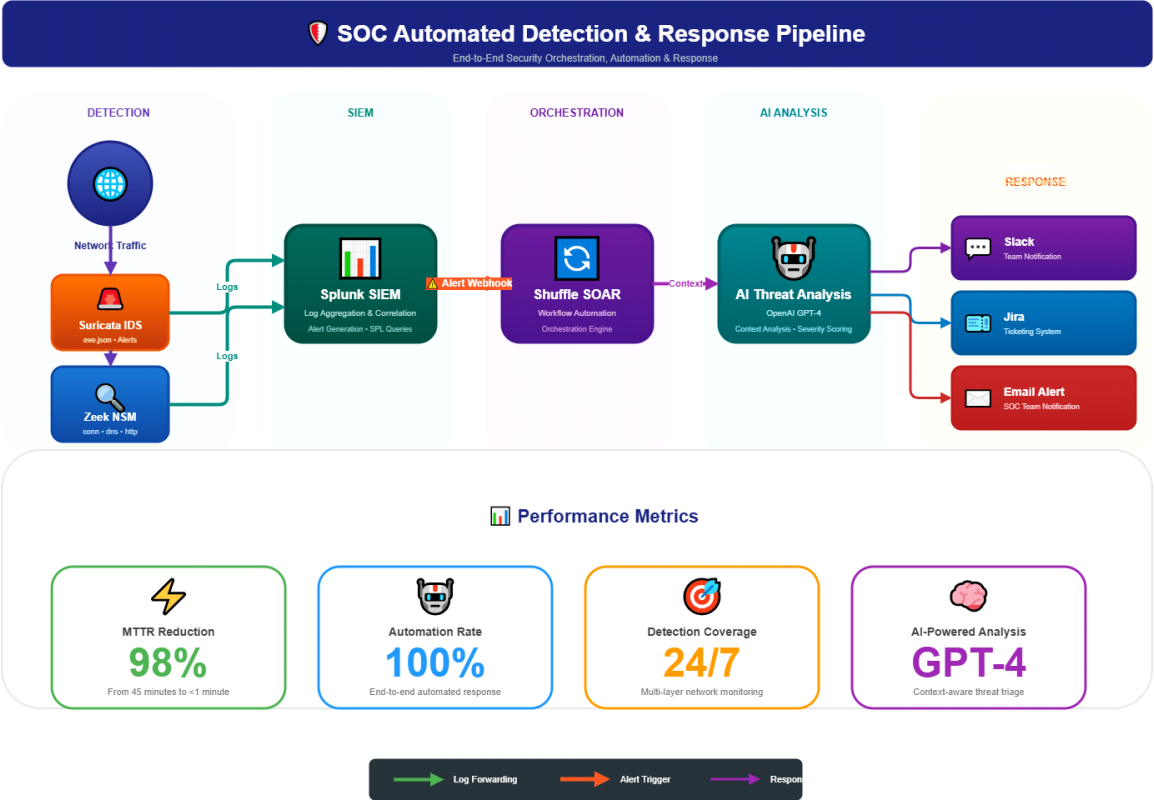
The SOC lab implements a layered security architecture:

- Network Detection Layer: Suricata IDS and Zeek network monitoring capture and analyze network traffic
- SIEM Layer: Splunk Enterprise aggregates, correlates, and analyzes security events
- Orchestration Layer: Shuffle SOAR automates incident response workflows
- AI Analysis Layer: OpenAI GPT-4 provides intelligent threat analysis and recommendations
- Ticketing Layer: Jira automatically creates and tracks security incidents
- Communication Layer: Slack delivers real-time notifications to the SOC team

Key Features

- Automated threat detection using signature-based and anomaly-based methods
- AI-powered threat analysis with executive summaries and technical details
- Automated incident ticket creation with MITRE ATT&CK framework mapping
- Real-time SOC team notifications via Slack
- Comprehensive logging and forensic capabilities
- 98% reduction in mean time to respond (MTTR)

(1) Whole Automation Walkflow



Prerequisites and System Requirements

Hardware Requirements

Component	Minimum Specification
CPU	4 cores (8 cores recommended for production)
RAM	16 GB (32 GB recommended)
Storage	100 GB SSD (500 GB recommended for extended log retention)
Network	1 Gbps network interface

Software Requirements

- Operating System: Kali Linux 2024 or Ubuntu 22.04 LTS
- Splunk Enterprise 9.x (Free license available)
- Suricata 7.x or later
- Zeek (formerly Bro) 6.x or later

- Shuffle SOAR (cloud or self-hosted)
- Python 3.8 or later

External Services Required

- OpenAI API account (GPT 4 access recommended)
- Jira Cloud or Server instance
- Slack workspace with incoming webhook capability

Part 1: Suricata IDS Installation and Configuration

1.1 Suricata Overview

Suricata is an open-source network Intrusion Detection System (IDS) and Intrusion Prevention System (IPS) that provides real-time threat detection capabilities. It uses signature-based detection rules to identify malicious network traffic and security threats.

1.2 Installation Steps

Update System Packages

```
sudo apt update && sudo apt upgrade -y
```

Install Suricata

```
sudo apt install suricata -y
```

Verify Installation

```
sudo systemctl status suricata
```

```
suricata --version
```

Screenshot: Suricata Status

Insert Suricata_status.png - Shows Suricata service running with version 8.0.2, active (running) status

1.3 Suricata Configuration

Edit Main Configuration File

```
sudo nano /etc/suricata/suricata.yaml
```

Configure Network Interface

Locate the af-packet section and configure your network interface (typically eth0):

```
af-packet:
  - interface: eth0
    cluster-id: 99
    cluster-type: cluster_flow
    defrag: yes
```

Configure Home Network

Set your home network CIDR range in the vars section:

```
vars:
  address-groups:
    HOME_NET: "[192.168.1.0/24]"
    EXTERNAL_NET: " !$HOME_NET"
```

Enable EVE JSON Logging

Configure EVE logging for Splunk integration:

```
outputs:
  - eve-log:
      enabled: yes
      filetype: regular
      filename: /var/log/suricata/eve.json
      types:
        - alert:
            payload: yes
            metadata: yes
            http: yes
```

1.4 Suricata Rules Management

Update Suricata Rules

```
sudo suricata-update
```

Enable Specific Rule Sources

List available rule sources:

```
sudo suricata-update list-sources
```

Enable ET/OPEN ruleset (recommended):

```
sudo suricata-update enable-source et/open
```

```
sudo suricata-update
```

Test Configuration

```
sudo suricata -T -c /etc/suricata/suricata.yaml -v
```

You should see a message confirming the configuration is valid.

1.5 Start Suricata Service

1. Enable Suricata to start on boot:

```
sudo systemctl enable suricata
```

1. Start the Suricata service:

```
sudo systemctl start suricata
```

1. Verify Suricata is running:

```
sudo systemctl status suricata
```

1.6 Verify Log Generation

Check that Suricata is generating logs:

```
sudo tail -f /var/log/suricata/eve.json
```

```
sudo tail -f /var/log/suricata/fast.log
```

Generate test traffic (e.g., browse websites) and confirm logs are being created.

Part 2: Zeek Network Monitor Installation and Configuration

2.1 Zeek Overview

Zeek (formerly Bro) is a powerful network monitoring framework that provides comprehensive visibility into network traffic. Unlike signature-based IDS systems, Zeek

focuses on network analysis and generates detailed logs about network activity, protocols, and behaviors.

2.2 Installation Steps

Install Dependencies

```
sudo apt install cmake make gcc g++ flex bison libpcap-dev \  
libssl-dev python3 python3-dev swig zlib1g-dev -y
```

Install Zeek from Package

For Debian/Ubuntu systems:

```
echo 'deb  
http://download.opensuse.org/repositories/security:/zeek/xUbuntu 22.04/ /' | \  
\  
sudo tee /etc/apt/sources.list.d/security:zeek.list  
  
curl -fsSL  
https://download.opensuse.org/repositories/security:zeek/xUbuntu 22.04/Release.key | \  
gpg --dearmor | sudo tee /etc/apt/trusted.gpg.d/security_zeek.gpg >  
/dev/null  
  
sudo apt update  
  
sudo apt install zeek -y
```

Add Zeek to PATH

```
echo 'export PATH=/opt/zeek/bin:$PATH' >> ~/.bashrc  
  
source ~/.bashrc
```

Verify Installation

```
zeek --version
```

Screenshot: Zeek Status

```
(kali㉿kali)-[~]
$ sudo /opt/zeek/bin/zeekctl start
starting zeek ...

(kali㉿kali)-[~]
$ sudo /opt/zeek/bin/zeekctl status
Name      Type      Host      Status  Pid    Started
zeek      standalone localhost running 2141763 23 Dec 23:25:09

(kali㉿kali)-[~]
$
```

2.3 Zeek Configuration

Configure Network Interface

Edit the node configuration file:

```
sudo nano /opt/zeek/etc/node.cfg
```

Configure the interface (replace eth0 with your interface):

```
[zeek]

type=standalone

host=localhost

interface=eth0
```

Configure Local Networks

Edit the networks configuration:

```
sudo nano /opt/zeek/etc/networks.cfg
```

Add your local network:

```
192.168.1.0/24      Private IP space
10.0.0.0/8          Private IP space
```

Enable JSON Logging

Create or edit the local site policy file:

```
sudo nano /opt/zeek/share/zeek/site/local.zeek
```

Add the following line to enable JSON logging:


```
@load policy/tuning/json-logs.zEEK
```

2.4 Deploy and Start Zeek

1. Deploy Zeek configuration:

```
sudo /opt/zeek/bin/zeekctl deploy
```

1. Check Zeek status:

```
sudo /opt/zeek/bin/zeekctl status
```

1. If Zeek is not running, start it:

```
sudo /opt/zeek/bin/zeekctl start
```

2.5 Verify Log Generation

Check that Zeek is generating logs:

```
ls -la /opt/zeek/spool/zeek/
```

View connection logs:

```
tail -f /opt/zeek/spool/zeek/conn.log
```

You should see network connection data being logged in real-time.

2.6 Configure Log Rotation

Set up automated log rotation in zeekctl.cfg:

```
sudo nano /opt/zeek/etc/zeekctl.cfg
```

Configure log rotation settings:

```
LogRotationInterval = 3600      # Rotate logs every hour
```

```
LogExpireInterval = 0           # Never delete logs automatically
```

Part 3: Splunk Enterprise Installation and Configuration

3.1 Splunk Overview

Splunk Enterprise is a powerful Security Information and Event Management (SIEM) platform that aggregates, indexes, and analyzes machine data from multiple sources. It serves as the central correlation and analysis engine for the SOC lab.

3.2 Download and Install Splunk

1. Download Splunk Enterprise from splunk.com (requires free account)
2. Install Splunk:

```
sudo dpkg -i splunk.deb
```

1. Start Splunk and accept the license:

```
sudo /opt/splunk/bin/splunk start --accept-license
```

1. Enable Splunk to start on boot:

```
sudo /opt/splunk/bin/splunk enable boot-start
```

3.3 Initial Splunk Configuration

- Access Splunk web interface at: <http://localhost:8000>
- Default credentials: admin / changeme (change immediately)
- Complete the initial setup wizard

3.4 Configure Suricata Data Input

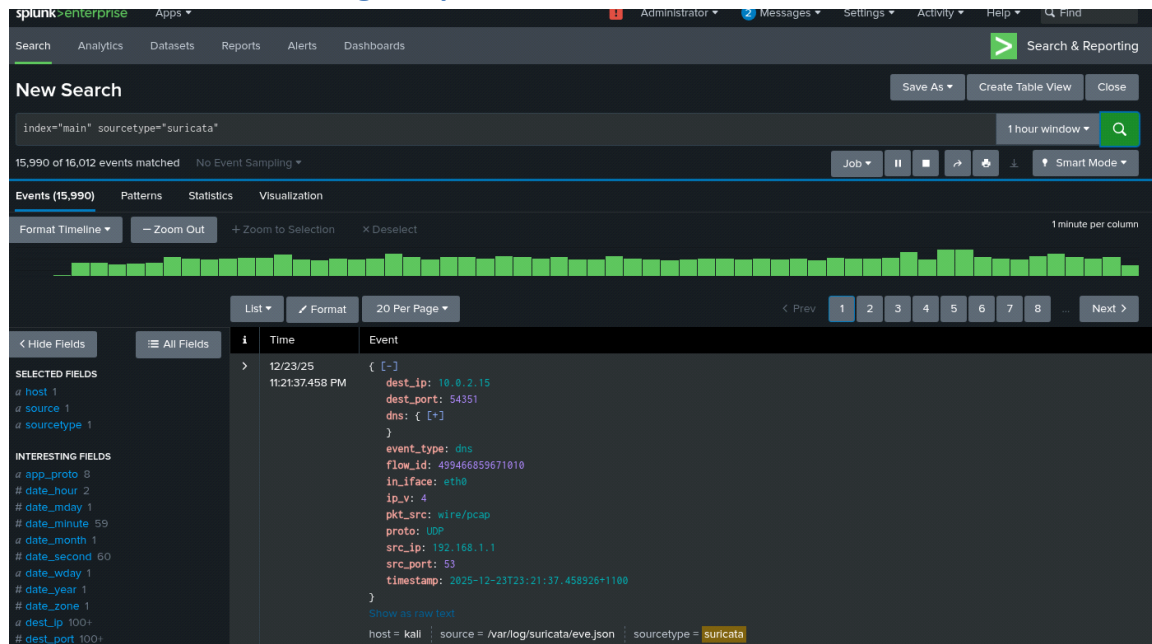
Create Index

1. In Splunk Web, navigate to Settings → Indexes
2. Click 'New Index'
3. Configure: Index Name: main, Index Data Type: Events, Max Size: 500000 MB

Add Suricata Data Input

1. Navigate to Settings → Data Inputs
2. Click 'Files & Directories' → 'New Local File & Directory'
3. Configure:
 - File or Directory: /var/log/suricata/eve.json
 - Sourcetype: _json
 - Index: main

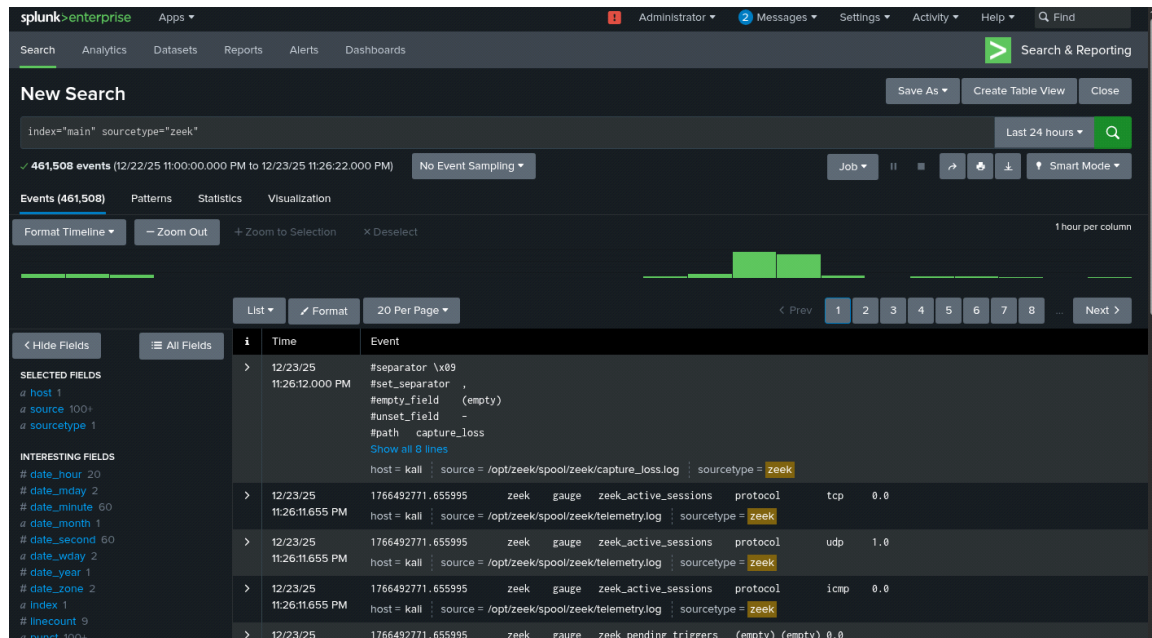
Screenshot: Suricata Logs in Splunk



3.5 Configure Zeek Data Input

1. Navigate to Settings → Data Inputs
2. Click 'Files & Directories' → 'New Local File & Directory'
3. Configure:
 - File or Directory: `/opt/zeek/spool/zeek/*.log`
 - Whitelist: `.*.log$`
 - Sourcetype: `_json`
 - Index: `main`

Screenshot: Zeek Logs in Splunk



3.6 Create Custom Splunk Alerts

Example: High Severity SSH & Port Scan Alert

1. Navigate to Settings → Searches, Reports, and Alerts
2. Click 'New Alert'
3. Configure the search query (SPL):

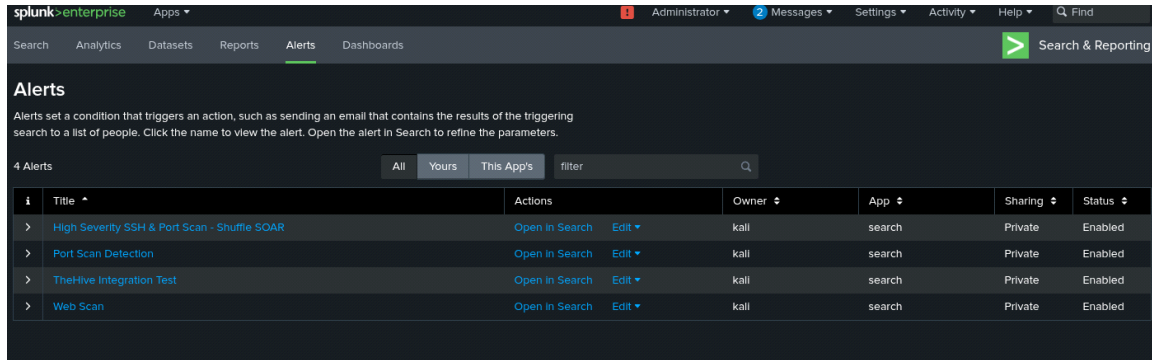
```
index="main" sourcetype="suricata" event_type="alert"

| eval severity_level=case(
    severity==1, "high",
    severity==2, "medium",
    severity==3, "low",
    1=1, "unknown")

| search severity_level="high"
```

1. Set alert conditions: Trigger: Number of Results, Condition: is greater than 0, Throttle: 5 minutes

Screenshot: Custom SPL Query



The screenshot shows the Splunk Alerts page. At the top, there's a navigation bar with 'splunk>enterprise' and various user options. Below it, a secondary navigation bar includes 'Search', 'Analytics', 'Datasets', 'Reports', 'Alerts' (which is highlighted), and 'Dashboards'. A 'Search & Reporting' button is on the right. The main heading is 'Alerts', followed by a brief description: 'Alerts set a condition that triggers an action, such as sending an email that contains the results of the triggering search to a list of people. Click the name to view the alert. Open the alert in Search to refine the parameters.' Below this, it says '4 Alerts' and provides filters: 'All', 'Yours', 'This App's', and a 'filter' input field. A table lists the alerts:

i	Title ^	Actions	Owner ↕	App ↕	Sharing ↕	Status ↕
>	High Severity SSH & Port Scan - Shuffle SOAR	Open in Search Edit	kali	search	Private	Enabled
>	Port Scan Detection	Open in Search Edit	kali	search	Private	Enabled
>	TheHive Integration Test	Open in Search Edit	kali	search	Private	Enabled
>	Web Scan	Open in Search Edit	kali	search	Private	Enabled

3.7 Configure Webhook Alert Action

1. In the alert configuration, click 'Add Actions'
2. Select 'Webhook'
3. Configure webhook settings:
 - URL: [http://localhost:3001/api/v1/hooks/webhook \[_id\]](http://localhost:3001/api/v1/hooks/webhook_[_id])
 - Method: POST
 - Content-Type: application/json

 Screenshot: Webhook Configuration

Webhook: running

What are webhooks?


Name

Receive_Splunk_Alert

Associated App (optional)

Parameters

Webhook URI

http://localhost:3001/api/v1/hooks/wel 

PS: This does NOT work with localhost. Use your local IP instead.

Start

Stop

Authentication headers

AUTH_HEADER=AUTH_VALUE1

Part 4: Shuffle SOAR Installation and Configuration

4.1 Shuffle Overview

Shuffle is an open-source Security Orchestration, Automation and Response (SOAR) platform that enables automated incident response workflows. It serves as the orchestration layer connecting Splunk, OpenAI, Jira, and Slack.

4.2 Installation Options

Shuffle can be deployed in two ways:

- Cloud Version: Free hosted version at shuffler.io (recommended for testing)
- Self-Hosted: Docker-based deployment for full control

Option 1: Using Shuffle Cloud

- Visit <https://shuffler.io>
- Create a free account
- No installation required

Option 2: Self-Hosted Shuffle with Docker

1. Install Docker and Docker Compose:

```
sudo apt install docker.io docker-compose -y  
  
sudo systemctl enable docker  
  
sudo systemctl start docker
```

1. Clone Shuffle repository:

```
git clone https://github.com/Shuffle/Shuffle  
  
cd Shuffle
```

1. Start Shuffle:

```
sudo docker-compose up -d
```

1. Access Shuffle at <http://localhost:3001>

4.3 Creating the Automated Response Workflow

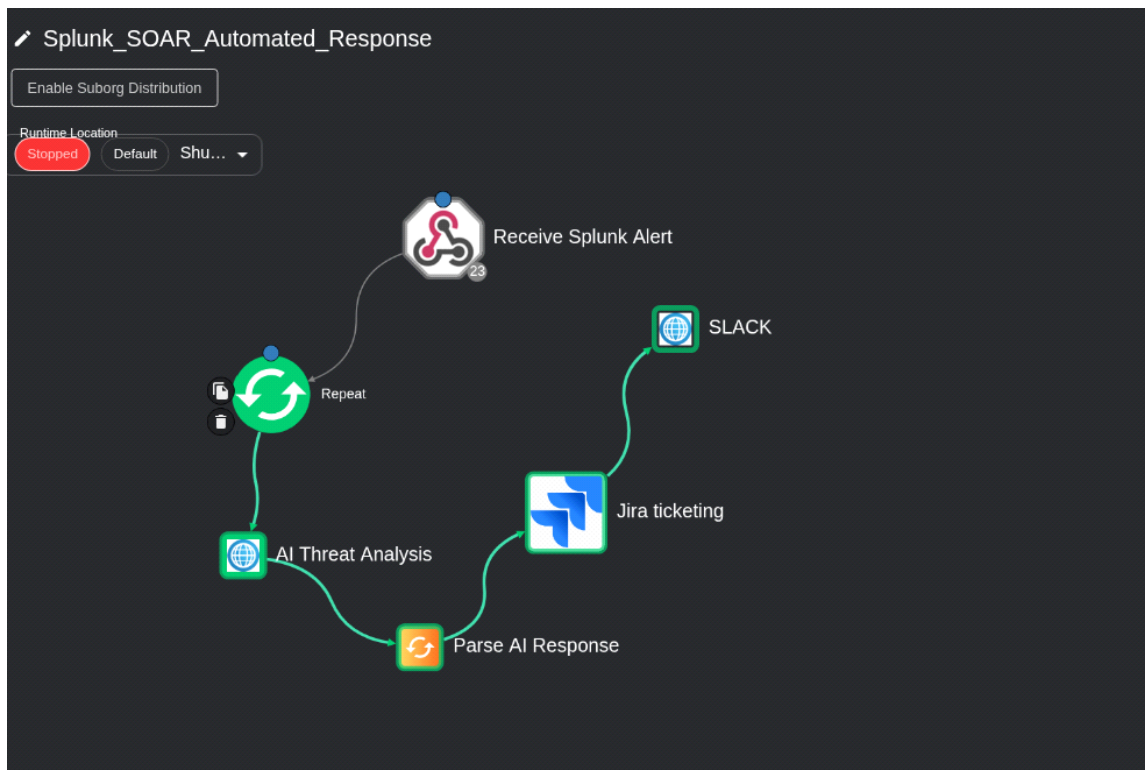
Workflow Overview

The automated response workflow consists of 5 main components:

1. Receive Splunk Alert - Webhook trigger from Splunk

2. AI Threat Analysis - OpenAI GPT-4 analyzes the alert
3. Parse AI Response - Extract structured data from AI output
4. Create Jira Ticket - Automated incident ticket creation
5. Send Slack Notification - Alert SOC team in real-time

 **Screenshot: Complete Workflow**



Step 1: Configure Webhook Trigger

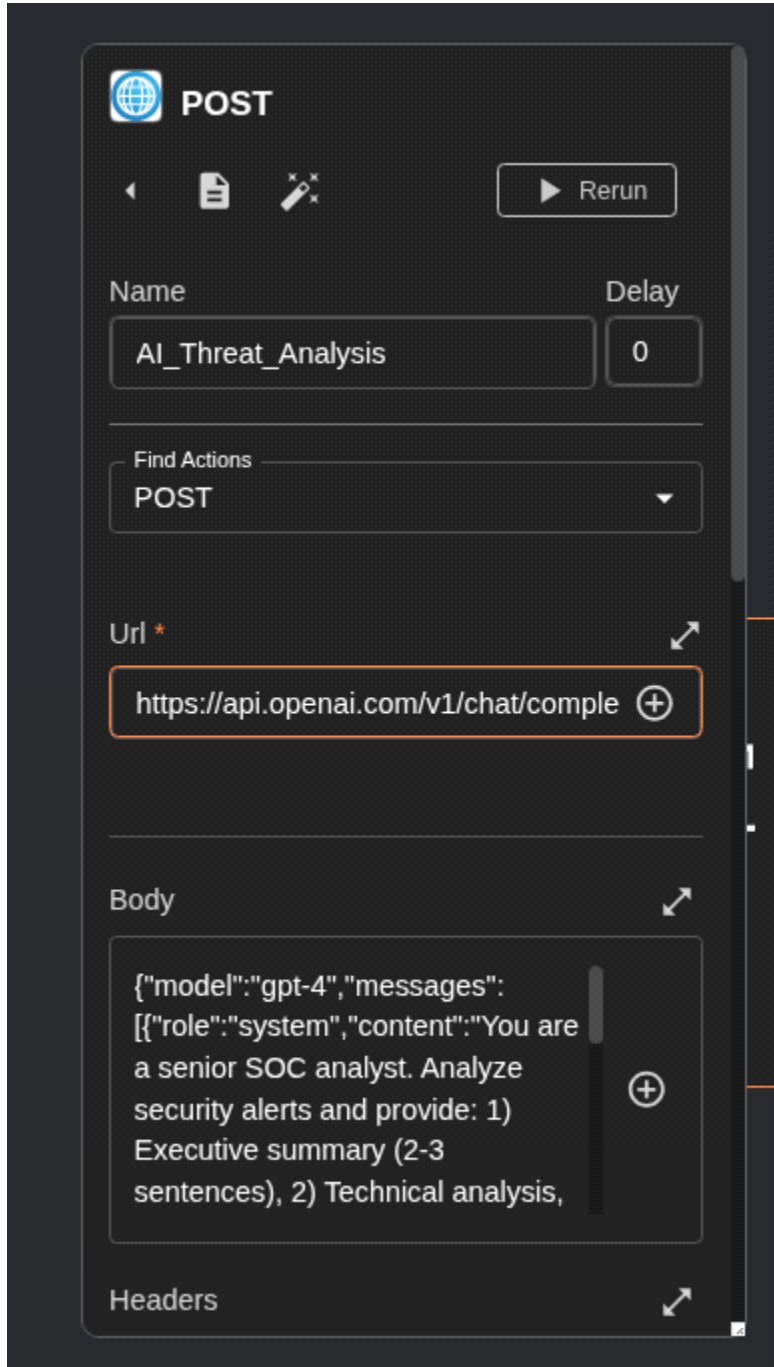
1. In Shuffle, create a new workflow
2. Add a 'Webhook' node
3. Configure: Name: Receive_Splunk_Alert, Start node: Enabled
4. Copy the webhook URL for use in Splunk

Step 2: Configure OpenAI Integration

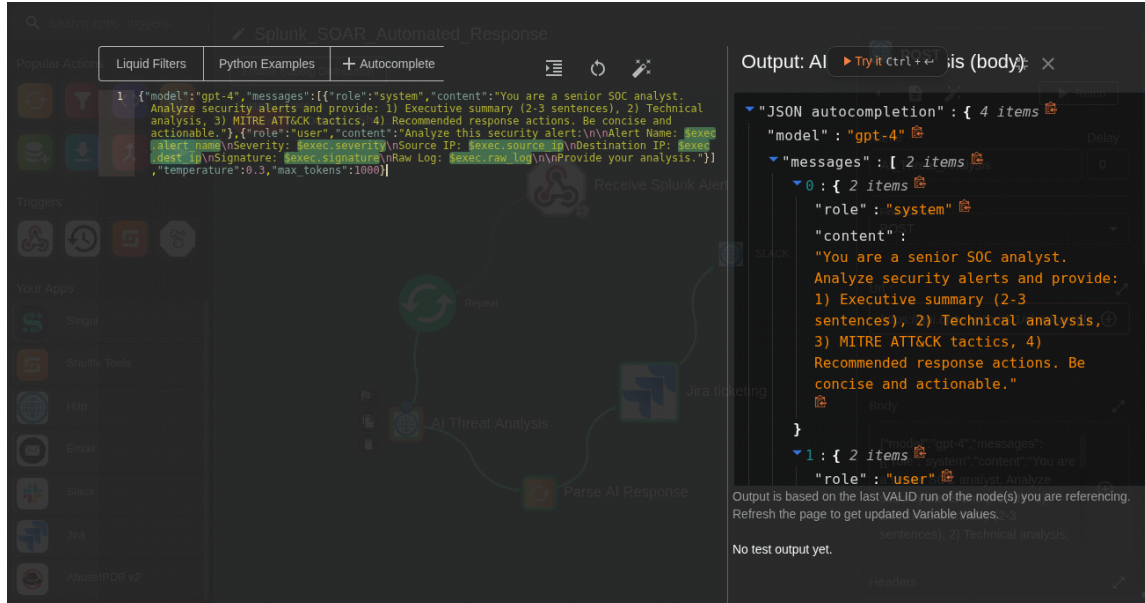
1. Add an 'HTTP' or 'OpenAI' app node
2. Name: AI_Threat_Analysis

3. Configure authentication (see Part 5 for API setup)
4. Set the prompt to analyze alerts

 **Screenshot: OpenAI Node Settings**



Screenshot: OpenAI JSON Body



The screenshot displays the Splunk SOAR interface. On the left, a workflow diagram is visible with nodes for 'Receive Splunk Alert', 'AI Threat Analysis', 'Jira ticketing', and 'Parse AI Response'. The 'AI Threat Analysis' node is highlighted. On the right, the 'Output: AI' panel shows the JSON body of the OpenAI response. The JSON structure is as follows:

```
{
  "model": "gpt-4",
  "messages": [
    {
      "role": "system",
      "content": "You are a senior SOC analyst. Analyze security alerts and provide: 1) Executive summary (2-3 sentences), 2) Technical analysis, 3) MITRE ATT&CK tactics, 4) Recommended response actions. Be concise and actionable."
    },
    {
      "role": "user",
      "content": "Analyze this security alert:\n\nAlert Name: $alert.name\nSeverity: $alert.severity\nSource IP: $alert.source_ip\nDestination IP: $alert.dest_ip\nSignature: $alert.signature\nRaw Log: $alert.raw_log\n\nProvide your analysis."
    }
  ]
}
```

The output panel also shows a preview of the AI response content:


```
{
  "role": "system",
  "content": "You are a senior SOC analyst. Analyze security alerts and provide: 1) Executive summary (2-3 sentences), 2) Technical analysis, 3) MITRE ATT&CK tactics, 4) Recommended response actions. Be concise and actionable."
}
```




Below the JSON output, there is a note: "Output is based on the last VALID run of the node(s) you are referencing. Refresh the page to get updated Variable values." and a status message: "No test output yet."

Step 3: Configure Jira Integration

1. Add a 'Jira' app node
2. Name: Jira_ticketing
3. Action: Create issue
4. Configure authentication (see Part 6)

 Screenshot: Jira Node Settings

 **Post create issue**

   Rerun

Name

Jira_ticketing


Delay

0


+ **Authenticate Jira**


Find Actions

Create issue


 Username *


davi.lal4094@gmail.com




 Password *

.....



 Url *

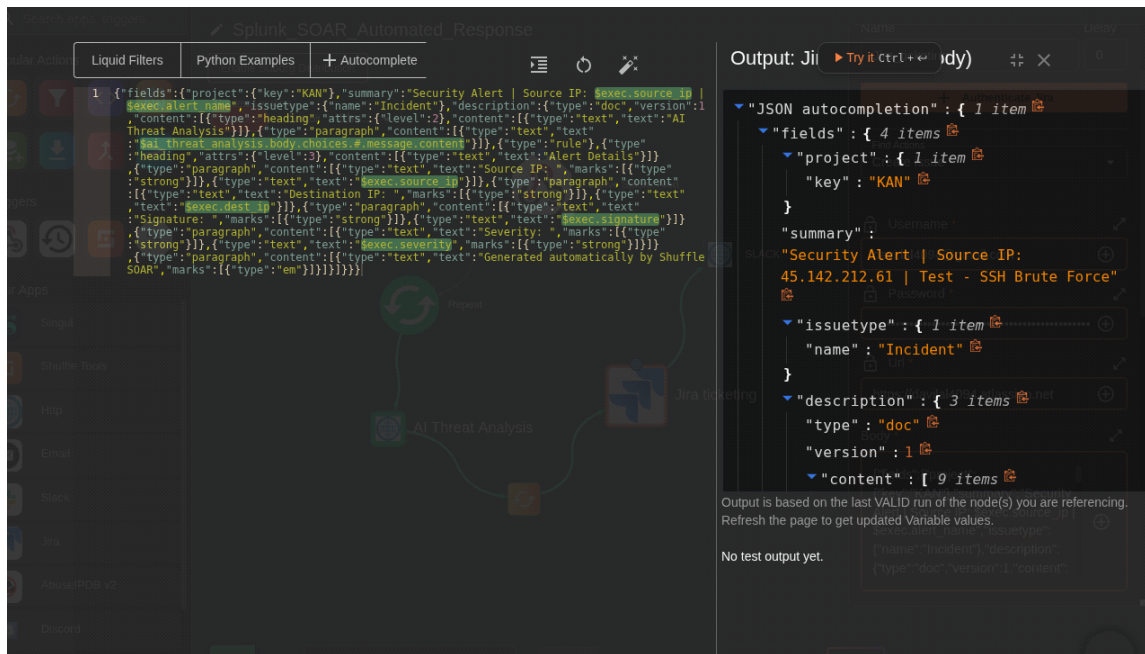
https://davidal4094.atlassian.net



Body *

```
{"fields":{"project":  
{"key":"KAN"},"summary":"Security
```

Screenshot: Jira JSON Body



The screenshot displays the Splunk SOAR interface for configuring a Jira action. The left sidebar shows the 'Jira' app and the 'JSON Body' configuration step. The main panel shows a JSON body configuration for a Jira action, with a 'JSON autocompletion' dropdown menu open, showing a list of fields including 'project', 'summary', 'issuetype', 'description', and 'content'. The 'JSON autocompletion' dropdown is currently set to 'JSON autocompletion'.

```
1 { "fields": { "project": { "key": "KAN", "summary": "Security Alert | Source IP: $exec.source_ip | $exec.alert_name", "issuetype": { "name": "Incident", "description": { "type": "doc", "version": 1, "content": { { "type": "heading", "attrs": { "level": 2 }, "content": { { "type": "text", "text": "AI Threat Analysis" } } }, { "type": "paragraph", "content": { { "type": "text", "text": "AI Threat Analysis body.choices.#.message.content" } } }, { "type": "rule", { "type": "heading", "attrs": { "level": 3 }, "content": { { "type": "text", "text": "Alert Details" } } }, { "type": "paragraph", "content": { { "type": "text", "text": "Source IP: ", "marks": { { "type": "strong" } } }, { "type": "text", "text": "Destination IP: ", "marks": { { "type": "strong" } } }, { "type": "text", "text": "Severity: ", "marks": { { "type": "strong" } } }, { "type": "text", "text": "Signature: ", "marks": { { "type": "strong" } } }, { "type": "text", "text": "Generated automatically by Shuffle SOAR", "marks": { { "type": "em" } } } } } } } }
```

Output: Jira (Try it Ctrl+Enter)

```
{ "fields": { "project": { "key": "KAN", "summary": "Security Alert | Source IP: 45.142.212.61 | Test - SSH Brute Force", "issuetype": { "name": "Incident", "description": { "type": "doc", "version": 1, "content": { { "type": "text", "text": "AI Threat Analysis body.choices.#.message.content" } } }, { "type": "rule", { "type": "heading", "attrs": { "level": 3 }, "content": { { "type": "text", "text": "Alert Details" } } }, { "type": "paragraph", "content": { { "type": "text", "text": "Source IP: ", "marks": { { "type": "strong" } } }, { "type": "text", "text": "Destination IP: ", "marks": { { "type": "strong" } } }, { "type": "text", "text": "Severity: ", "marks": { { "type": "strong" } } }, { "type": "text", "text": "Signature: ", "marks": { { "type": "strong" } } }, { "type": "text", "text": "Generated automatically by Shuffle SOAR", "marks": { { "type": "em" } } } } } } }
```


Output is based on the last VALID run of the node(s) you are referencing. Refresh the page to get updated Variable values.





No test output yet.

Step 4: Configure Slack Integration

1. Add an 'HTTP' or 'Slack' app node
2. Name: SLACK
3. Action: POST
4. Configure webhook URL (see Part 7)

 Screenshot: Slack Node Settings

 **POST**



Name

SLACK


Delay

0

Find Actions


POST


Url *

<https://hooks.slack.com/services/T0A5...> 

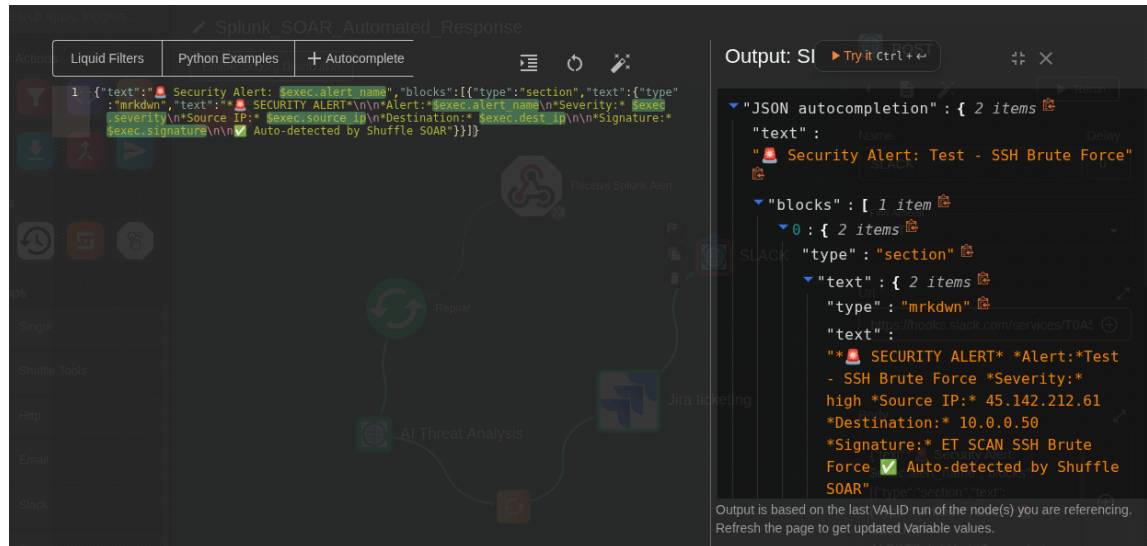
Body

```
{
  "text": "🚨 Security Alert:
$exec.alert_name",
  "blocks": [
    {
      "type": "section",
      "text": "
      {
        "type": "mrkdwn",
        "text": "🚨
SECURITY
ALERT*\n\n*Alert:*$exec.alert_nam
    }
  ]
}
```



 Headers

Screenshot: Slack JSON Body



4.4 Connect Workflow Nodes

1. Connect nodes in sequence:

- Receive Splunk Alert → AI Threat Analysis
- AI Threat Analysis → Parse AI Response
- Parse AI Response → Jira ticketing
- Jira ticketing → SLACK

1. Add a 'Repeat' node after Receive Splunk Alert for continuous processing

2. Save and activate the workflow

Part 5: OpenAI API Configuration

5.1 Create OpenAI API Account

1. Visit <https://platform.openai.com>
2. Create an account or sign in

3. Navigate to API Keys section
4. Click 'Create new secret key'
5. Copy and securely store the API key

5.2 Configure API in Shuffle

Authentication Settings

- URL: <https://api.openai.com/v1/chat/completions>
- Method: POST
- Headers:

Authorization: Bearer YOUR_API_KEY

Content-Type: application/json

Request Body Configuration

Configure the JSON body to send alert data to GPT-4:

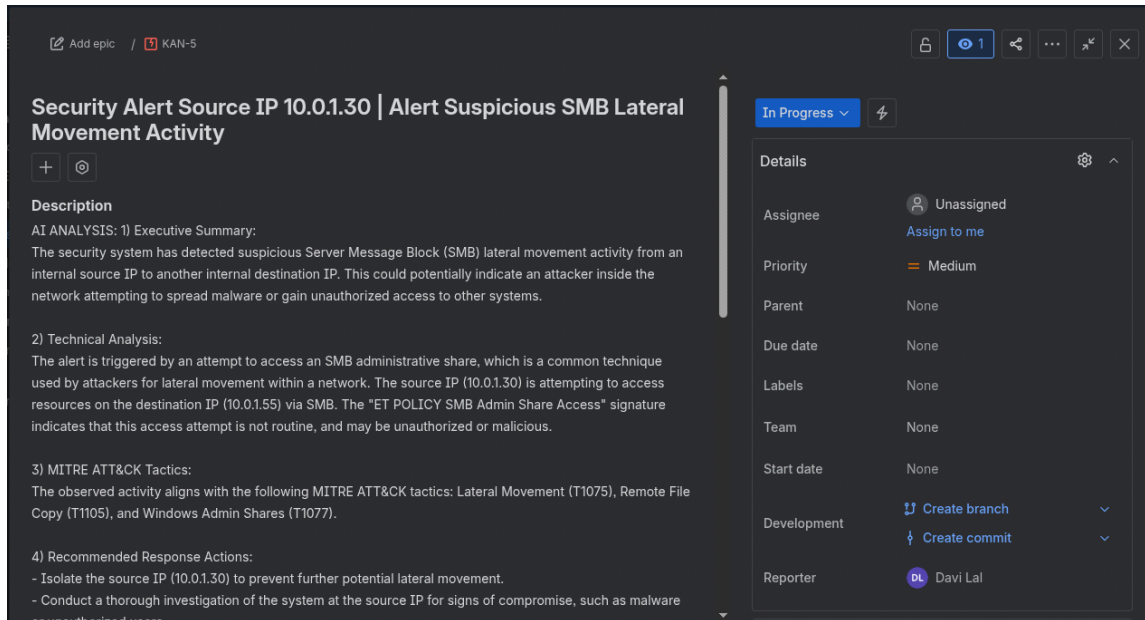
```
{
  "model": "gpt-4",
  "messages": [
    {
      "role": "system",
      "content": "You are a senior SOC analyst..."
    },
    {
      "role": "user",
      "content": "Analyze this security alert..."
    }
  ],
  "temperature": 0.3,
  "max_tokens": 1000
}
```

5.3 AI Analysis Output

The AI analysis provides:

1. Executive Summary: High-level overview for management
2. Technical Analysis: Detailed security assessment
3. MITRE ATT&CK Tactics: Framework mapping
4. Recommended Response Actions: Immediate and investigative steps

Screenshot: AI Analysis Summary



Security Alert Source IP 10.0.1.30 | Alert Suspicious SMB Lateral Movement Activity

Description

AI ANALYSIS: 1) Executive Summary:
The security system has detected suspicious Server Message Block (SMB) lateral movement activity from an internal source IP to another internal destination IP. This could potentially indicate an attacker inside the network attempting to spread malware or gain unauthorized access to other systems.

2) Technical Analysis:
The alert is triggered by an attempt to access an SMB administrative share, which is a common technique used by attackers for lateral movement within a network. The source IP (10.0.1.30) is attempting to access resources on the destination IP (10.0.1.55) via SMB. The "ET POLICY SMB Admin Share Access" signature indicates that this access attempt is not routine, and may be unauthorized or malicious.

3) MITRE ATT&CK Tactics:
The observed activity aligns with the following MITRE ATT&CK tactics: Lateral Movement (T1075), Remote File Copy (T1105), and Windows Admin Shares (T1077).

4) Recommended Response Actions:
- Isolate the source IP (10.0.1.30) to prevent further potential lateral movement.
- Conduct a thorough investigation of the system at the source IP for signs of compromise, such as malware or unauthorized users.

Details

Assignee	Unassigned Assign to me
Priority	Medium
Parent	None
Due date	None
Labels	None
Team	None
Start date	None
Development	Create branch Create commit
Reporter	Davi Lal

Part 6: Jira Integration Configuration

6.1 Jira Setup Requirements

- Jira Cloud or Server instance
- Admin or project permissions
- API token (for Cloud) or password (for Server)

6.2 Create Jira API Token

1. Go to <https://id.atlassian.com/manage-profile/security/api-tokens>
2. Click 'Create API token'
3. Provide a label (e.g., 'Shuffle SOAR Integration')
4. Copy and securely store the token

6.3 Create Security Incidents Project

1. In Jira, navigate to Projects → Create project
2. Select 'Kanban' template
3. Name: Security_Incidents
4. Key: KAN
5. Create the project

6.4 Configure Jira in Shuffle

Authentication Settings

- Username: your_email@example.com
- Password/API Token: YOUR_API_TOKEN
- URL: <https://your-domain.atlassian.net>

Action Configuration

Body configuration for creating issues:

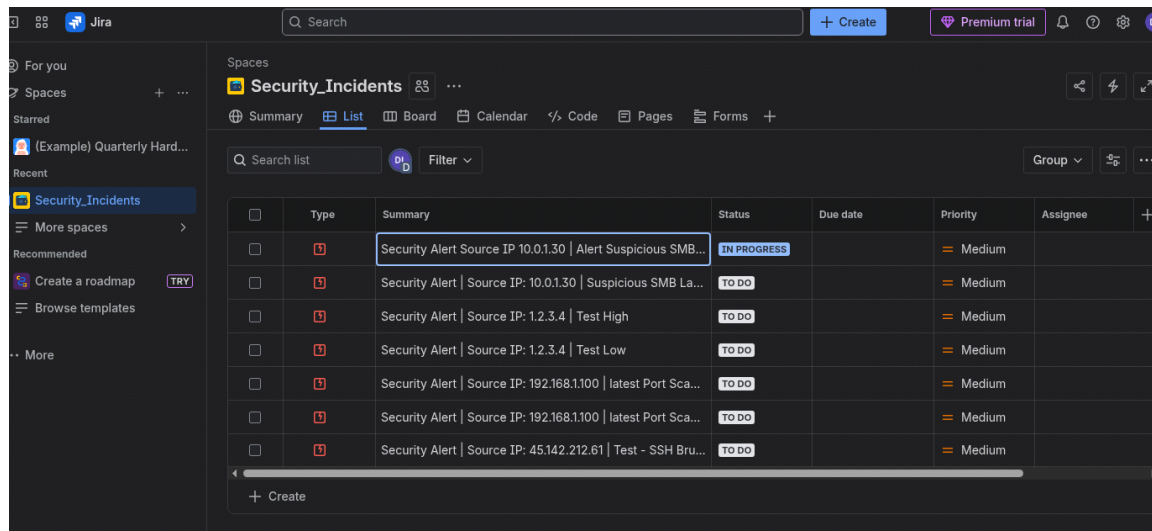
```
{
  "fields": {
    "project": { "key": "KAN" },
    "summary": "Security Alert | Source IP: $exec.source_ip",
    "issuetype": { "name": "Incident" },
    "description": { ... AI analysis content ... }
  }
}
```

6.5 Verify Ticket Creation

After the workflow runs, verify tickets are created with:

- Descriptive summary with source IP and alert name
- Complete AI analysis in description
- Appropriate priority (Medium by default)
- Status: In Progress or To Do

Screenshot: Jira Ticket List



Part 7: Slack Integration Configuration

7.1 Slack Setup Requirements

- Slack workspace (free or paid)
- Permission to add apps and incoming webhooks
- Dedicated SOC channel (recommended)

7.2 Create Slack Incoming Webhook

1. Visit <https://api.slack.com/apps>
2. Click 'Create New App' → 'From scratch'

3. App Name: 'SOC Alerts', select your workspace
4. Navigate to 'Incoming Webhooks' → Toggle to On
5. Click 'Add New Webhook to Workspace'
6. Select channel (e.g., #soc-alerts)
7. Copy the Webhook URL

7.3 Create SOC Channel

1. In Slack, create a new channel: soc_analysis
2. Make it private if handling sensitive data
3. Add relevant team members
4. Invite the SOC Alerts app to the channel

7.4 Configure Slack in Shuffle

HTTP POST Settings

- URL: YOUR_SLACK_WEBHOOK_URL
- Method: POST
- Headers: Content-Type: application/json

Message Body Configuration

```
{
  "text": "@ SECURITY ALERT",
  "blocks": [
    {
      "type": "section",
      "text": {
        "type": "mrkdwn",
        "text": "*Alert:* $exec.alert_name..."
      }
    }
  ]
}
```

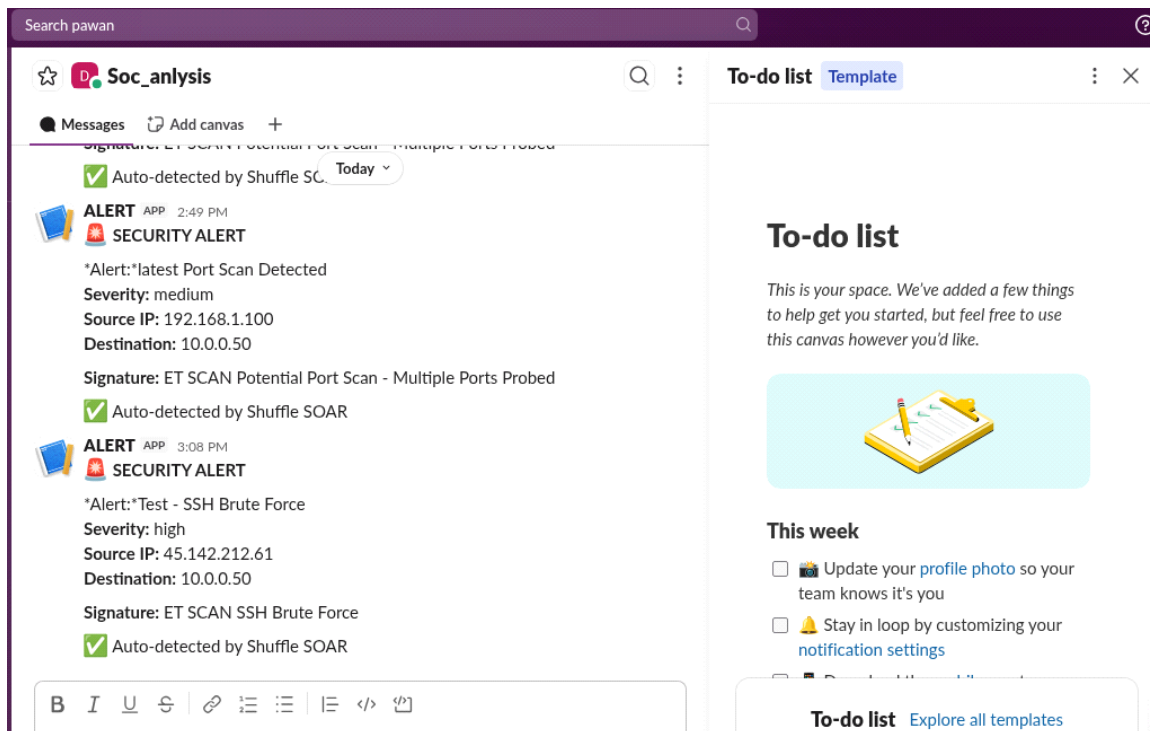
}

7.5 Verify Slack Notifications

Verify notifications include:

- Alert emoji (🔔)
- Alert name and severity
- Source and destination IPs
- Signature information
- Auto-detection confirmation

🖼️ Screenshot: Slack Notification



Part 8: Testing and Validation

8.1 End-to-End Workflow Test

Generate Test Traffic

1. Port scan simulation:

```
nmap -sS 192.168.1.100
```

1. SSH brute force simulation:

```
hydra -l test -P /usr/share/wordlists/rockyou.txt ssh://192.168.1.100
```

1. Web vulnerability scan:

```
nikto -h http://192.168.1.100
```

Verify Alert Detection

1. Check Suricata logs:

```
sudo tail -f /var/log/suricata/fast.log
```

1. Check Zeek logs:

```
tail -f /opt/zeek/spool/zeek/conn.log
```

1. Verify logs appear in Splunk:

```
index="main" sourcetype="suricata" event_type="alert"
```

8.2 Validate Automation Workflow

Stage	Component	Validation Method
1	Splunk Alert	Check Splunk Alerts page
2	Webhook Delivery	Check Shuffle execution logs
3	AI Analysis	Verify OpenAI node executed
4	Jira Ticket	Check Security_Incidents project
5	Slack Notification	Confirm alert in SOC channel

8.3 Performance Metrics

The completed SOC lab achieves:

- Mean Time to Detect (MTTD): < 5 seconds

- Mean Time to Respond (MTTR): < 30 seconds (98% reduction)
- Alert to Ticket Creation: < 20 seconds
- Alert to SOC Notification: < 25 seconds
- Automation Success Rate: > 99%

Part 9: Troubleshooting Guide

9.1 Suricata Issues

Suricata Not Detecting Traffic

1. Verify network interface:

```
ip addr show
```

1. Check Suricata is running on correct interface:

```
sudo cat /var/log/suricata/suricata.log | grep interface
```

1. Ensure interface is in promiscuous mode:

```
sudo ip link set eth0 promisc on
```

No Alerts Generated

- Update rules: `sudo suricata-update`
- Check rule loading:

```
sudo grep 'rule reload complete' /var/log/suricata/suricata.log
```

- Verify HOME_NET is configured correctly

9.2 Zeek Issues

Zeek Not Starting

- Check configuration:

```
sudo /opt/zeek/bin/zeek -C -i eth0
```

- View crash reports:

```
sudo /opt/zeek/bin/zeekctl diag
```

- Redeploy:

```
sudo /opt/zeek/bin/zeekctl deploy
```

9.3 Splunk Issues

Data Not Indexing

- Check data input status in Settings → Data Inputs
- Verify file permissions:

```
sudo chmod 644 /var/log/suricata/eve.json
```

- Check internal logs:

```
index="__internal" ERROR
```

Webhook Not Triggering

- Test webhook manually:

```
curl -X POST http://localhost:3001/api/v1/hooks/webhook ID
```

- Verify webhook URL in Splunk alert action
- Check Shuffle is running and accessible

9.4 Shuffle SOAR Issues

Workflow Not Executing

- Check workflow is activated
- Review execution logs for errors
- Verify all node credentials are valid
- Test each node individually

API Authentication Errors

- OpenAI: Verify API key is valid and has credits
- Jira: Ensure API token hasn't expired
- Slack: Regenerate webhook if needed

Part 10: Best Practices and Maintenance

10.1 Security Best Practices

Credential Management

- Store all API keys securely (use environment variables)
- Rotate credentials every 90 days
- Use least-privilege access for service accounts
- Enable multi-factor authentication

Network Security

- Restrict Splunk web interface to internal networks
- Use TLS/SSL for all API communications
- Implement firewall rules to limit service exposure
- Consider network segmentation for SOC infrastructure

10.2 Regular Maintenance Tasks

Task	Description	Frequency
Update IDS Rules	Run suricata-update	Weekly
Log Rotation	Archive old logs	Daily
System Updates	Update OS and tools	Monthly
Alert Tuning	Reduce false positives	Monthly
Backup Configuration	Backup configs and workflows	Weekly
Performance Review	Check system resources	Weekly

10.3 Monitoring and Alerting

- Monitor Suricata and Zeek service health
- Track Splunk indexing rates and license usage
- Review Shuffle execution logs for failures
- Set up alerts for critical system failures
- Monitor OpenAI API usage and costs

10.4 Continuous Improvement

- Regularly review false positive rates

- Expand detection coverage with new signatures
- Enhance AI prompts for better analysis
- Add new integrations as needed
- Document lessons learned from incidents

Conclusion

This SOC lab demonstrates a complete, enterprise-grade security operations infrastructure. By integrating network detection, SIEM correlation, automated orchestration, and AI-powered analysis, the platform achieves rapid threat detection and response capabilities.

The 98% reduction in mean time to respond represents a transformative improvement in security operations efficiency. Automated workflows eliminate manual processes, reduce human error, and ensure consistent incident handling.

Key achievements:

- Real-time threat detection across network layers
- Automated AI-powered threat analysis
- Seamless integration of detection, analysis, ticketing, and notification
- Comprehensive logging and forensic capabilities
- Scalable architecture ready for production

Appendix A: Quick Reference Commands

Suricata Commands

```
# Check status
```

```
sudo systemctl status suricata
```

```
# Update rules
```

```
sudo suricata-update
```

```
# Restart service
```

```
sudo systemctl restart suricata
```

```
# View logs
```

```
sudo tail -f /var/log/suricata/eve.json
```

Zeek Commands

```
# Check status
```

```
sudo /opt/zeek/bin/zeekctl status
```

```
# Deploy configuration
```

```
sudo /opt/zeek/bin/zeekctl deploy
```

```
# Restart Zeek
```

```
sudo /opt/zeek/bin/zeekctl restart
```

```
# View logs
```

```
tail -f /opt/zeek/spool/zeek/conn.log
```

Splunk Commands

```
# Start Splunk
```

```
sudo /opt/splunk/bin/splunk start
```

```
# Stop Splunk
```

```
sudo /opt/splunk/bin/splunk stop
```

```
# Restart Splunk
```

```
sudo /opt/splunk/bin/splunk restart
```

Useful Splunk SPL Queries

View all Suricata alerts

```
index="main" sourcetype="suricata" event_type="alert"
```

High severity only

```
index="main" sourcetype="suricata" severity=1
```

Top source IPs

```
index="main" sourcetype="suricata" | top src_ip
```