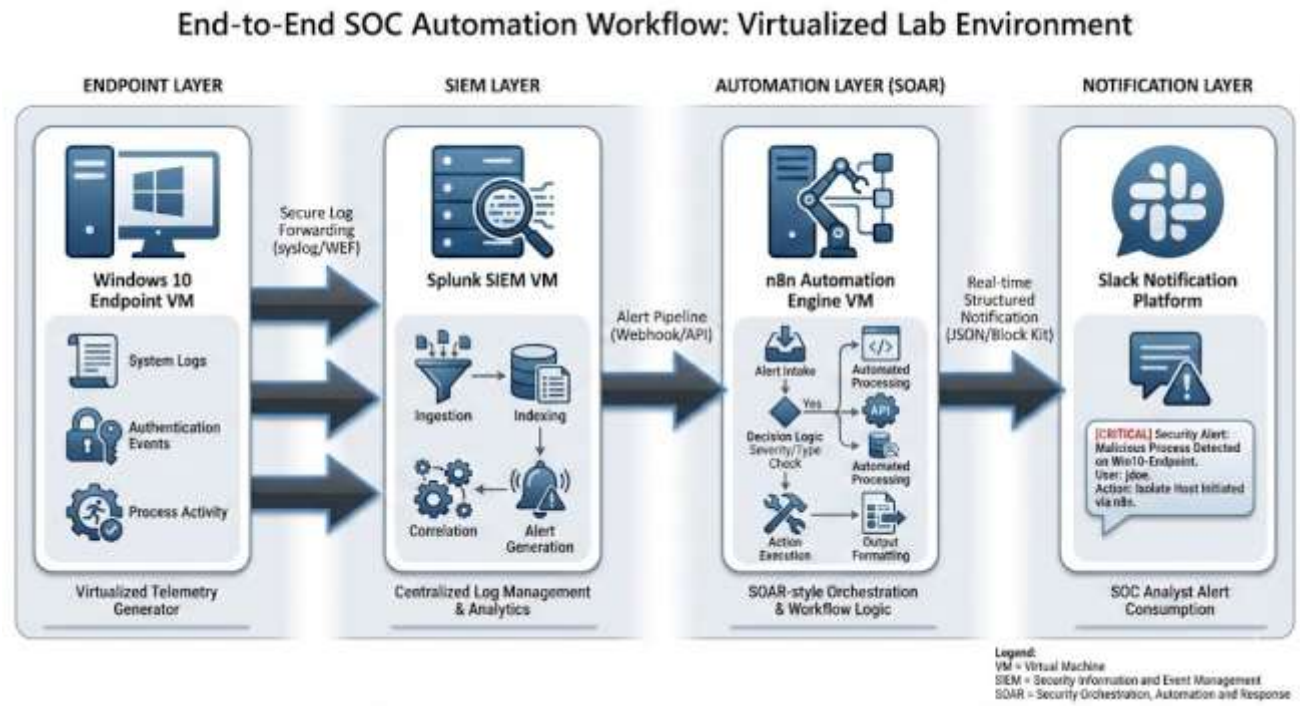
Design and Implementation of an Automated SOC Workflow

Objectives:

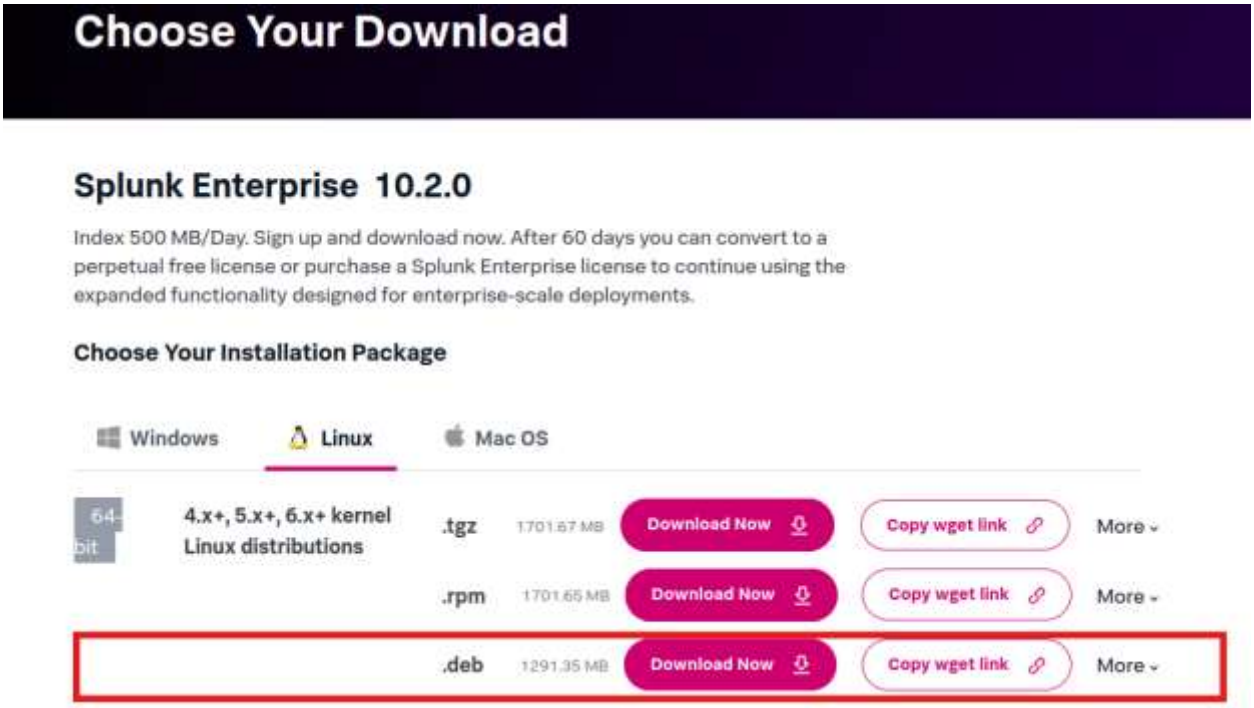
The objective of this lab is to demonstrate an end-to-end SOC automation workflow by integrating endpoint telemetry, SIEM detection, and automated response. A Windows 10 system generates security events that are ingested and analyzed by Splunk, where alerts are created based on defined detection logic. These alerts are then forwarded to n8n to trigger automated workflows, resulting in real-time security notifications delivered to Slack. This lab provides practical insight into SIEM–SOAR integration and automated SOC operations.



Step :1 Installing Splunk and Configuring GUI

In this step, Splunk Enterprise is installed on a dedicated virtual machine to serve as the centralized SIEM platform for the lab. After installation, the Splunk web interface is configured to enable access to the management console, verify successful deployment, and prepare the environment for log ingestion, search, and alert configuration in subsequent steps.

The initial phase of the SOC automation workflow begins with provisioning the central SIEM engine. This step involves selecting the Splunk Enterprise 10.2.0 installer specifically for a Linux environment. By choosing the Debian (.deb) package, the setup is optimized for deployment on a Linux-based server (such as Ubuntu), which will serve as the primary instance for data indexing, log analysis, and alert generation.



The installation is performed on the Linux host by executing the Debian package manager command. This step unpacks the Splunk binaries and prepares the filesystem for the SIEM software deployment.

Command: sudo dpkg -i splunk-10.2.0-d749cb17ea65-linux-amd64.deb

```
safwan@safwan-VirtualBox: $ sudo dpkg -i splunk-10.2.0-d749cb17ea65-linux-amd64.deb
```

The setup begins by acquiring the Splunk Enterprise 10.2.0 Debian package for Linux, which serves as the central log aggregator. The package is installed via the command line, followed by a transition to the dedicated splunk user environment to initialize the service from the binary directory.

- **Installer:** splunk-10.2.0-linux-amd64.deb (~1.3 GB).
- **Installation:** Executed using sudo dpkg -i to deploy files into the /opt/splunk directory.
- **User Management:** Switched to the service account using sudo -u splunk bash to ensure proper file permissions.

- **Initialization:** Navigated to /opt/splunk/bin and executed ./splunk start to trigger the license agreement and service startup.

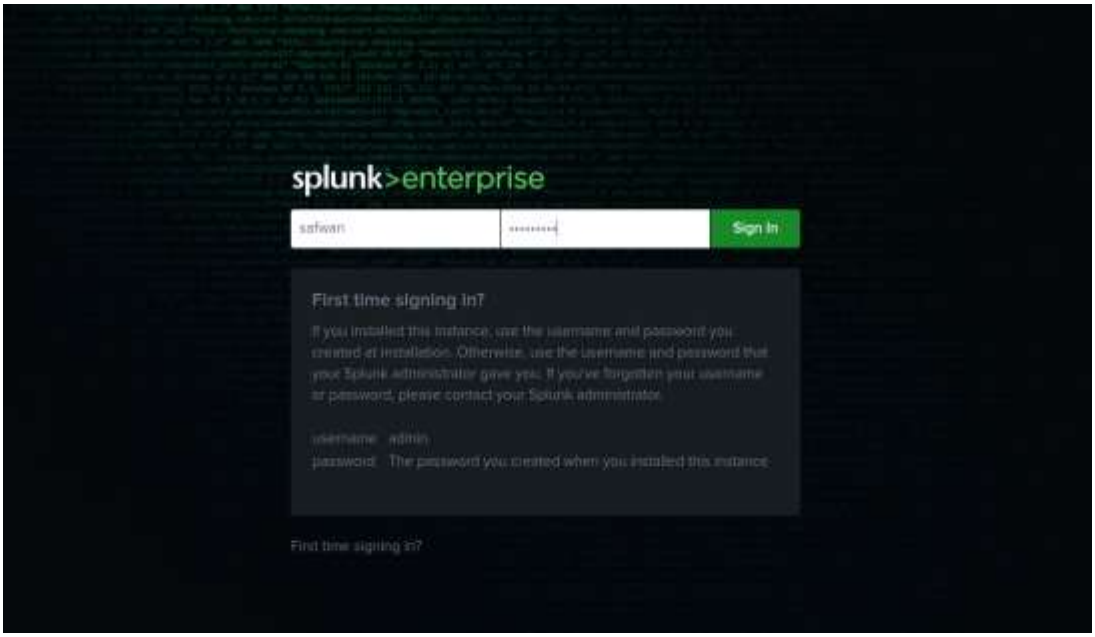
```
safwan@safwan-VirtualBox:/opt/splunk$ sudo -u splunk bash
[sudo] password for safwan:
splunk@safwan-VirtualBox:~$ cd /opt/splunk
splunk@safwan-VirtualBox:~$ cd bin
splunk@safwan-VirtualBox:~/bin$ ./splunk start
```

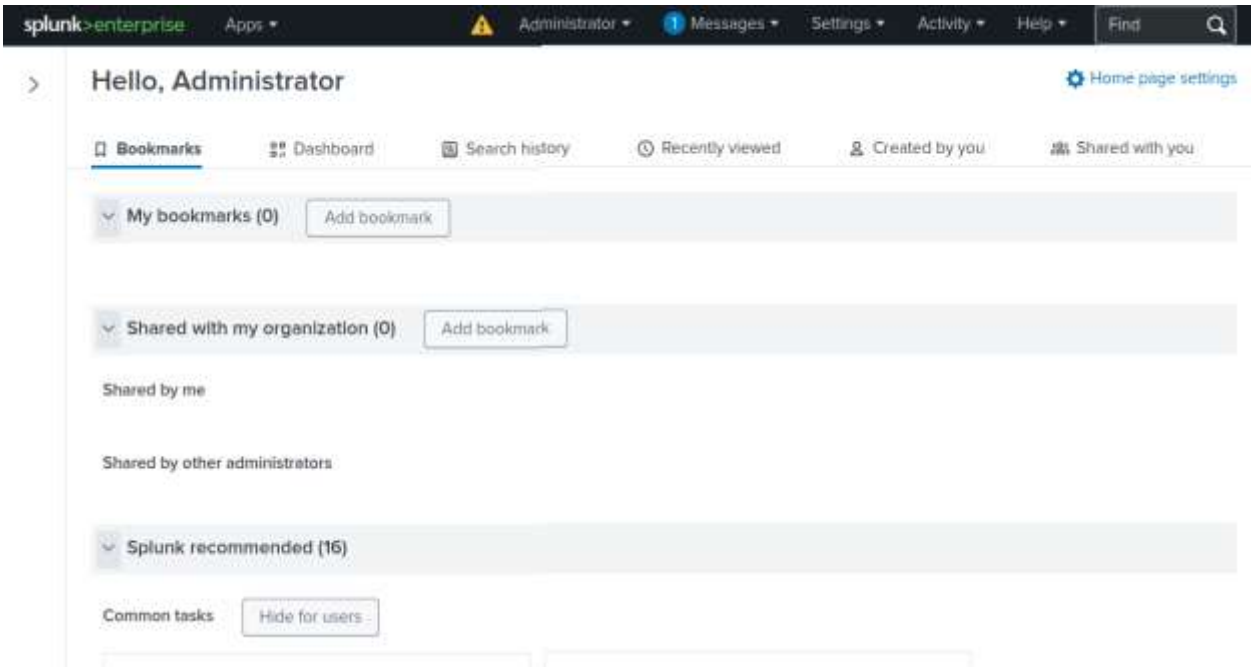
Configuration of the initial administrator username and a secure password (minimum 8 characters) to grant access to the Splunk Web interface.

```
Please enter an administrator username: safwan
Password must contain at least:
   * 8 total printable ASCII character(s).
Please enter a new password:
```

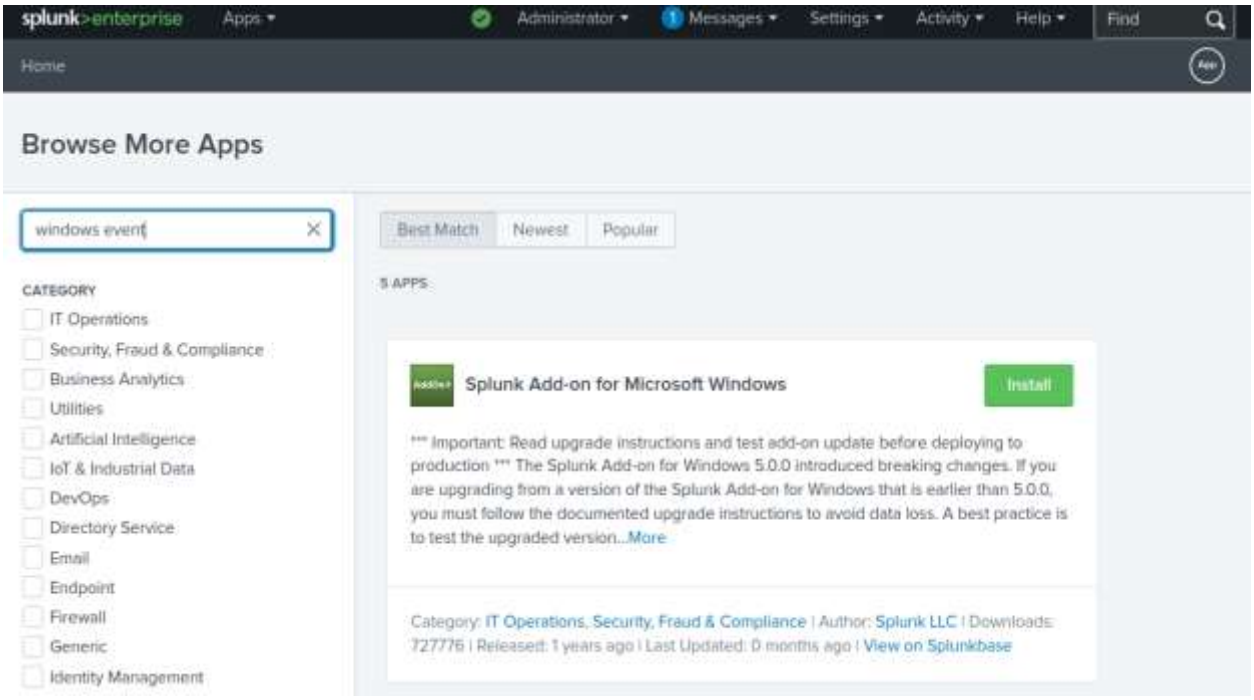
```
safwan@safwan-VirtualBox:/opt/splunk/bin$ sudo ./splunk enable boot-start -user splunk
Init script installed at /etc/init.d/splunk.
Init script is configured to run at boot.
safwan@safwan-VirtualBox:/opt/splunk/bin$
```

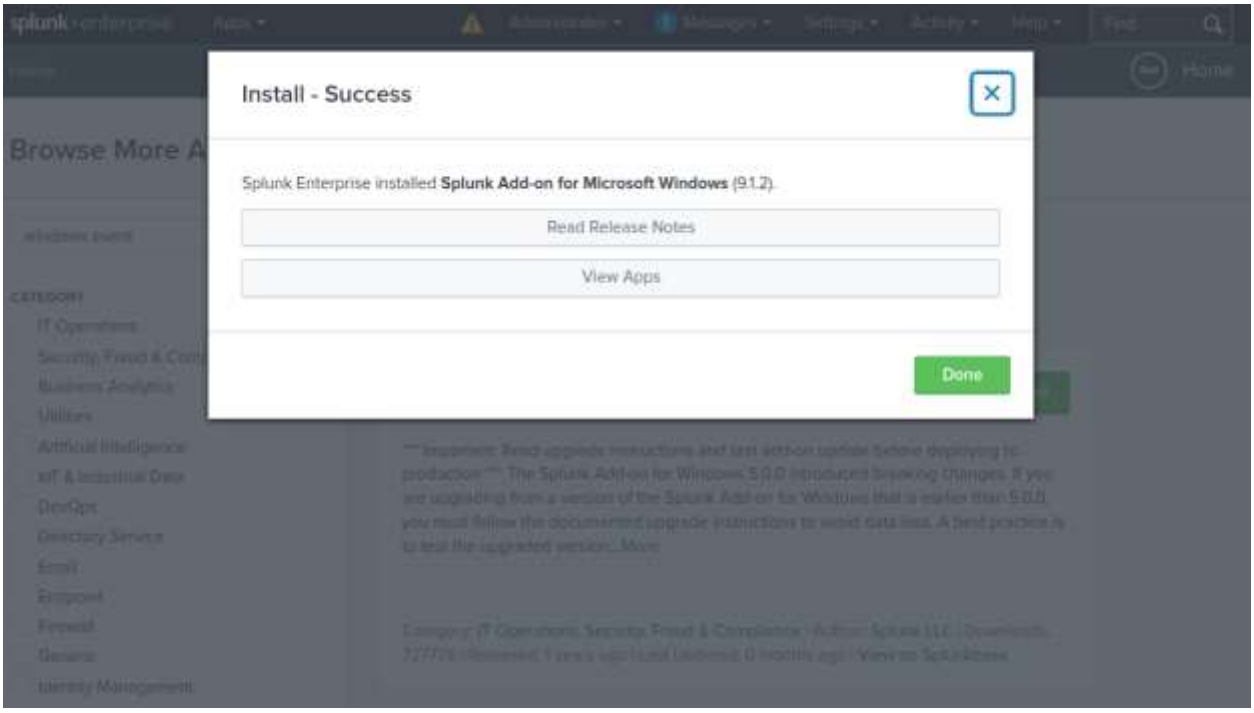
The Splunk Web interface is accessed by navigating to the host's IP address on port 8000 via a web browser. This GUI serves as the primary portal for logging in with the administrative credentials created during installation, enabling the transition from command-line setup to a visual environment for managing security events and automation tasks.





To enable endpoint telemetry ingestion, the **Splunk Add-on for Microsoft Windows** is installed via the Splunk Web GUI. This application provides the necessary knowledge objects to map Windows event logs to the Splunk CIM, ensuring that data from the Windows 10 system is correctly parsed and indexed for analysis

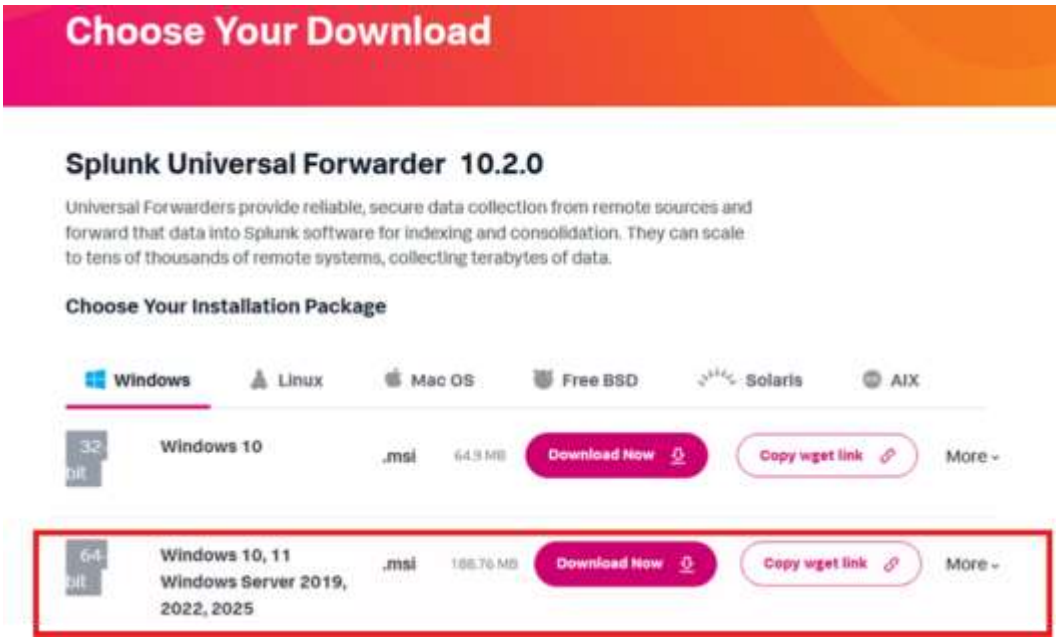




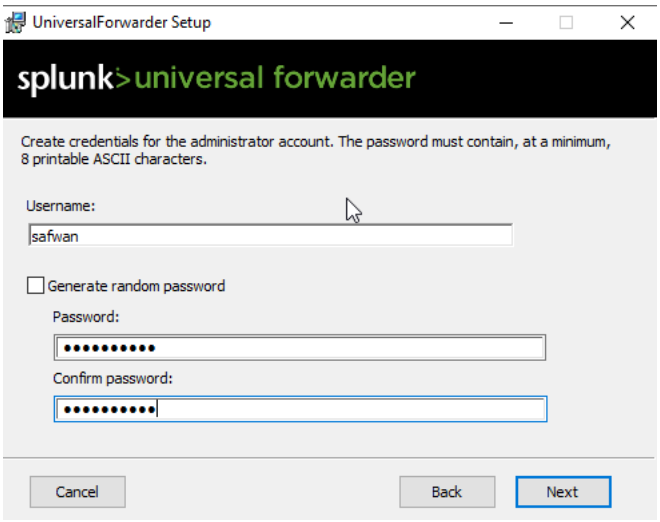
Part 2: Send Telemetry from Widnows VM to Splunk

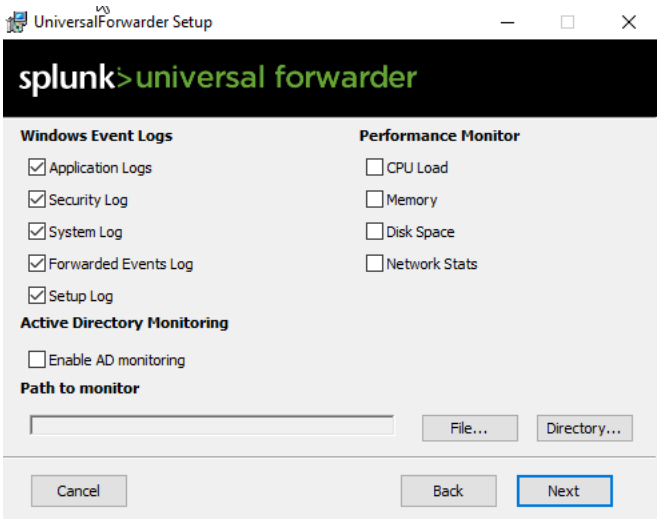
In this part, the Windows 10 virtual machine is configured to generate and forward system and security telemetry to the Splunk SIEM. This enables Splunk to ingest endpoint logs, validate data flow, and provide visibility into Windows activity for monitoring and detection purposes.

To enable telemetry collection from the Windows 10 VM, the Splunk Universal Forwarder 10.2.0 is selected for download. The 64-bit Windows .msi installer is chosen to ensure compatibility with modern Windows architectures. This lightweight agent is dedicated to harvesting local system logs and securely forwarding them to the Splunk indexer for analysis.

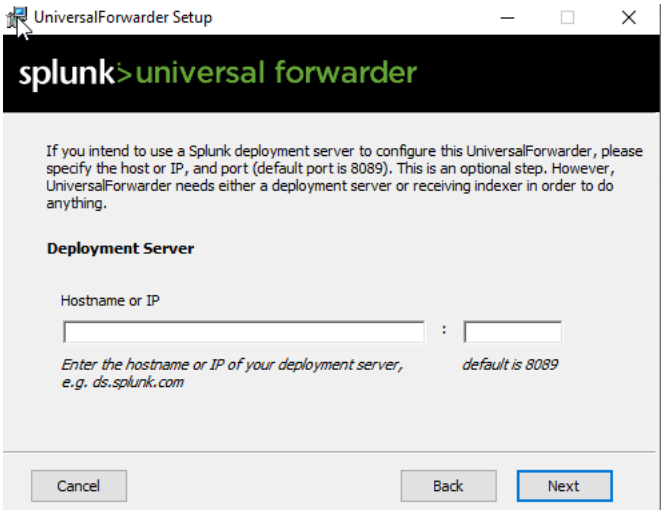


After downloading , installation process starts. In this follow the exact same steps as per below figures displayes for poper configuration.



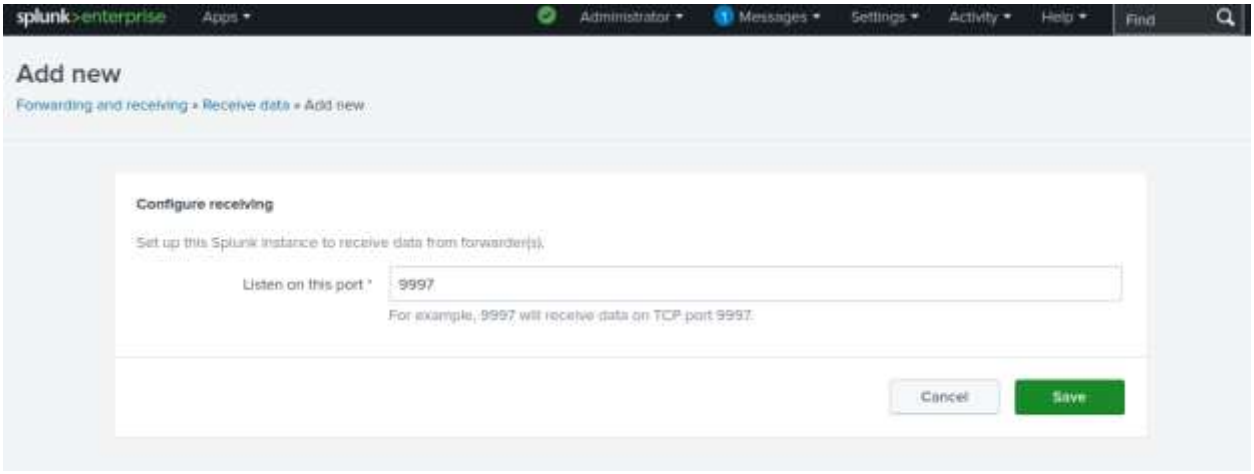


After this step Receiver Server option will come, so on that add the Splunk VM IP Address with 9997 port, as the Splunk listens for the telemetry at port 9997.

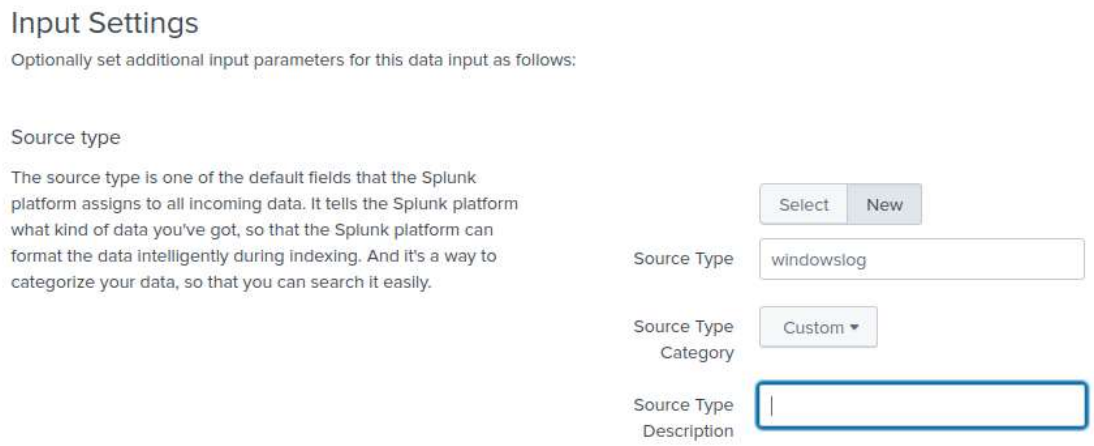


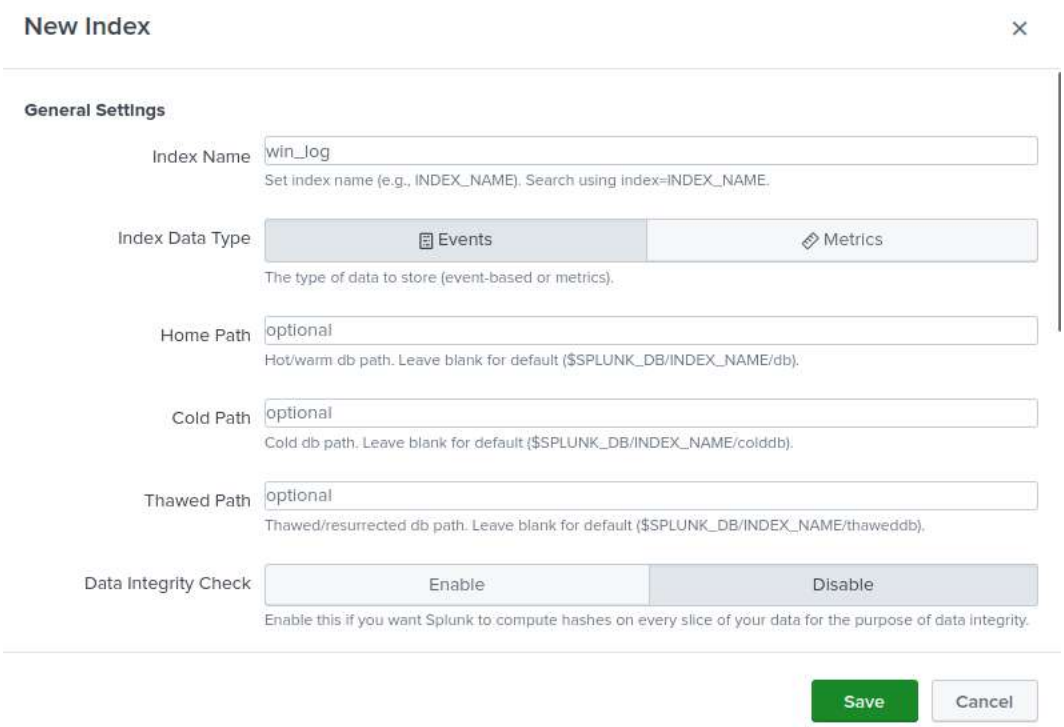
To prepare the SIEM for incoming endpoint telemetry, a receiver is configured within the Splunk Web interface. By navigating to Settings > Forwarding and receiving, a new receiving port is defined to listen for traffic from remote forwarders.

The standard **port 9997** is specified and saved, enabling the Splunk indexer to ingest data streams from the Windows VM. This configuration is vital for establishing the communication channel required for real-time log analysis and subsequent SOC automation.

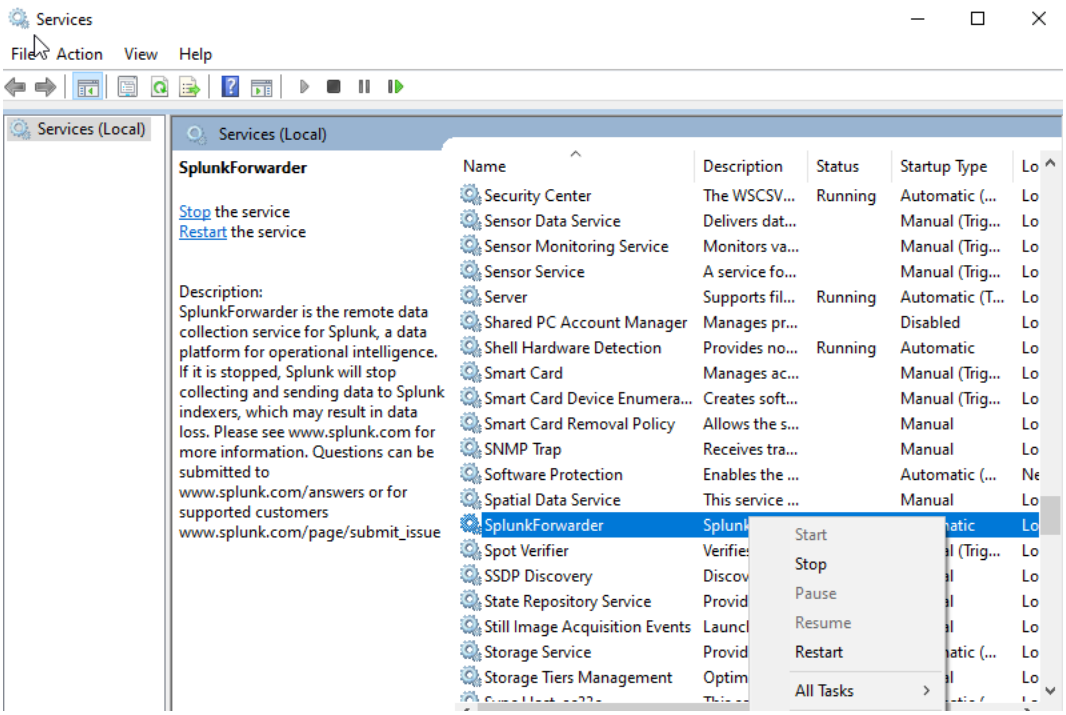


In this part add the IP Address of the Windows VM in the Source Type Description.



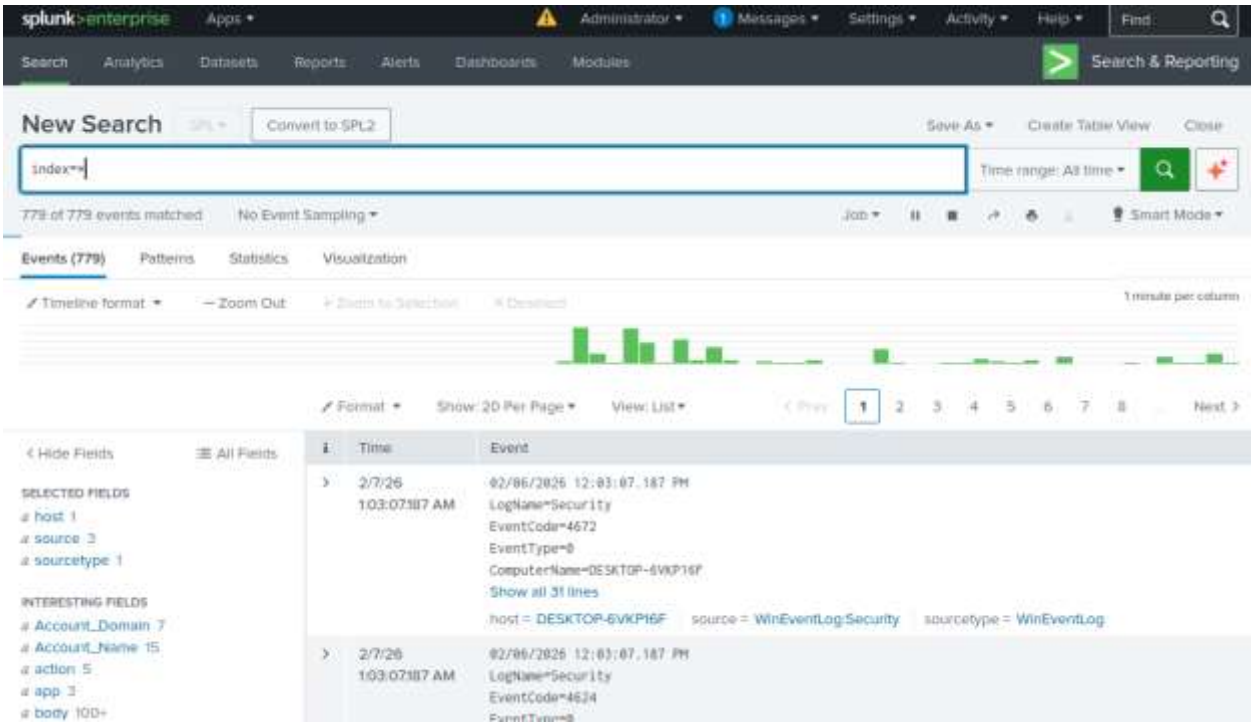


Then go to the services in Windows and search for SplunkForwarder. Right click on it and restart it and ensure it should run smoothly. As this is a very crucial part of the process, if this in not configured properly the telemetry won't be sent over to the Splunk GUI.



The final stage of the telemetry setup involves verifying that the Windows event logs are successfully reaching the Splunk indexer. By executing a global search for **index=*,** the Search & Reporting interface confirms the ingestion of real-time data from the Windows 10 endpoint.

- **Verified Source:** Telemetry is being received from the WinEventLog:Security source.
- **Event Confirmation:** Successful capture of critical security events, such as EventCode 4672 (Special Logon) and EventCode 4624 (An account was successfully logged on).
- **Host Identification:** The data is correctly mapped to the target Windows machine (DESKTOP-6VKP16F), indicating a healthy connection between the Universal Forwarder and the SIEM.



Part 3: Installing n8n

In this part, the n8n automation platform is installed on a dedicated virtual machine. This sets up the environment for creating automated workflows that can process alerts from Splunk and trigger security responses or notifications.

Make separate directory for n8n configuration

```
safwan@safwan-VirtualBox:~$ mkdir n8n
safwan@safwan-VirtualBox:~$ cd n8n
safwan@safwan-VirtualBox:~/n8n$ sudo nano docker-compose.yaml
```

The installation of n8n is managed through Docker Compose, providing a consistent and isolated environment for the automation platform. By utilizing a YAML configuration file, the service is defined with persistent storage and specific networking parameters required for SOC orchestration.

- **Docker Image:** Utilization of the n8nio/n8n:latest image to ensure the platform remains up-to-date with the latest security features and nodes.
- **Port Mapping:** Binding the container's internal service to port 5678 on the host machine, enabling web browser access to the workflow editor.
- **Environment Variables:** Configuration of critical host details, including the Host Machine IP, protocol (HTTP), and timezone (America/Toronto) to ensure accurate log timestamps in automated responses.
- **Data Persistence:** Mapping a local volume (./n8n_data) to the container's internal storage to preserve workflows, credentials, and configuration data across service restarts.

```
 GNU nano 7.2                          docker-compose.yaml *
services:
  n8n:
    image: n8nio/n8n:latest
    restart: always
    ports:
      - "5678:5678"
    environment:
      - N8N_HOST= (Host Machine IP)
      - N8N_PORT=5678
      - N8N_PROTOCOL=http
      - N8N_SECURE_COOKIE=false
      - GENERIC_TIMEZONE=AMERICA/TORONTO
    volumes:
      - ./n8n_data:/home/node/.n8n
```

The sudo docker-compose pull command is executed to download the specific n8n image layers defined in the configuration file. This step ensures all necessary dependencies and the latest platform binaries are present on the local host before the container is officially started.

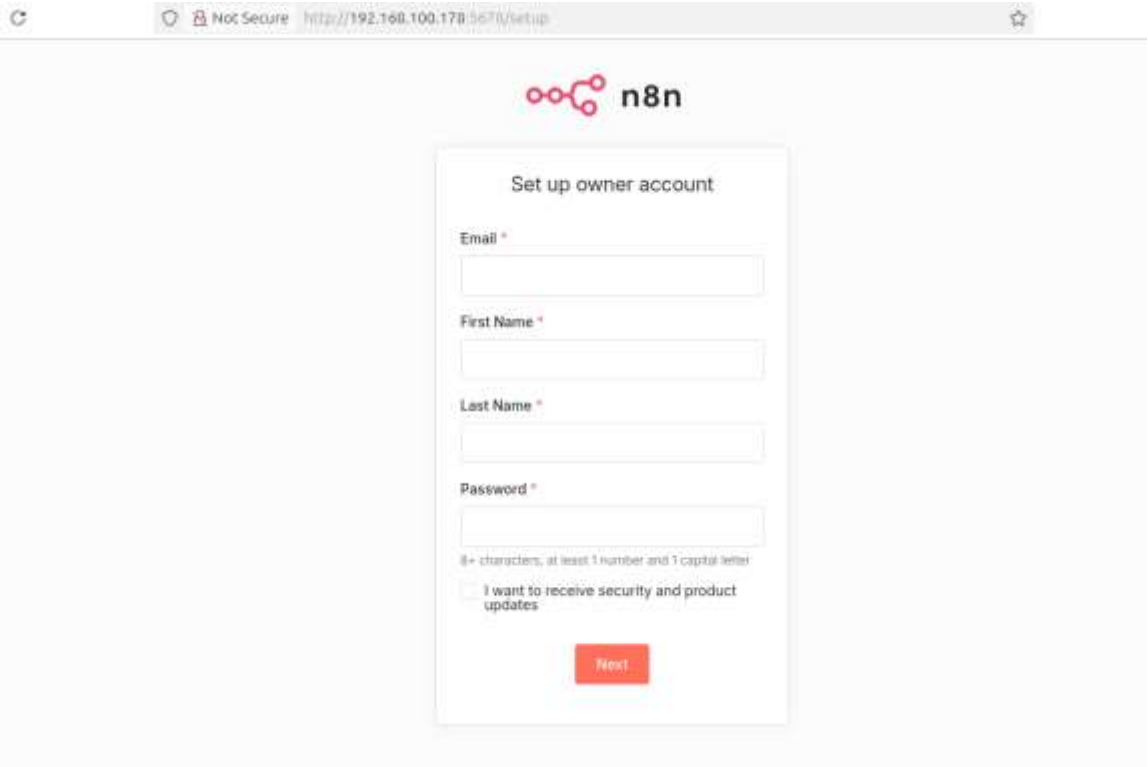
```
safwan@safwan-VirtualBox:~/n8n$ sudo docker-compose pull
```

The final step in the containerized deployment is the execution of the sudo docker-compose up -d command. This instruction initializes the n8n container in detached mode, allowing the automation platform to run in the background as a persistent service. Once active, the environment is ready for web-based access to begin workflow orchestration.

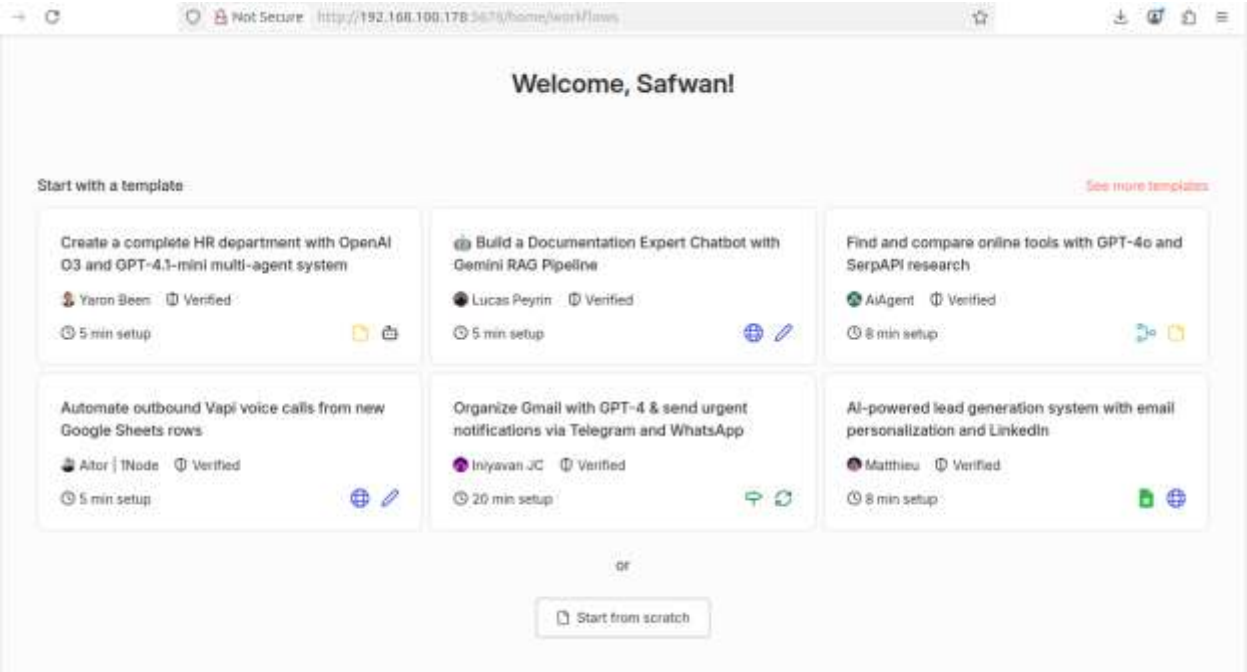
```
safwan@safwan-VirtualBox:~/n8n$ sudo docker-compose up -d
```

Once the container is running, the n8n web interface is accessed by navigating to the Host Machine IP on port 5678 via a web browser. This launches the initial setup wizard, which is the final step in preparing the automation environment for workflow creation.

- **Initial Access:** Navigating to http://<Host_IP>:5678 connects the browser to the n8n service running inside the Docker container.
- **Owner Account Creation:** The "Set up owner account" screen requires the registration of an administrative user with a valid email, name, and a secure password (minimum 8 characters with numbers and capital letters).



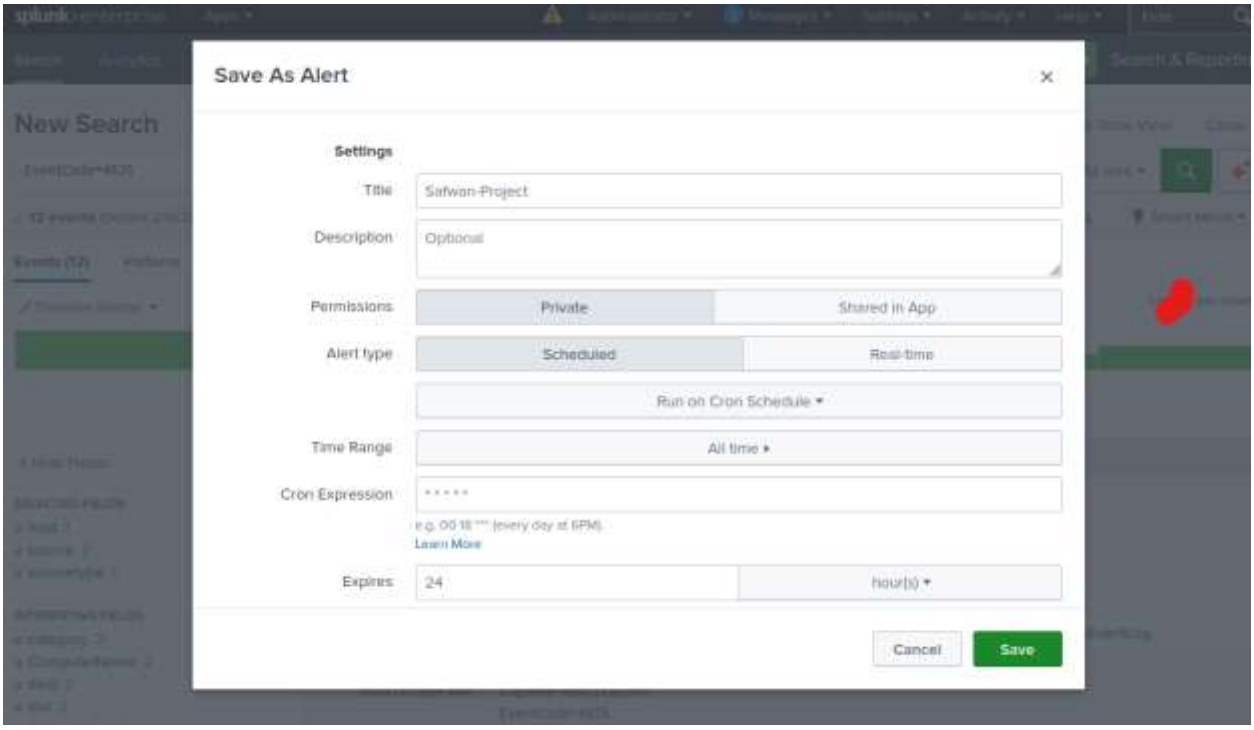
After the successful account creation the default GUI of n8n opens.



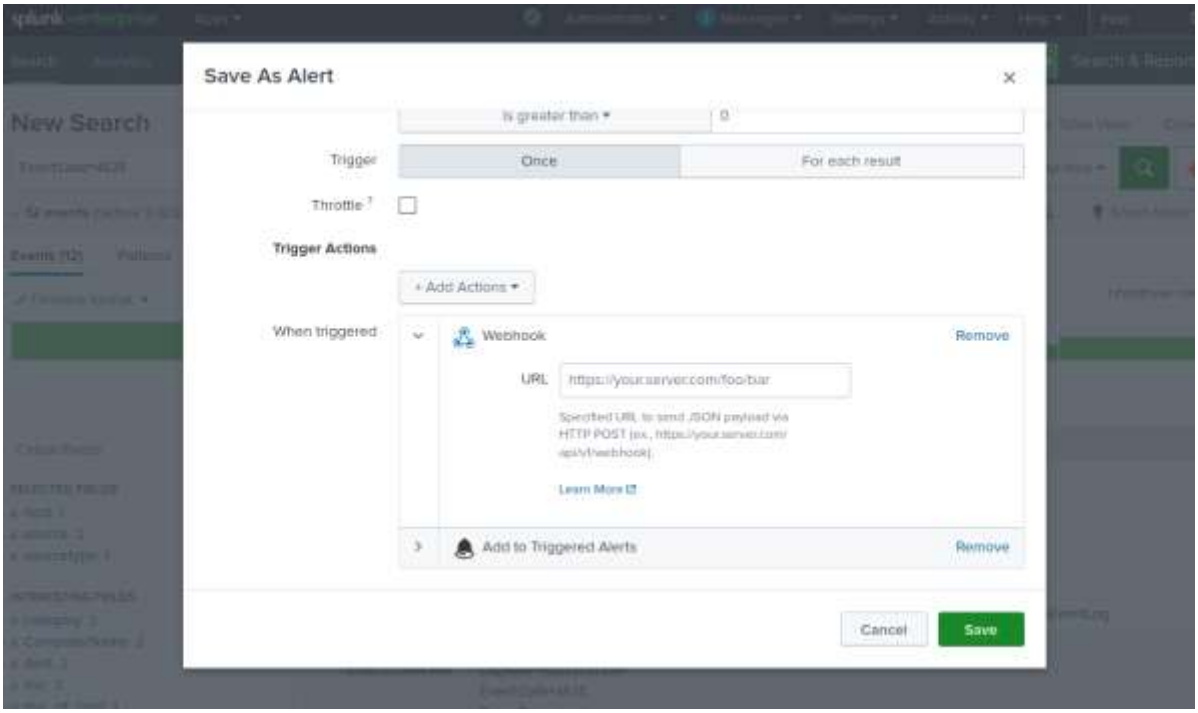
Part 4: Building Automation Workflow

In this part, an automated workflow is created in n8n to process alerts received from Splunk. The workflow defines the logic for handling security events and triggers corresponding actions, such as sending notifications to Slack, simulating a real-world SOC response process.

The first step in the automation workflow involves creating a scheduled alert in Splunk to detect specific security events. In the **Save As Alert** dialog, the search for EventCode=4625 (failed login attempts) is saved with the title "Safwan-Project". The alert is configured to run on a **Cron Schedule** of * * * * * (every minute) and is set to expire after 24 hours, ensuring continuous monitoring of the endpoint.



To receive these alerts, a **Webhook** node is configured within the n8n interface. The HTTP Method is set to **POST**, and the node generates a unique **Test URL** (e.g., http://192.168.100.178:5678/webhook-test/...). This URL serves as the listener that will accept the JSON payload sent from Splunk whenever the alert is triggered.



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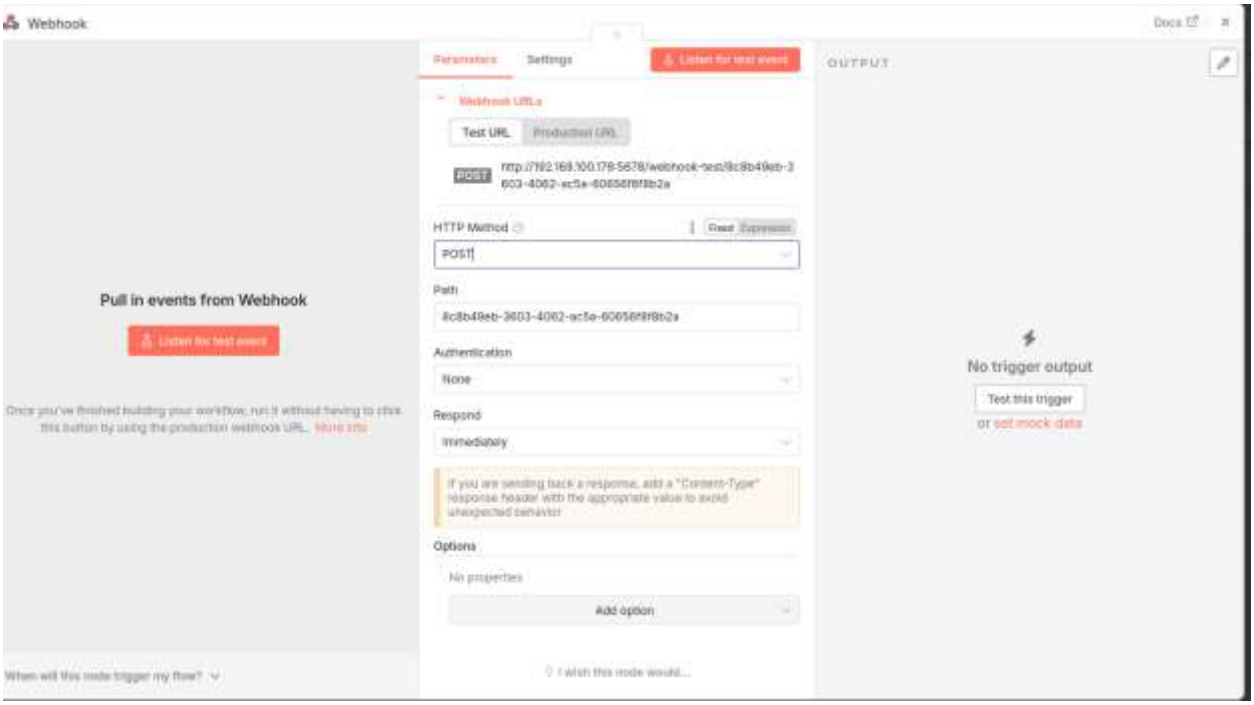
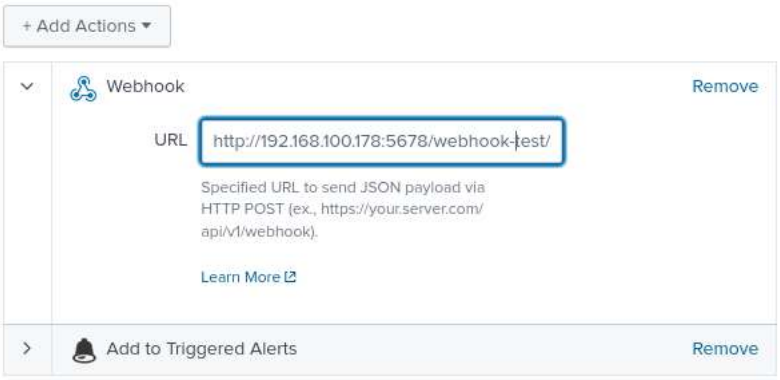
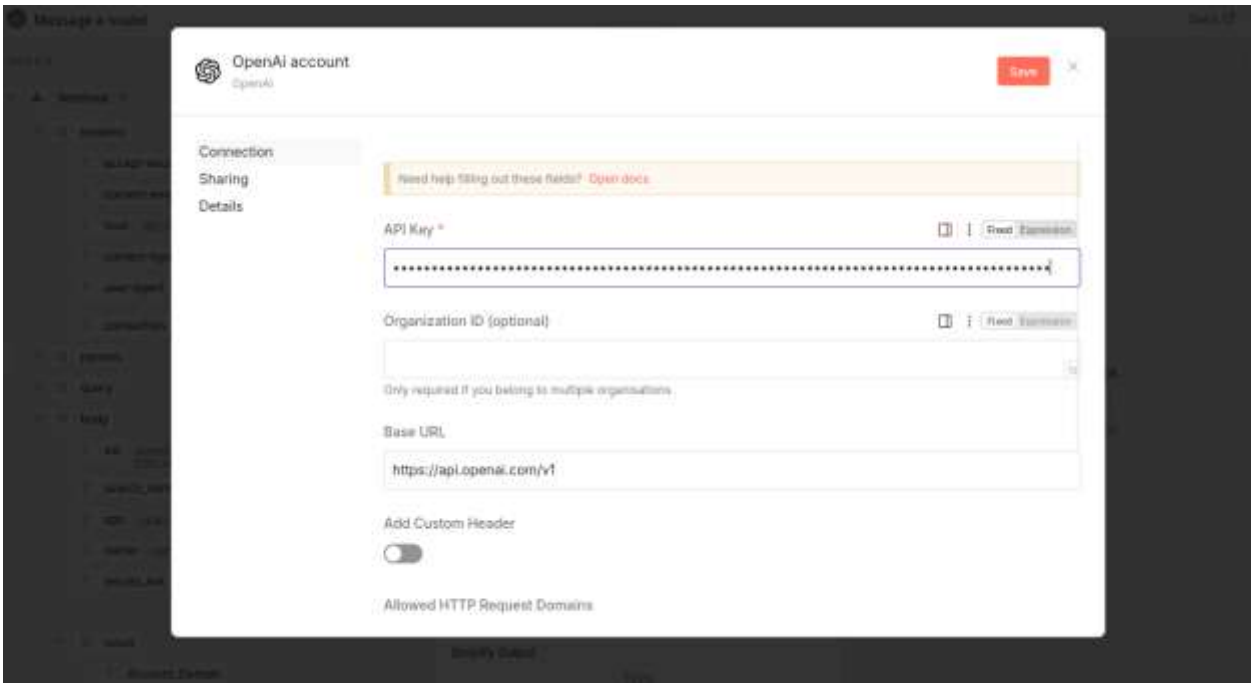


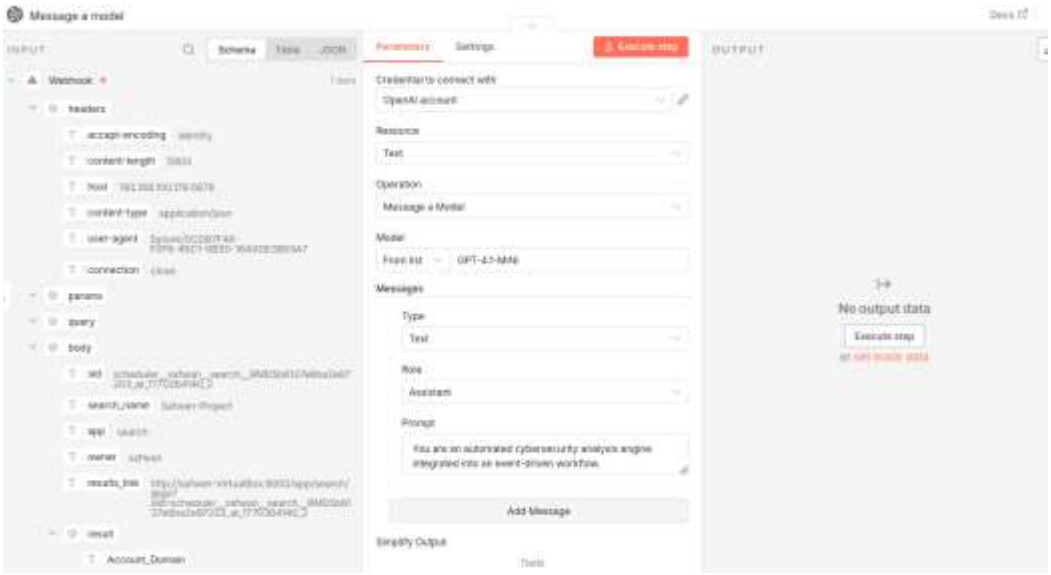
The final integration step connects the two platforms. Back in the Splunk alert settings under Trigger Actions, the "Webhook" option is selected. The unique Test URL generated by n8n is then pasted into the URL field. This configuration ensures that every time the alert fires, Splunk automatically sends the event data to the n8n automation flow for processing.



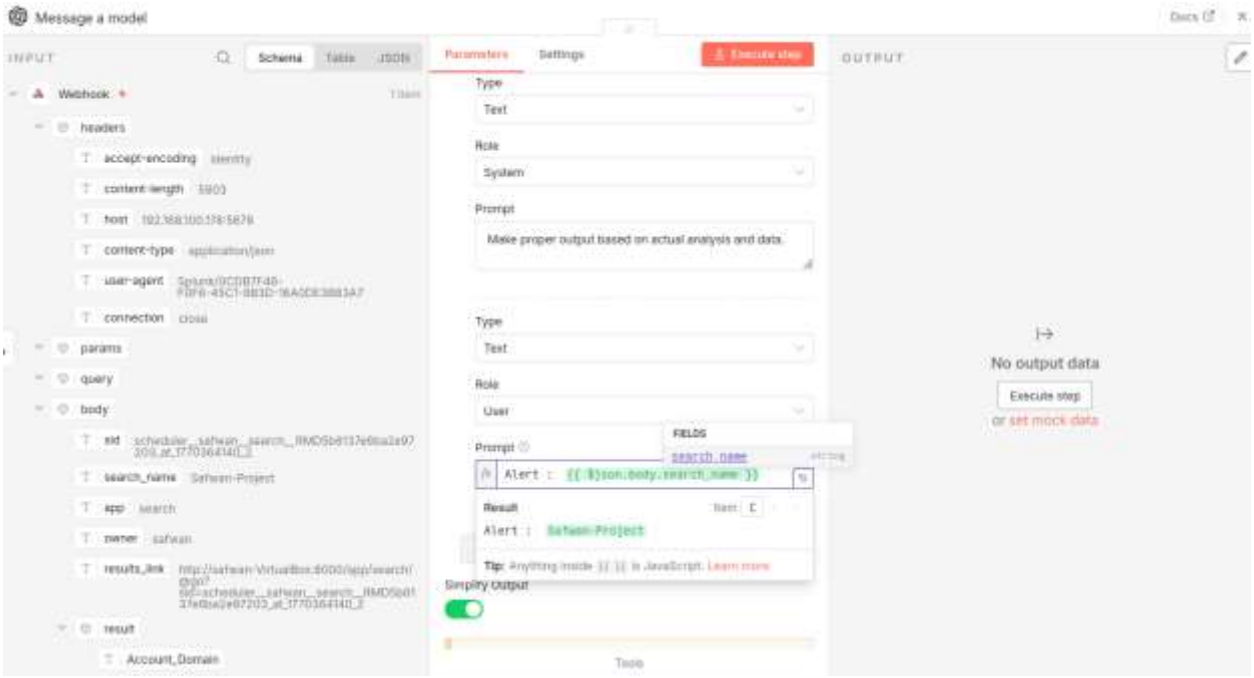
This step establishes the secure connection between the n8n automation platform and the OpenAI API. A new OpenAI account credential is created within the workflow, where the secret API Key is input and saved. This authentication allows the workflow to programmatically access GPT models for analyzing security alerts.



The OpenAI node is configured to define the AI's operational role within the SOC workflow. Under the Messages section, an "Assistant" role is created with a specific system prompt: *"You are an automated cybersecurity analysis engine integrated into an event-driven workflow."* This instruction sets the context, ensuring the model interprets subsequent data as a security analyst rather than a general-purpose chatbot.

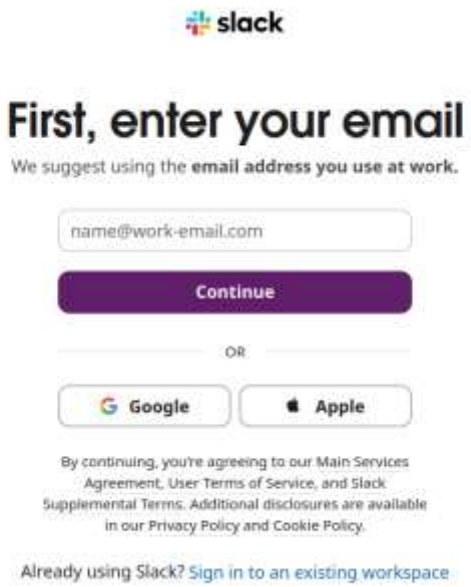


The workflow logic is further refined by mapping incoming Splunk data to the AI's input prompt. A User role is added to the message parameters, utilizing a dynamic expression: Alert : {{ $json.body.search_name }}. This configuration ensures that the specific title of the triggered Splunk alert (e.g., "Safwan-Project") is automatically injected into the prompt, telling the AI exactly which security event it is analyzing.

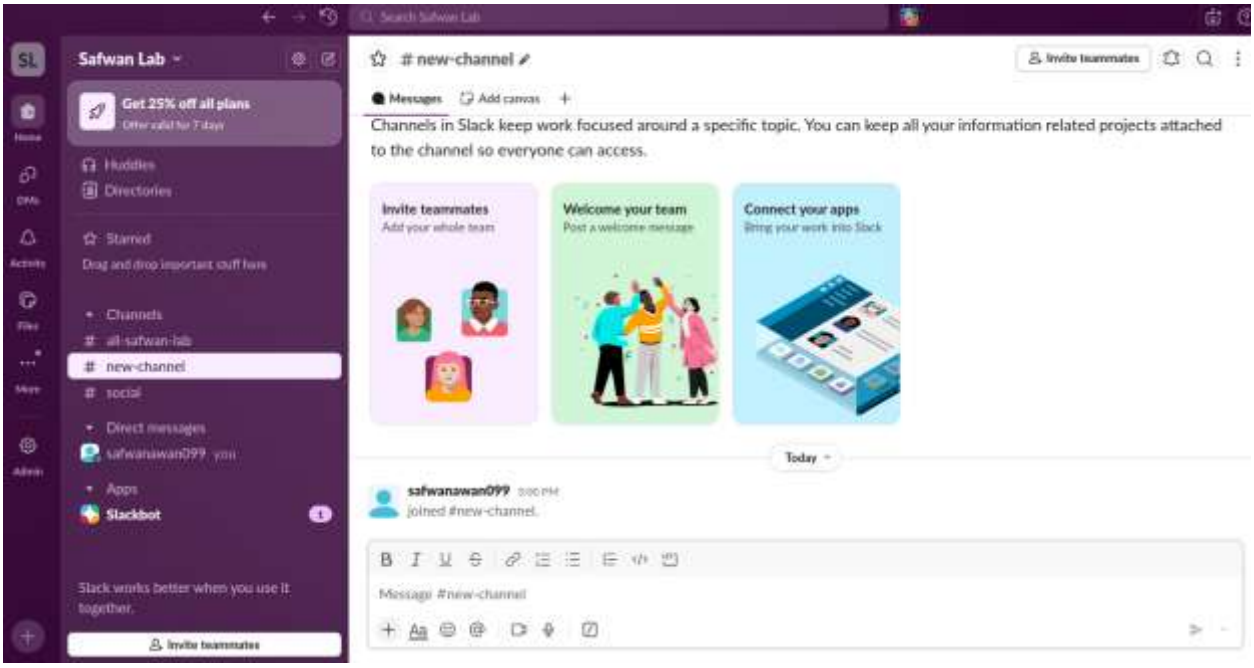


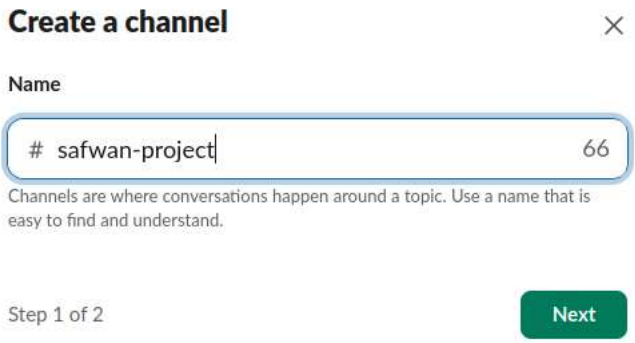
The final image demonstrates the construction of the full data payload passed to the AI model. An n8n Expression is used to stringify the entire JSON result from Splunk: {{ JSON.stringify($json.body.result,null,2) }}. The preview window confirms that critical telemetry—including EventCode 4625 (failed login), ComputerName (DESKTOP-6VKP16F), and timestamp data—is correctly formatted and ready to be processed by the AI for incident analysis.

Configuration of Slack:

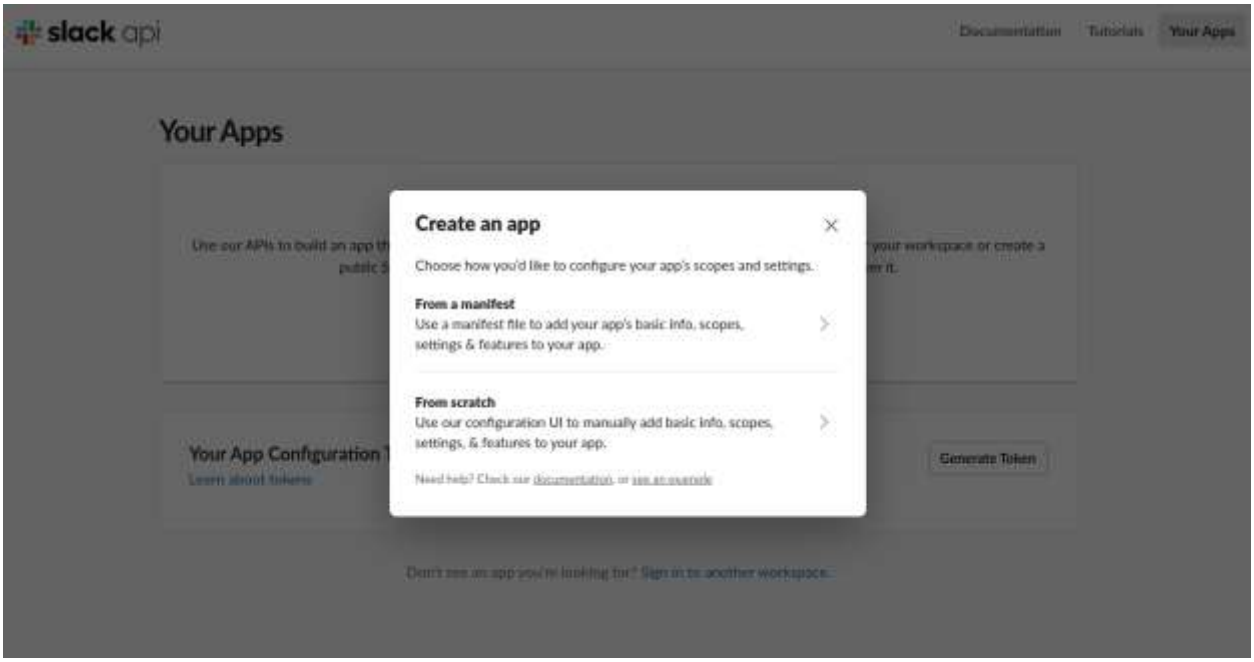


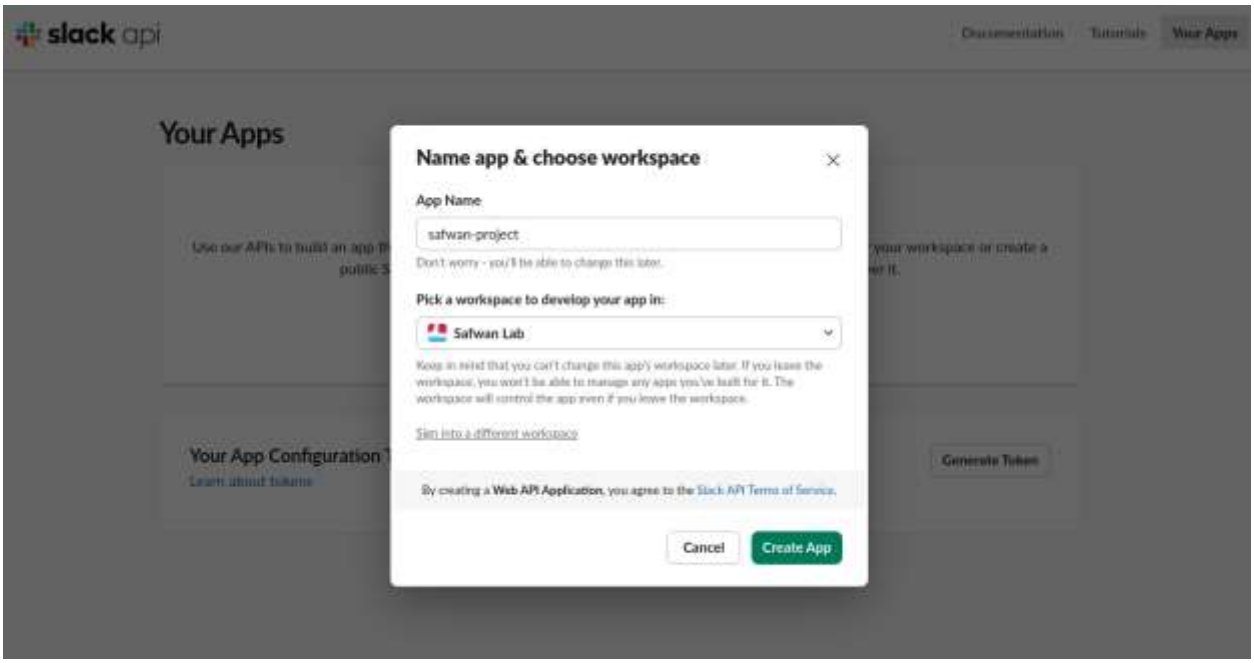
Click on Channels to add new channel for the smooth configuration of lab workflow.





The Slack API dashboard by selecting **"Create New App"** from scratch. The application is given a name, such as "SIEM-Alerts," and linked to the active project workspace. This creates the bot identity that will be responsible for delivering automated notifications from the SIEM.





Go to Scopes and then add all of the below scopes in the Add and OAuth Scope section.

Scopes

A Slack app's capabilities and permissions are governed by the scopes it requests.

Bot Token Scopes

Scopes that govern what your app can access.

OAuth Scope	Description
channels:read	View basic information about public channels in a workspace

Add an OAuth Scope

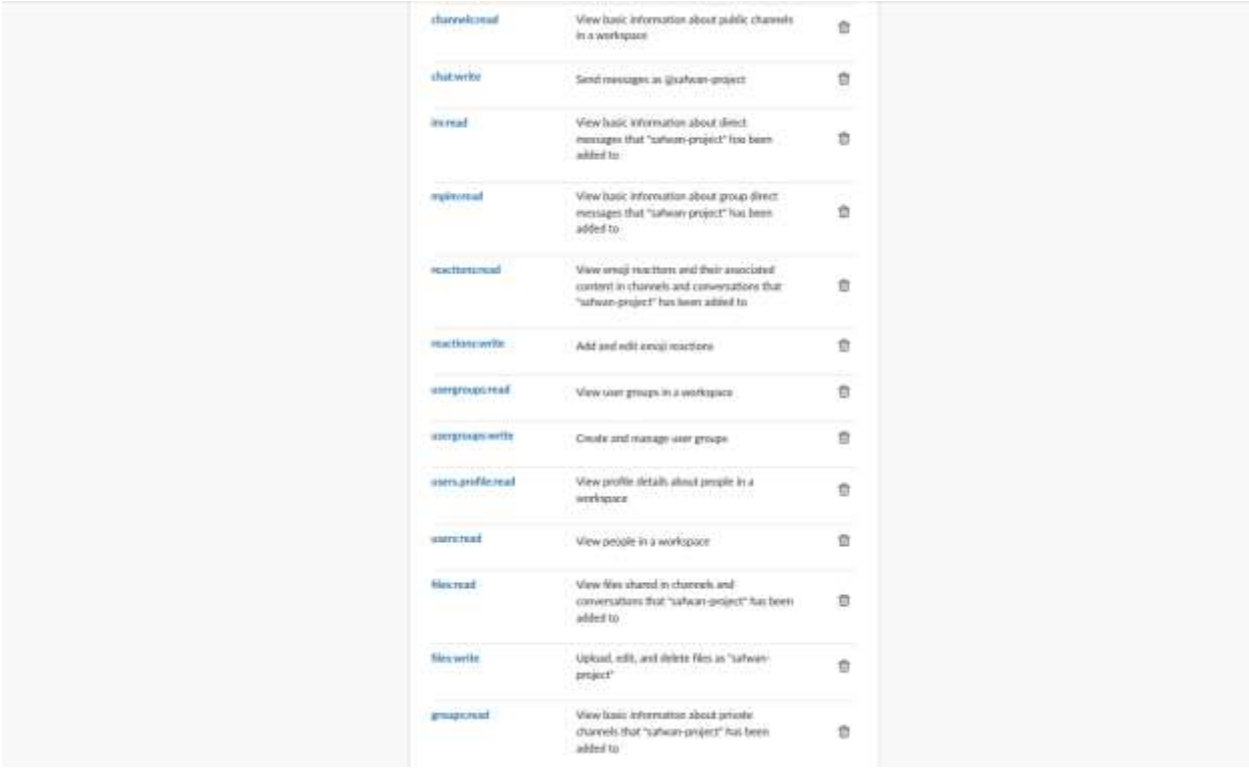
User Token Scopes

Scopes that access user data and act on behalf of users that authorize them.

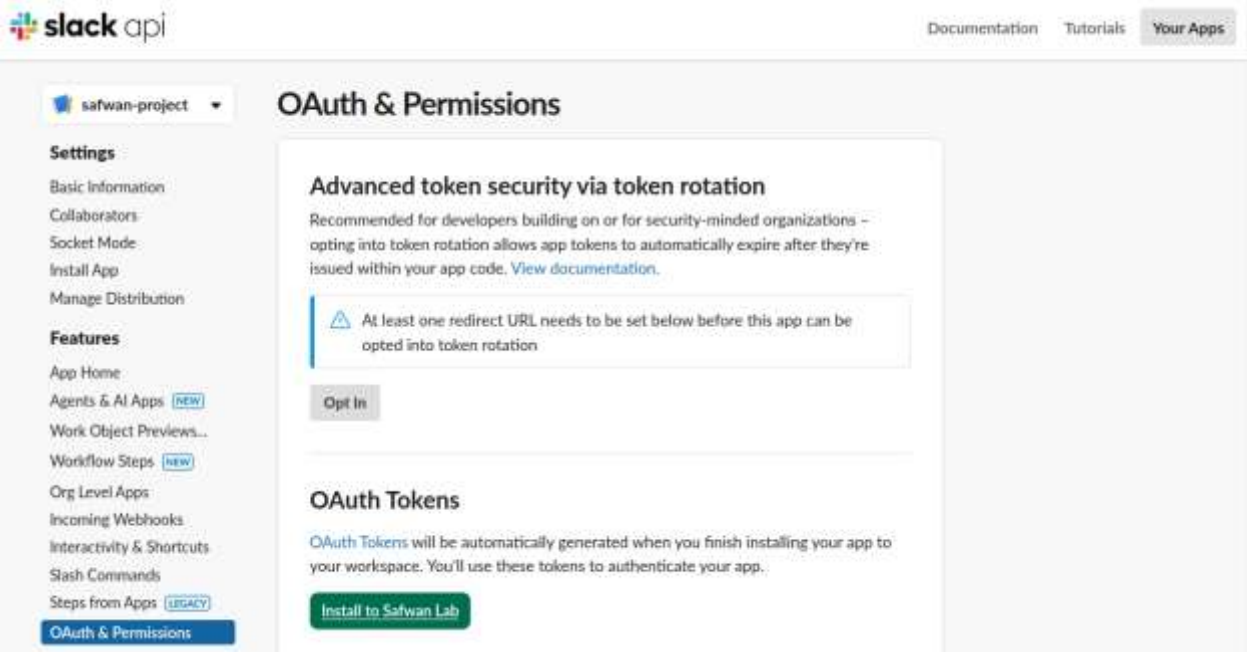
OAuth Scope	Description

You haven't added any OAuth Scopes for your User token.

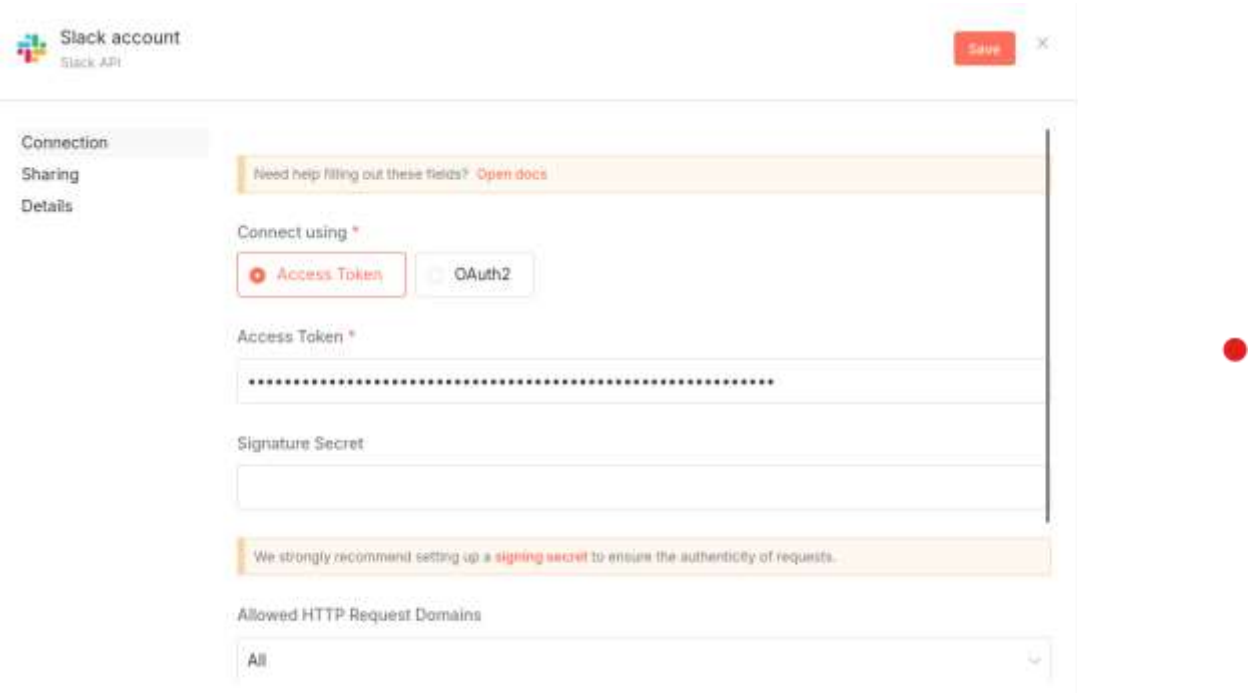
Add an OAuth Scope

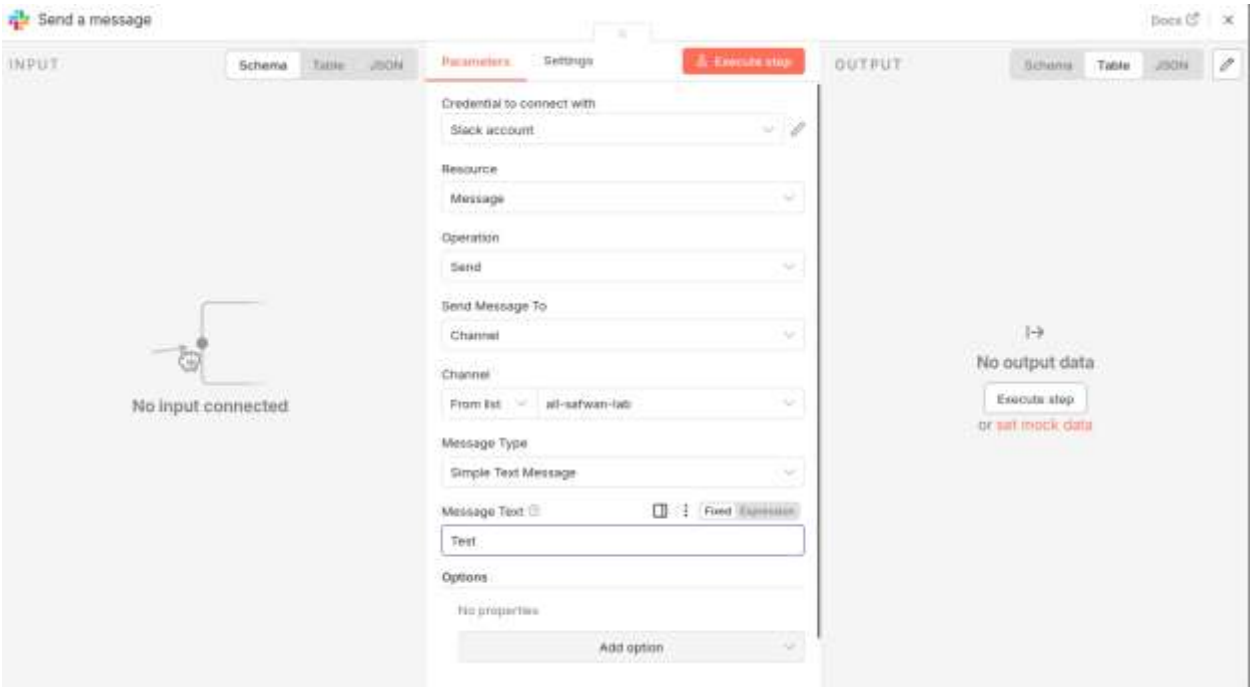


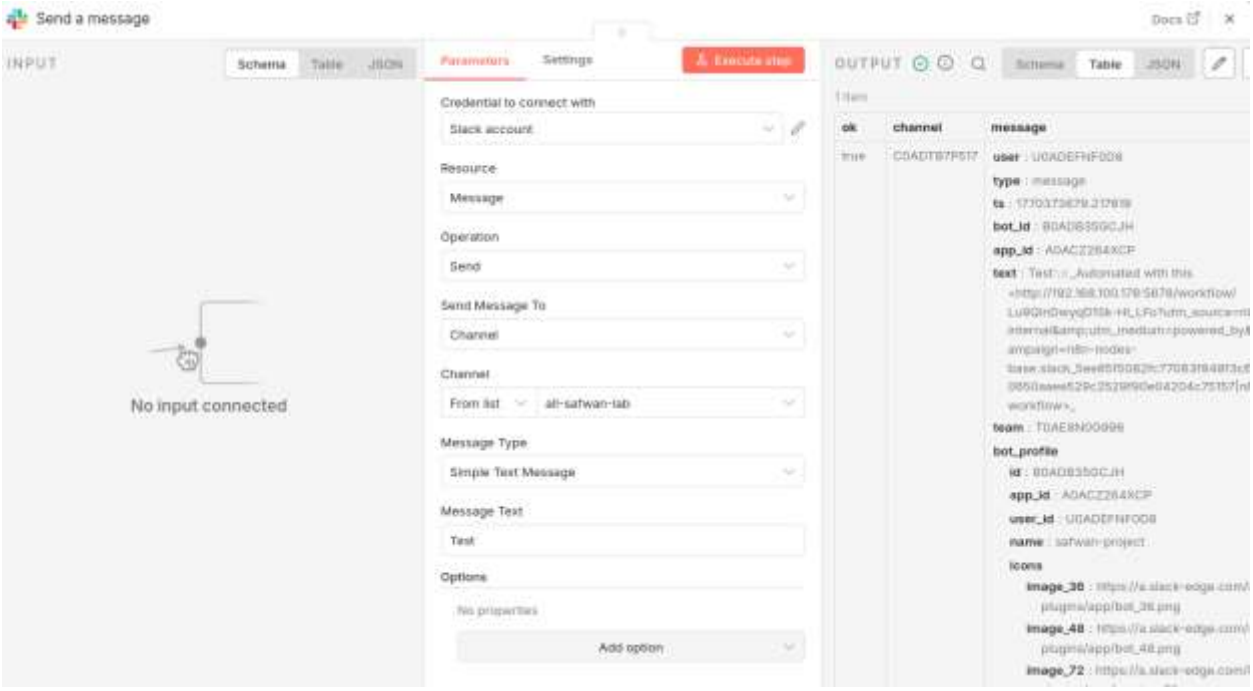
Upon Saving the previous work the new instance appear. In this click on the Install to “Safwan” Lab (Your case would be change) to get the API Key.



API Key that was taken from the previous step will be putted in the Slack node of n8n.




Send a message
Docs
INPUT
Schema
Table
JSON
Parameters
Settings
Execute step
OUTPUT
Schema
Table
JSON
Credential to connect with
Slack account
Resource
Message
Operation
Send
Send Message To
Channel
Channel
From list
all-safwan-lab
Message Type
Simple Text Message
Message Text
Fixed
Expression
Test
Options
No properties
Add option
No input connected
No output data
Execute step
or set mock data


Send a message
Docs
INPUT
Schema
Table
JSON
Parameters
Settings
Execute step
OUTPUT
Schema
Table
JSON
1 item
Credential to connect with
Slack account
Resource
Message
Operation
Send
Send Message To
Channel
Channel
From list
all-safwan-lab
Message Type
Simple Text Message
Message Text
Test
Options
No properties
Add option
No input connected
ok
channel
message
true
C0ADTB7P5T7
user : U0ADEFNF0D8
type : message
bot_id : B0AD835GCJH
app_id : A0ACZ264XCP
team : T0AE8N00996
bot_profile
id : B0AD835GCJH
app_id : A0ACZ264XCP
user_id : U0ADEFNF0D8
name : safwan-project
icons

This screenshot demonstrated the proper working of the complete Lab workflow. The Test shown in the Slack which was created in the slack n8n node.s