Information Technology for Logistics

Part 2: N8N

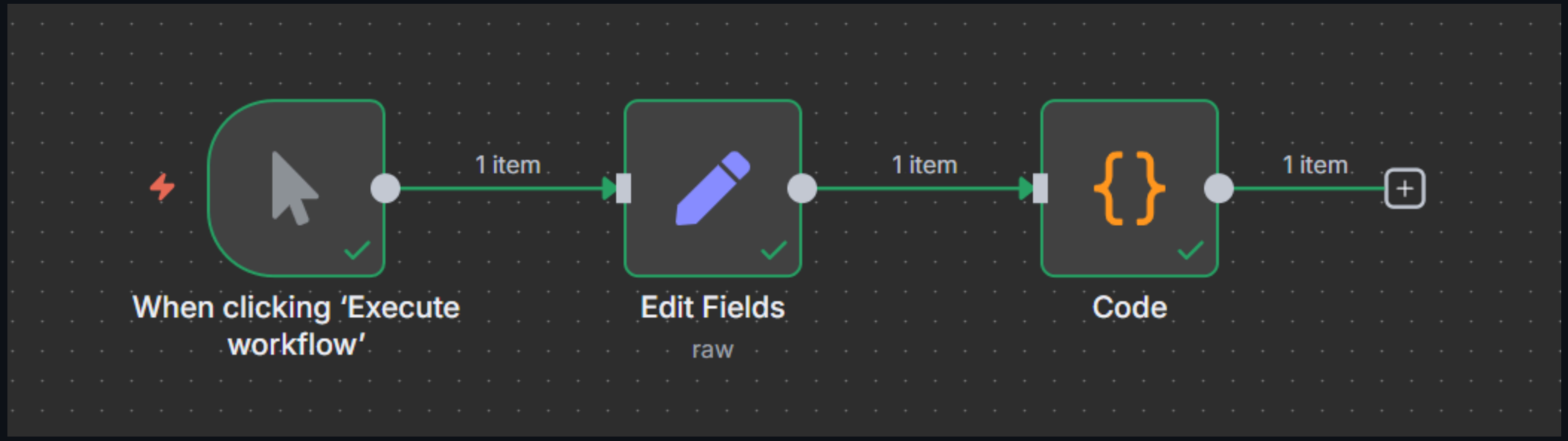
What is it?

> `n8n` is an open-source workflow automation tool that allows users to automate tasks and connect different apps, services, and APIs using a simple, visual interface.

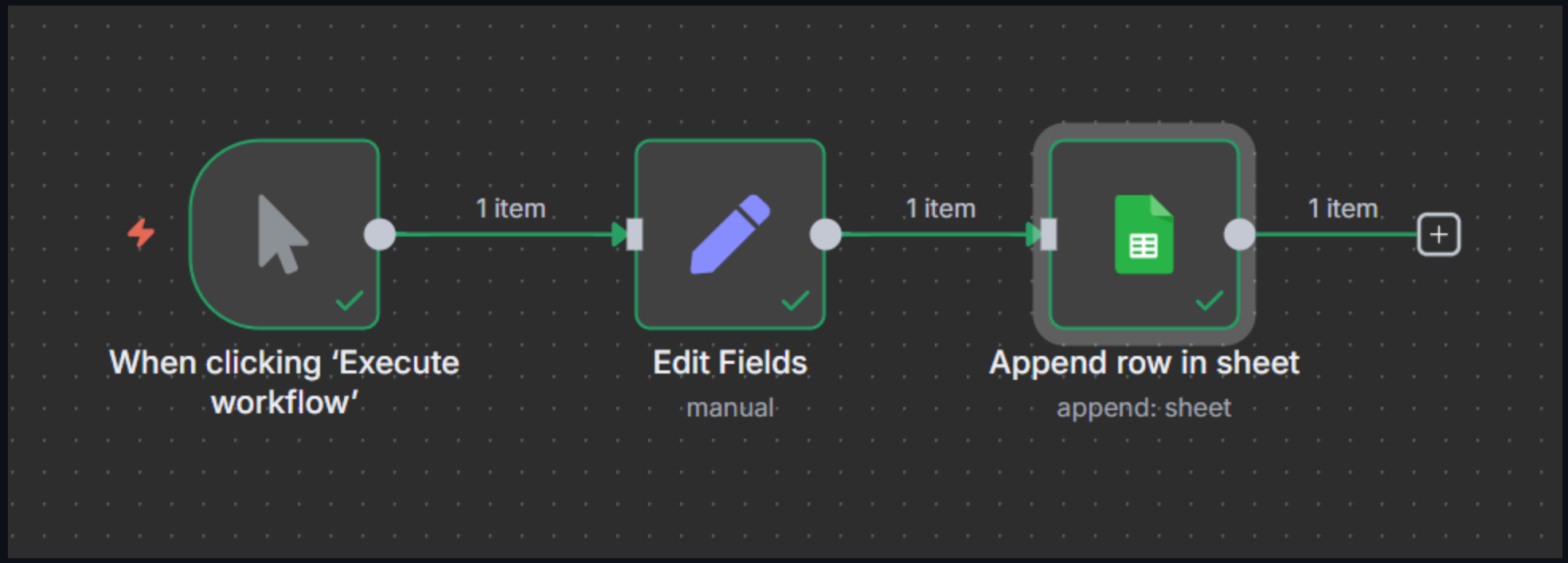
Installation

Guide

Basic Flow 1


1 item
1 item
1 item
When clicking 'Execute workflow'
Edit Fields
raw
Code

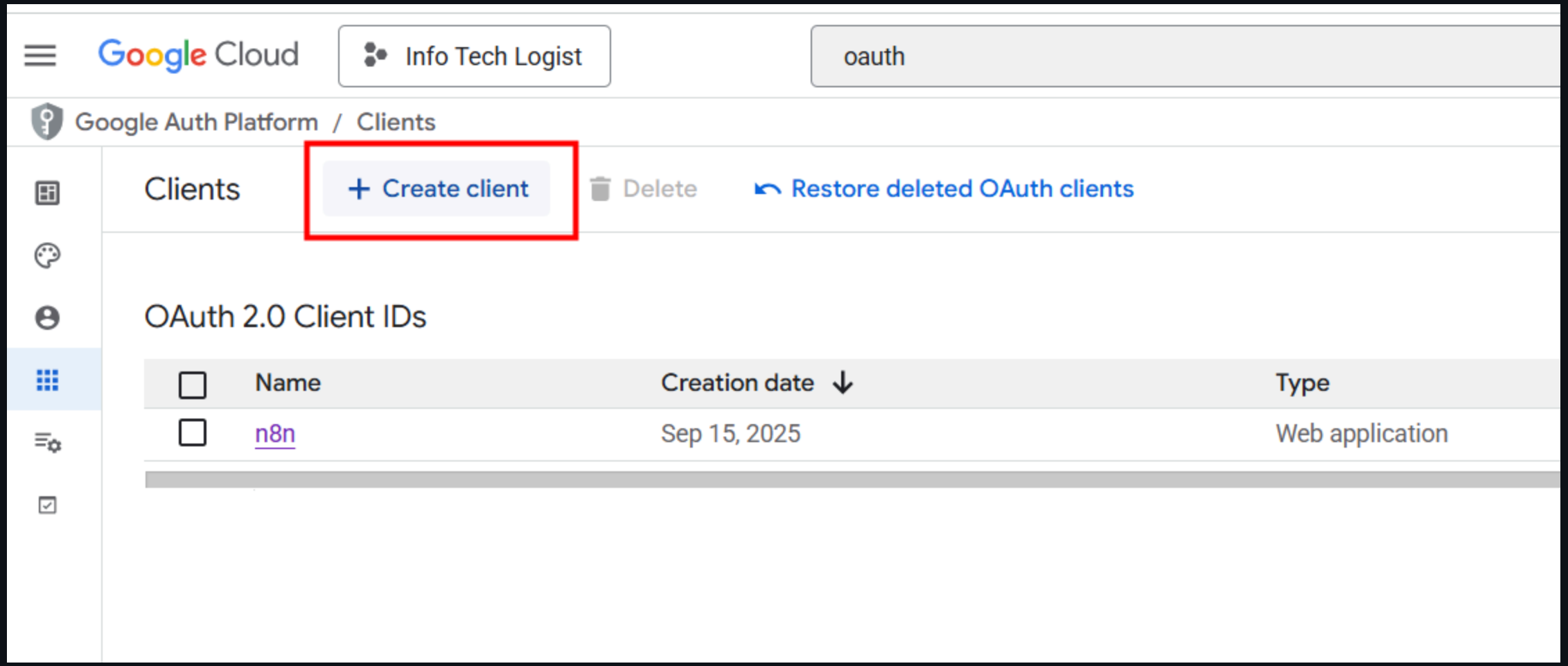
Google Sheet



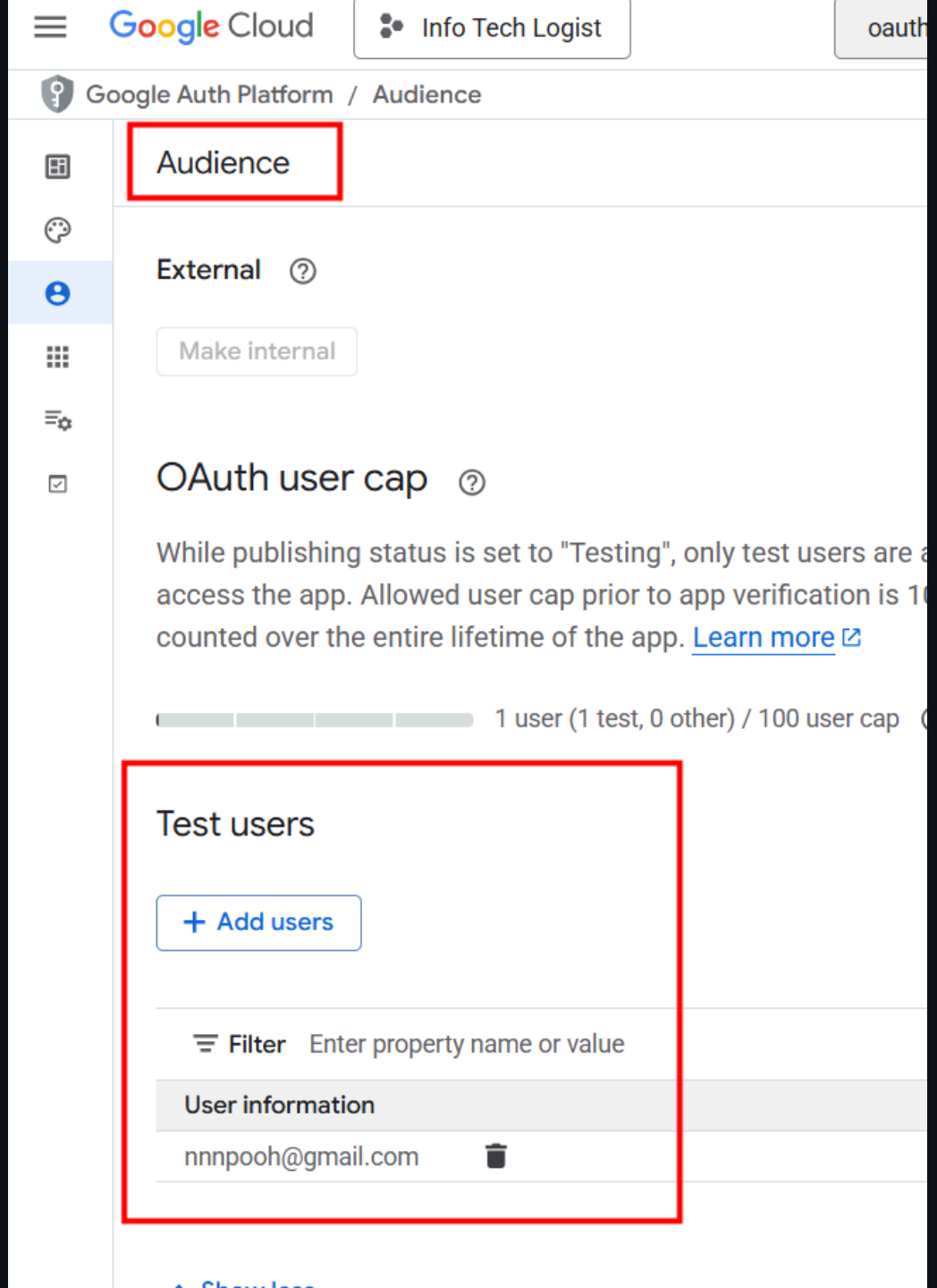
Google Sheet

- Create a new `project` in Google Cloud Platform
- Enable `Google Sheet API`
- Create `App` from the `Consent Screen`
- Create a `client` from the `App`
- Add a test `user`
- Enable `Google Drive API`

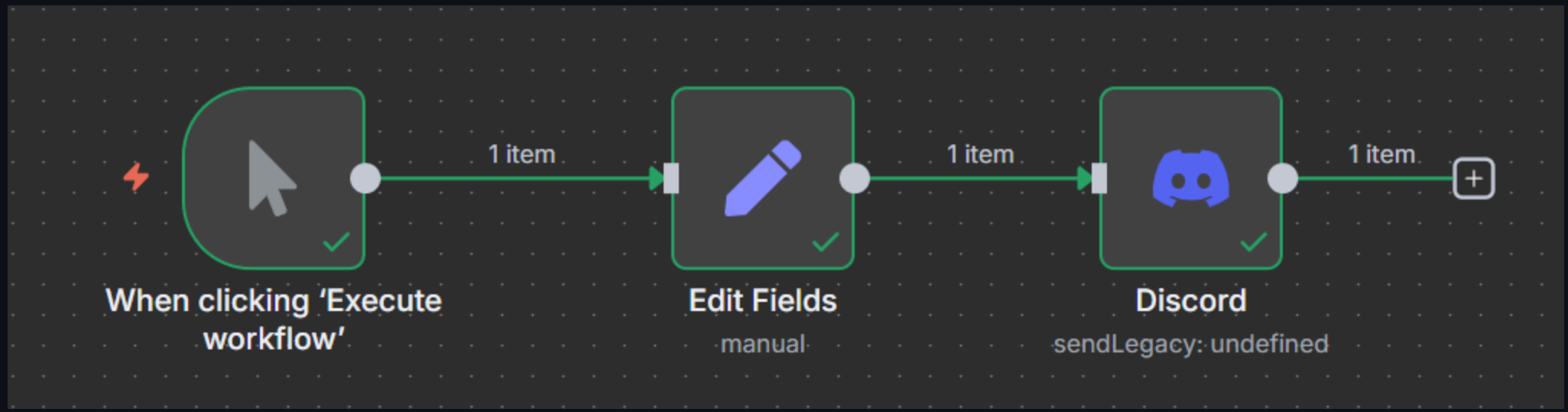
Create Client



Add Test User



Notification

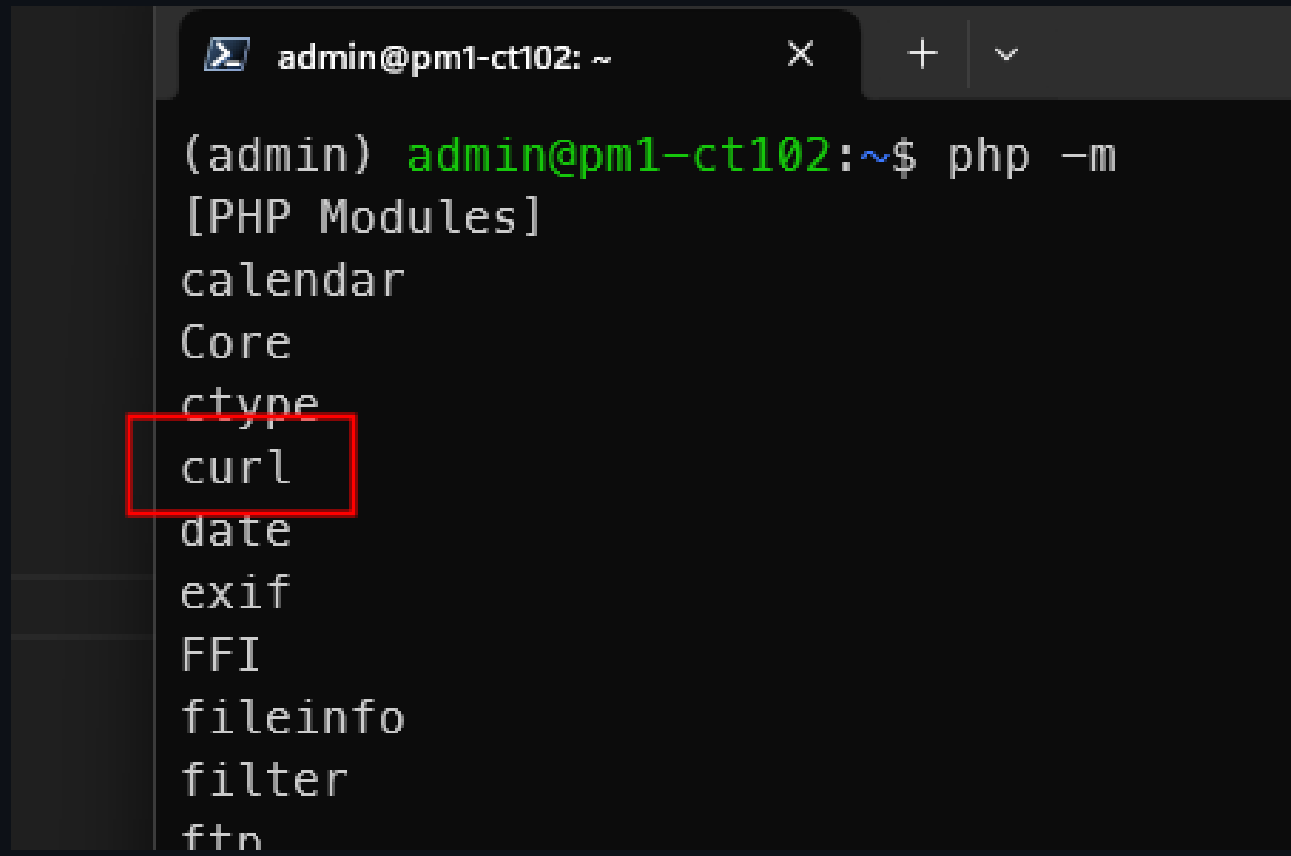


Drink Ordering System

> Connecting Web Application to Other Services

Install `curl` in `php`

- `sudo apt-get install php-curl`
- `sudo systemctl restart nginx`
- `php -m`

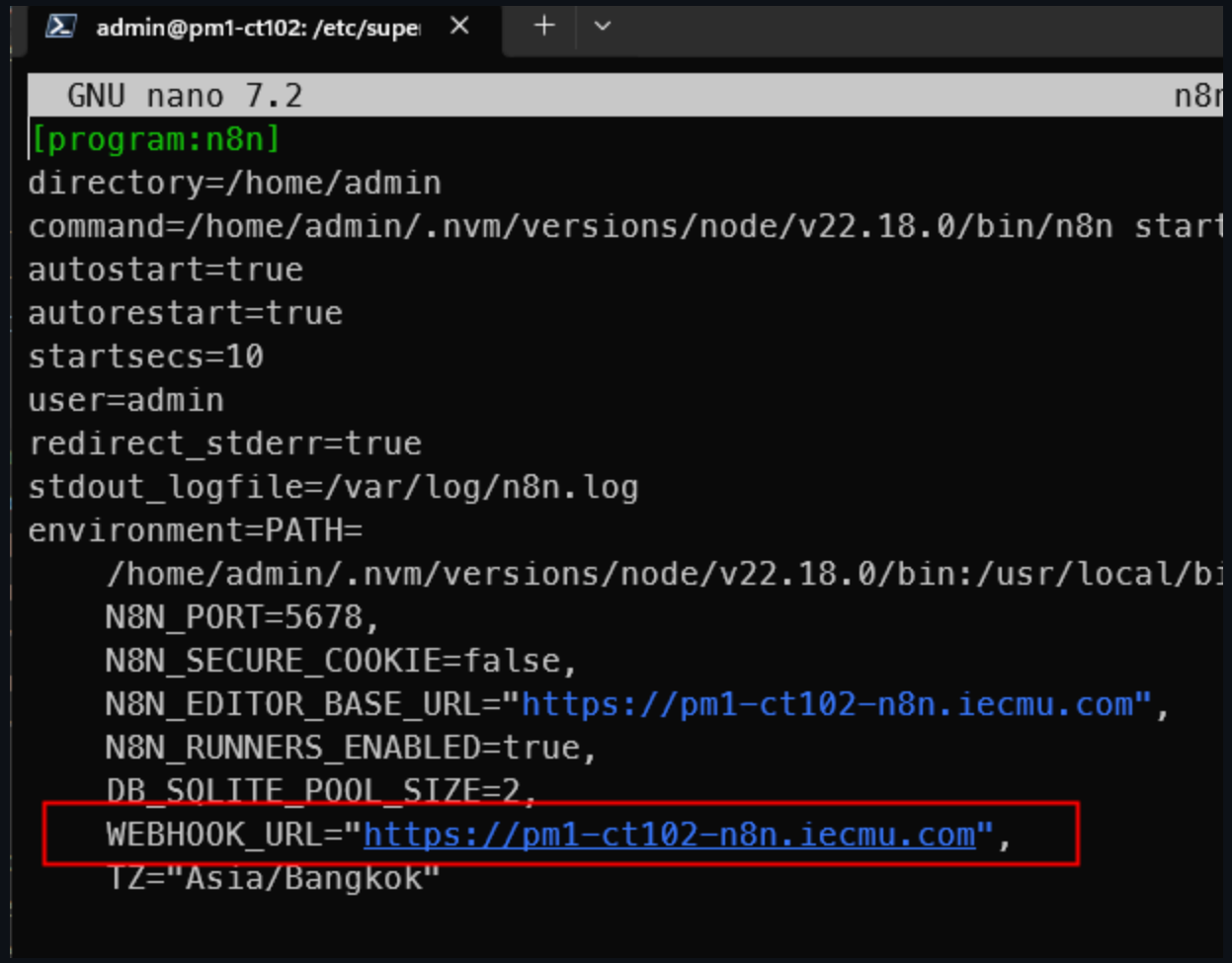


Modify `n8n` config

- `sudo nano /etc/supervisor/conf.d/n8n.conf`
- Add this line *(see next page)*

```
WEBHOOK_URL="https://pmX-ctXXX-n8n.iecmu.com",
```

- `sudo systemctl restart supervisor`


admin@pm1-ct102: /etc/supe
GNU nano 7.2 n8r
[program:n8n]
directory=/home/admin
command=/home/admin/.nvm/versions/node/v22.18.0/bin/n8n start
autostart=true
autorestart=true
startsecs=10
user=admin
redirect_stderr=true
stdout_logfile=/var/log/n8n.log
environment=PATH=
/home/admin/.nvm/versions/node/v22.18.0/bin:/usr/local/bi
N8N_PORT=5678,
N8N_SECURE_COOKIE=false,
N8N_EDITOR_BASE_URL="https://pm1-ct102-n8n.iecmu.com",
N8N_RUNNERS_ENABLED=true,
DB_SQLITE_POOL_SIZE=2,
WEBHOOK_URL="https://pm1-ct102-n8n.iecmu.com",
TZ="Asia/Bangkok"

Database

- Create a new database

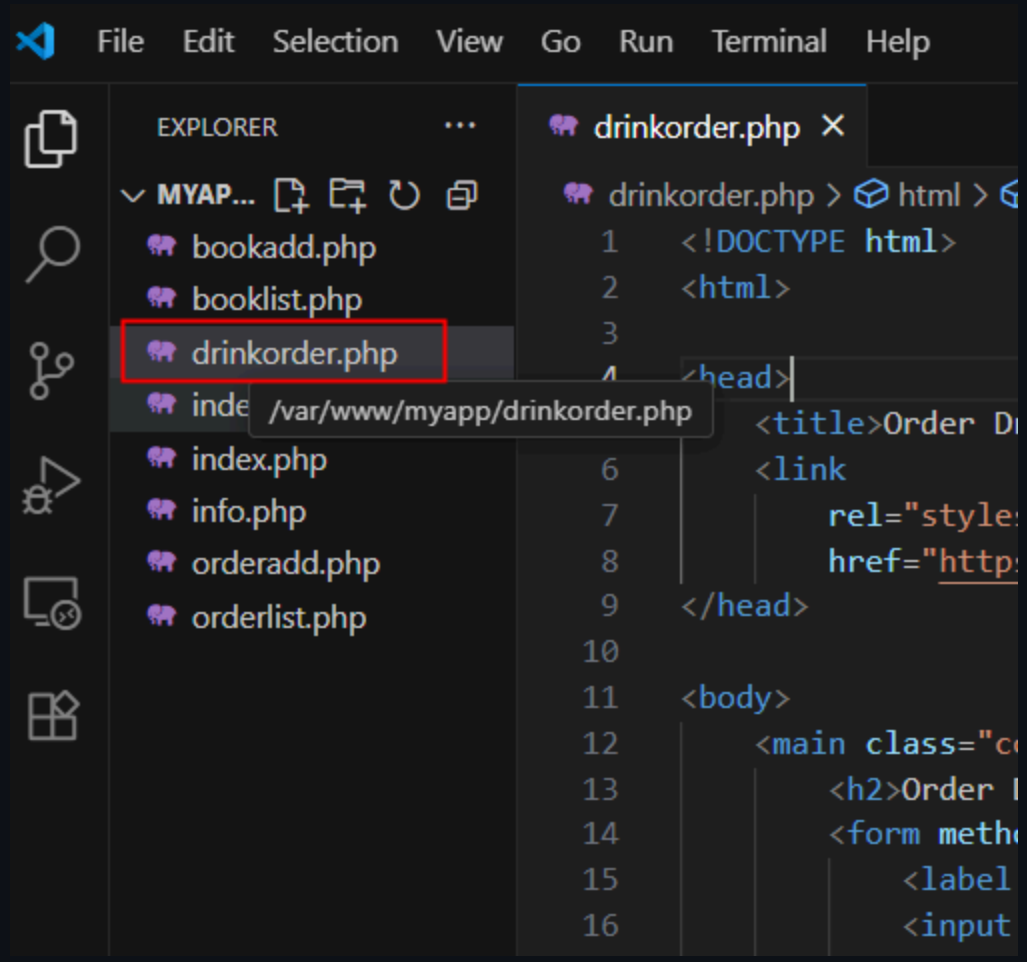
```
CREATE DATABASE IF NOT EXISTS iedrink;
```

- Create a new table

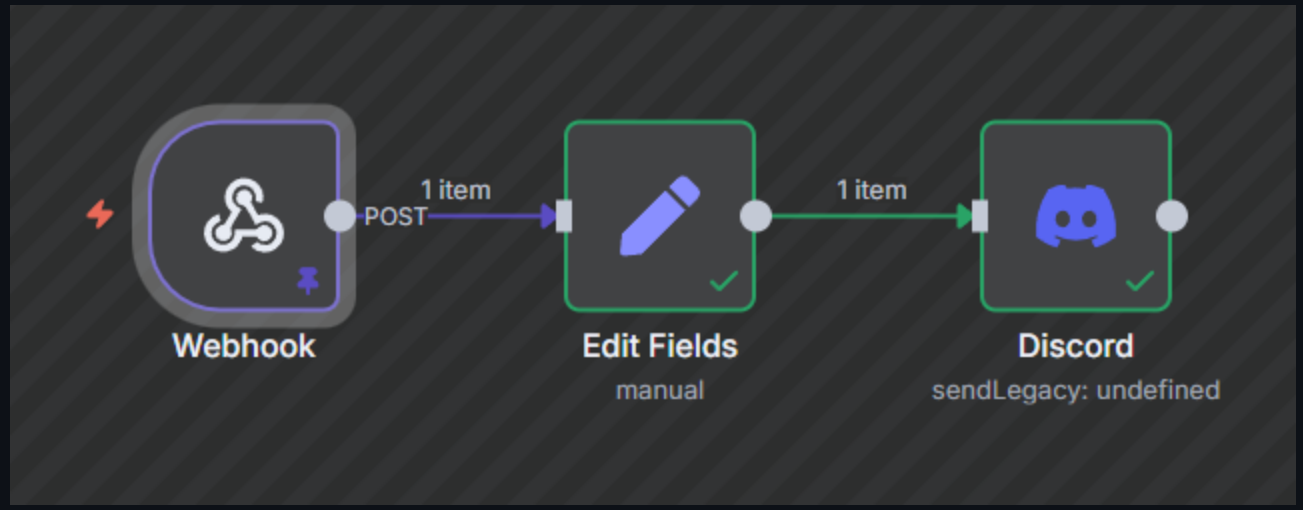
```
CREATE TABLE IF NOT EXISTS iedrink.orders (
  id INT NOT NULL AUTO_INCREMENT,
  drink_name VARCHAR(100),
  customer_name VARCHAR(100),
  quantity INT,
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
  PRIMARY KEY (id)
);
```

Web Application

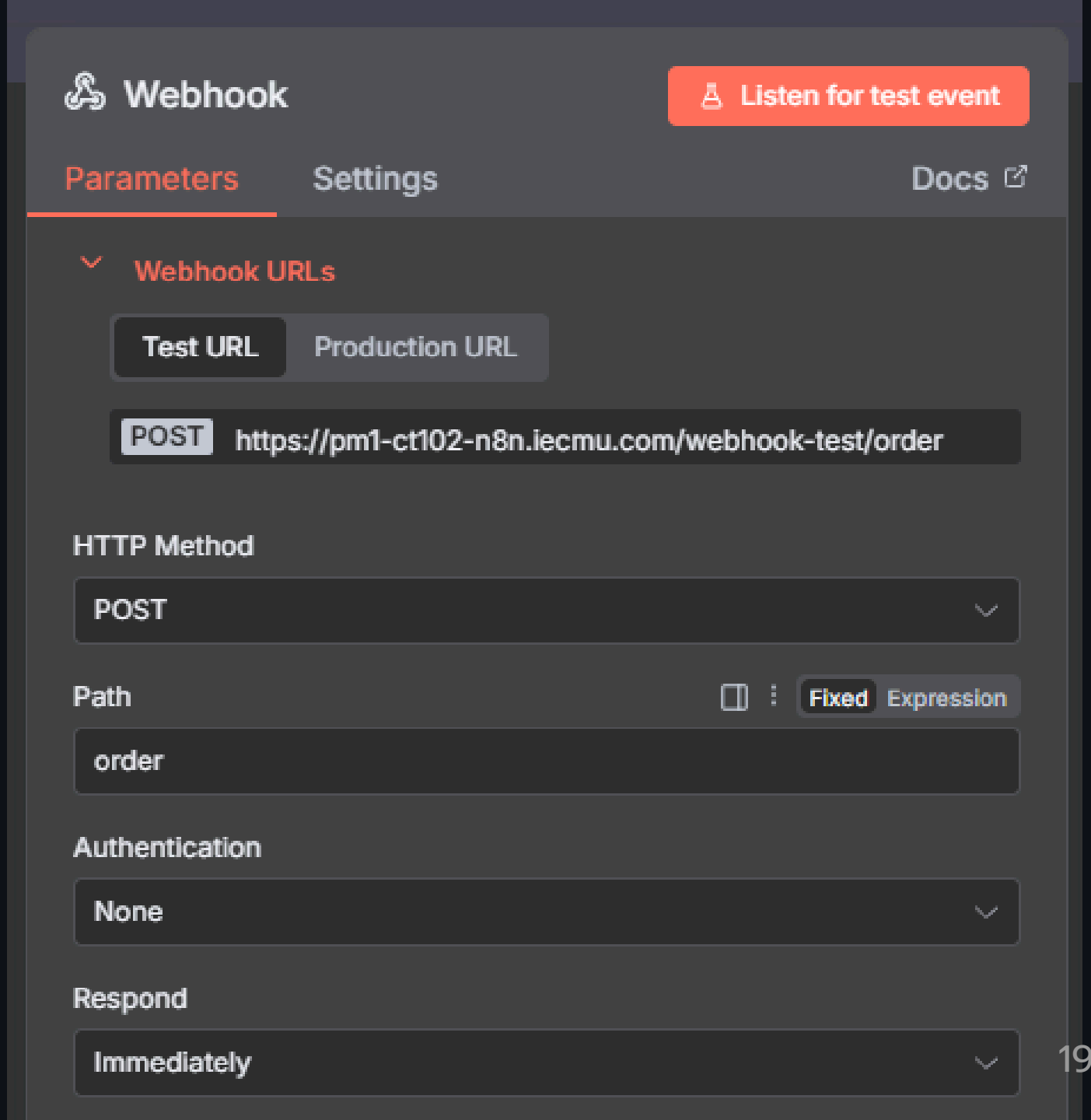
- Create `drinkorder.php` (Link)
  - Modify your database credential.
- Visit your page at https://pmX-ctXXX-web.iecmu.com/drinkorder.php


File Edit Selection View Go Run Terminal Help
EXPLORER
drinkorder.php
drinkorder.php > html >
MYAP...
bookadd.php
booklist.php
drinkorder.php
/var/www/myapp/drinkorder.php
index.php
info.php
orderadd.php
orderlist.php
1 <!DOCTYPE html>
2 <html>
3
4 <head>
5 <title>Order
6 <link
7 rel="style
8 href="http
9 </head>
10
11 <body>
12 <main class="c
13 <h2>Order
14 <form meth
15 <label
16 <input

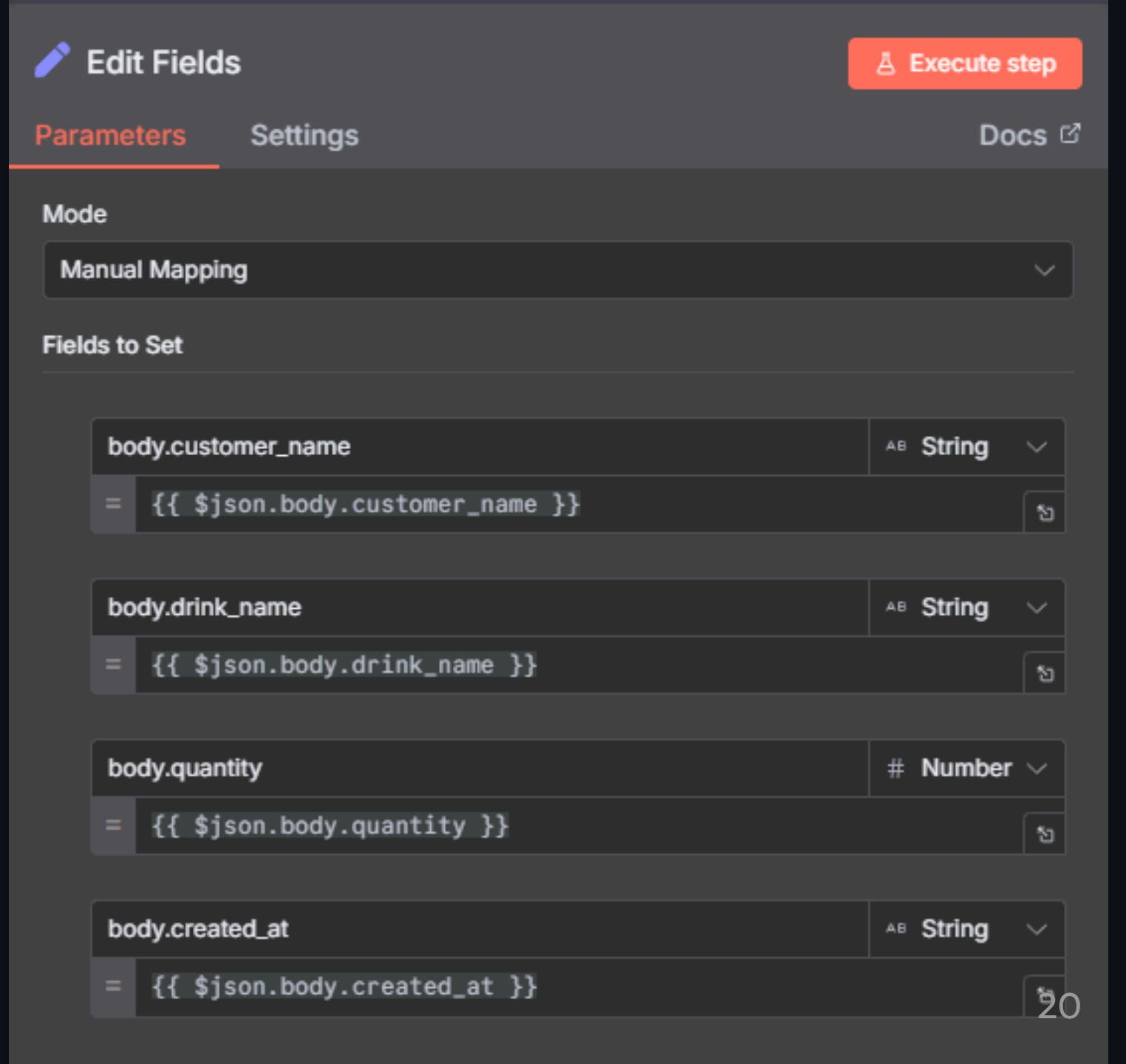
Webhook Flow



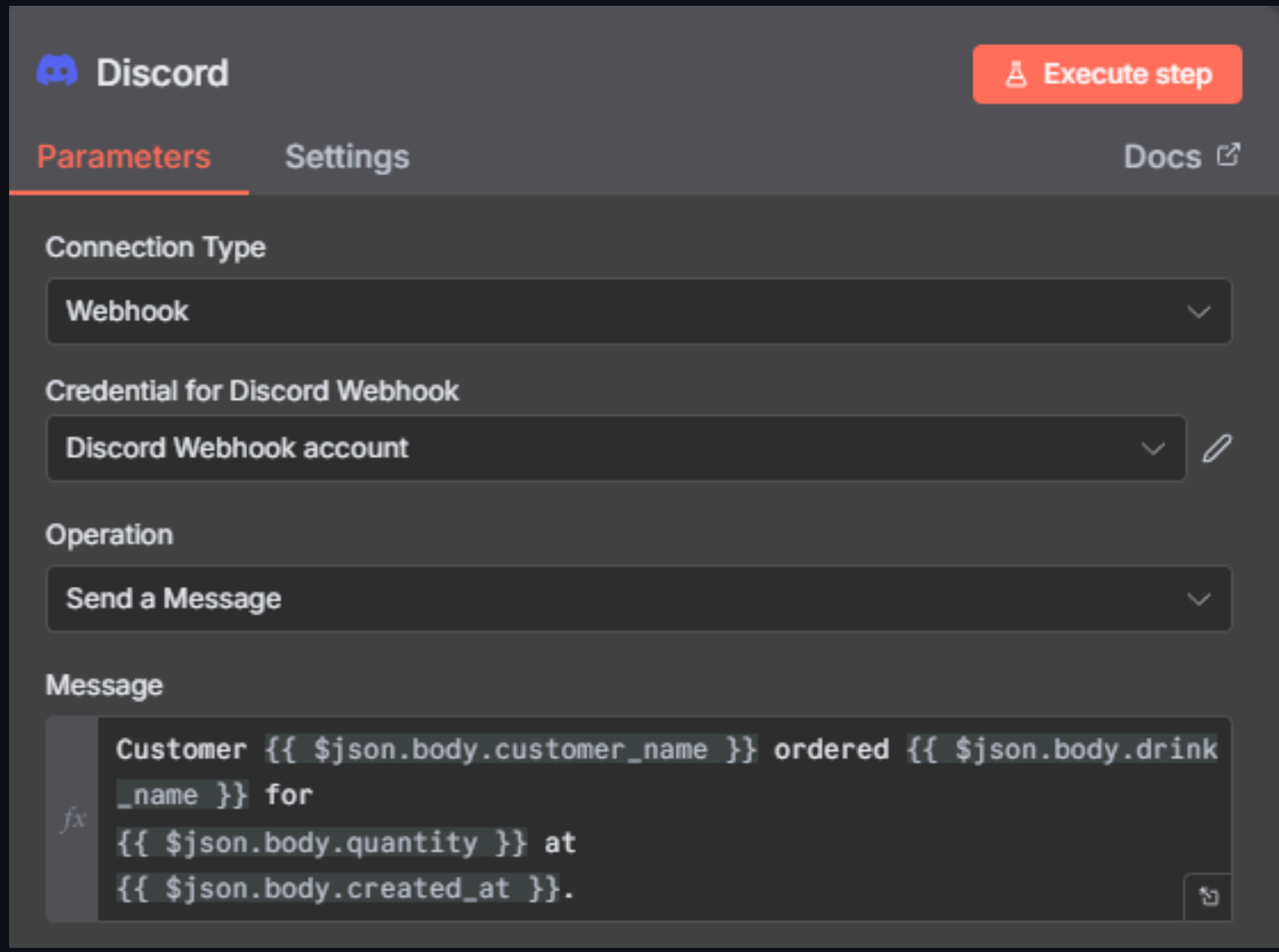
Webhook


Webhook
Listen for test event
Parameters
Settings
Docs
Webhook URLs
Test URL
Production URL
POST
https://pm1-ct102-n8n.iecmu.com/webhook-test/order
HTTP Method
POST
Path
Fixed
Expression
order
Authentication
None
Respond
Immediately

Edit Fields


Edit Fields
Execute step
Parameters
Settings
Docs
Mode
Manual Mapping
Fields to Set
body.customer_name
String
= {{ $json.body.customer_name }}
body.drink_name
String
= {{ $json.body.drink_name }}
body.quantity
Number
= {{ $json.body.quantity }}
body.created_at
String
= {{ $json.body.created_at }}

Discord


Discord
Execute step
Parameters
Settings
Docs
Connection Type
Webhook
Credential for Discord Webhook
Discord Webhook account
Operation
Send a Message
Message
fx
Customer {{ $json.body.customer_name }} ordered {{ $json.body.drink_name }} for
{{ $json.body.quantity }} at
{{ $json.body.created_at }}.

Discord

```
Customer {{ $json.body.customer_name }} ordered {{ $json.body.drink_name }} for
{{ $json.body.quantity }} at
{{ $json.body.created_at }}.
```

Extra

> Can you write the data into Google Sheet too?

MQTT

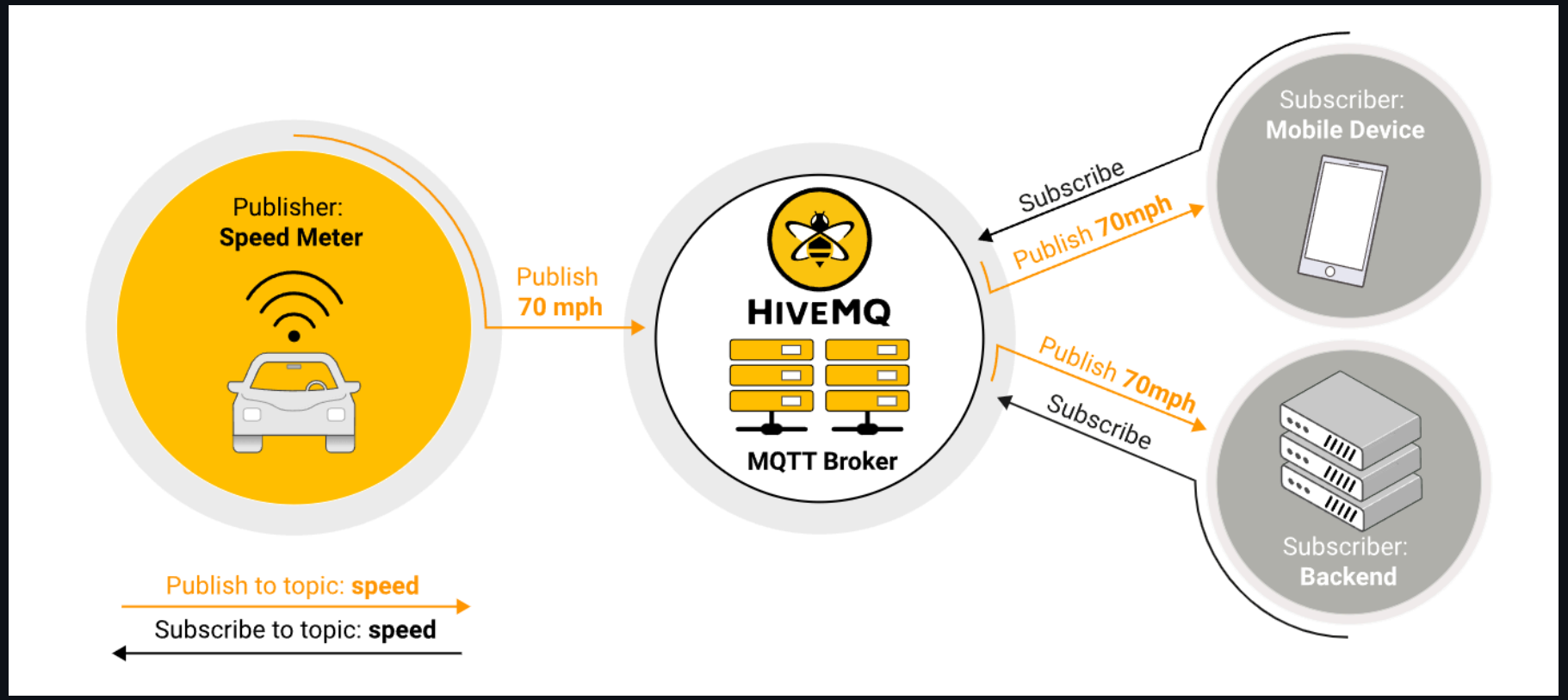
- MQTT is a Client Server publish/subscribe messaging transport protocol.
- It is light weight, open, simple, and designed so as to be easy to implement.
- Ideal for use in many situations
  - Machine to Machine (M2M)
  - **Internet of Things (IoT)**

Publish/subscribe pattern

- The publish/subscribe pattern (also known as `pub/sub`) provides an **alternative** to traditional client-server architecture.
  - In client-server architecture, a client communicates directly with an endpoint.

Broker

- The connection between `publishers` and `subscibers` is handled by a third component (the `broker`).
- The job of the broker is to filter all incoming messages and distribute them correctly to subscribers.


Publisher:
Speed Meter
Publish
70 mph
HIVEMQ
MQTT Broker
Subscribe
Publish 70mph
Publish 70mph
Subscribe
Subscriber:
Mobile Device
Subscriber:
Backend
Publish to topic: speed
Subscribe to topic: speed

Sensor

> Storing Sensor Data

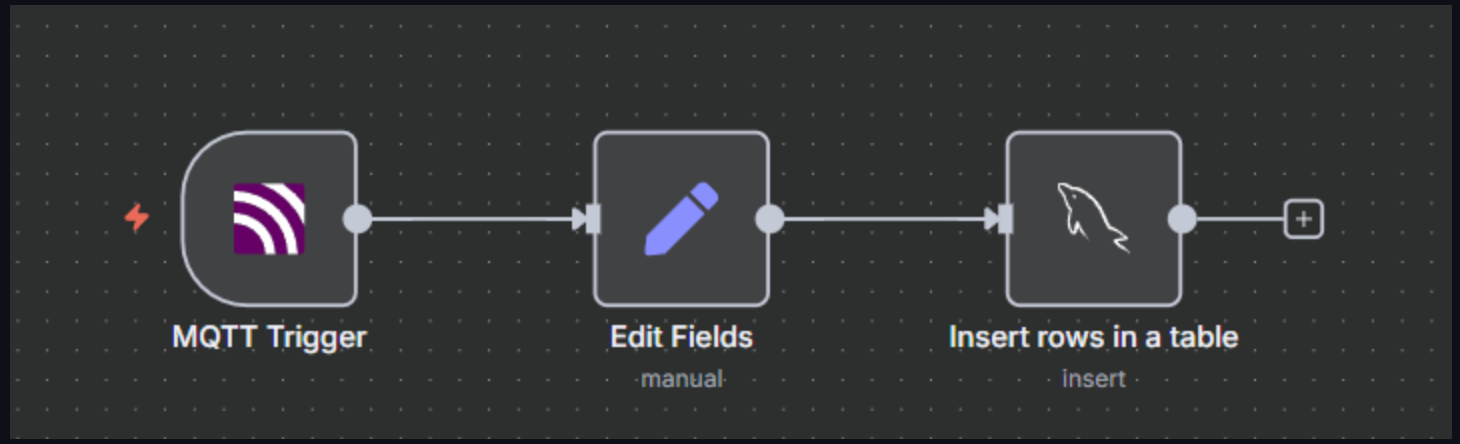
Database

- Create a new database

```
CREATE DATABASE IF NOT EXISTS sensor;
```

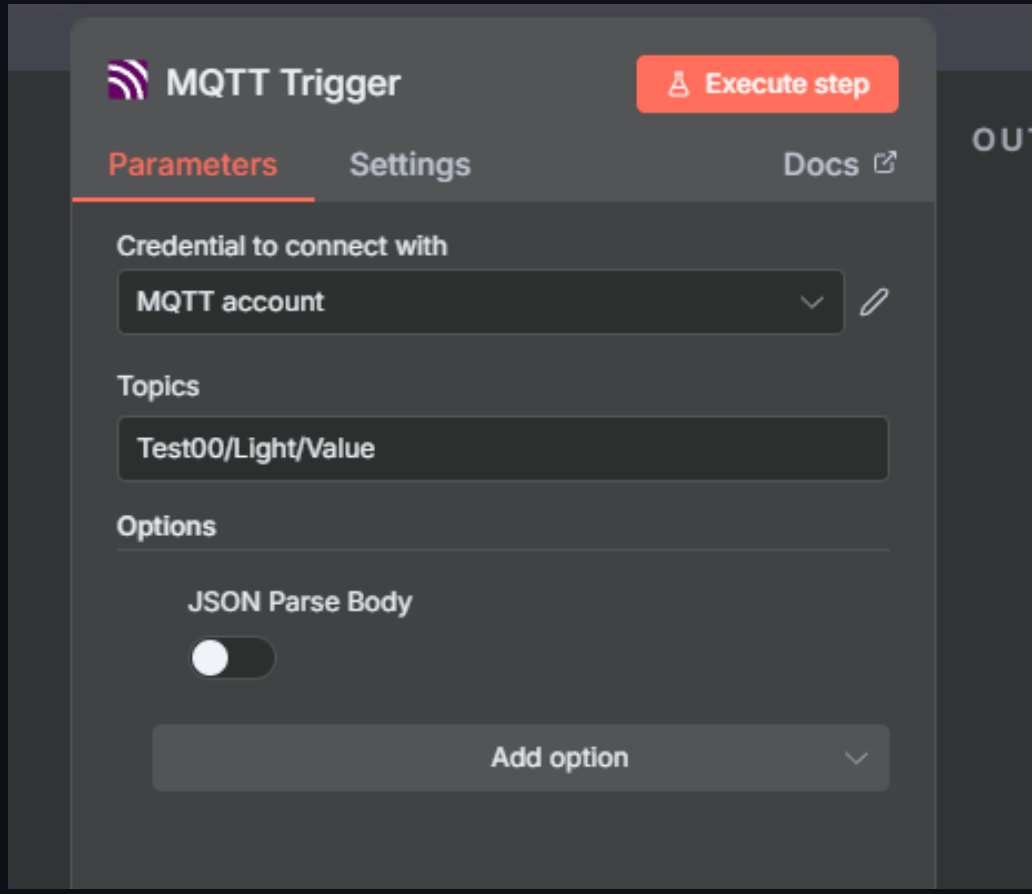
```
CREATE TABLE IF NOT EXISTS sensor.light (
  id INT AUTO_INCREMENT PRIMARY KEY,
  sensor_name VARCHAR(50),
  sensor_value FLOAT,
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP
);
```

Database Record Flow

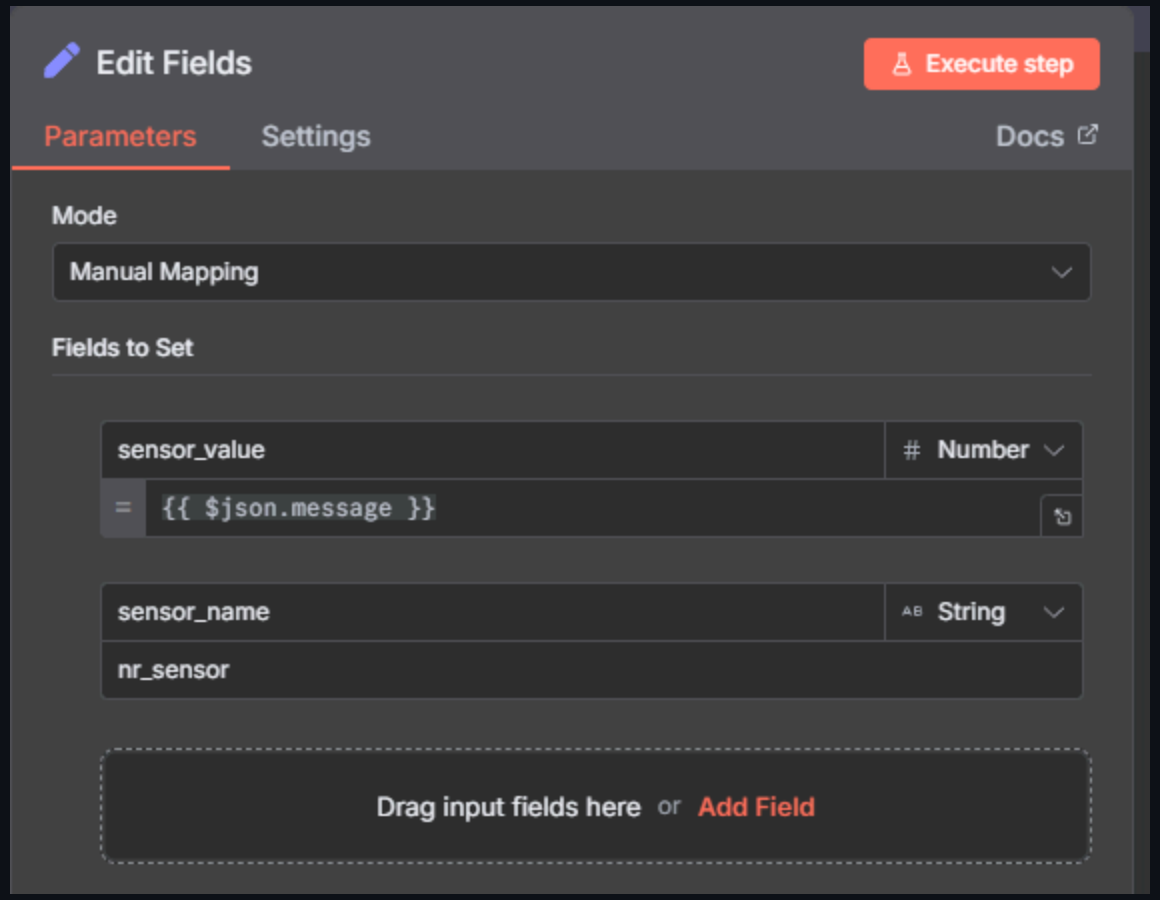


MQTT

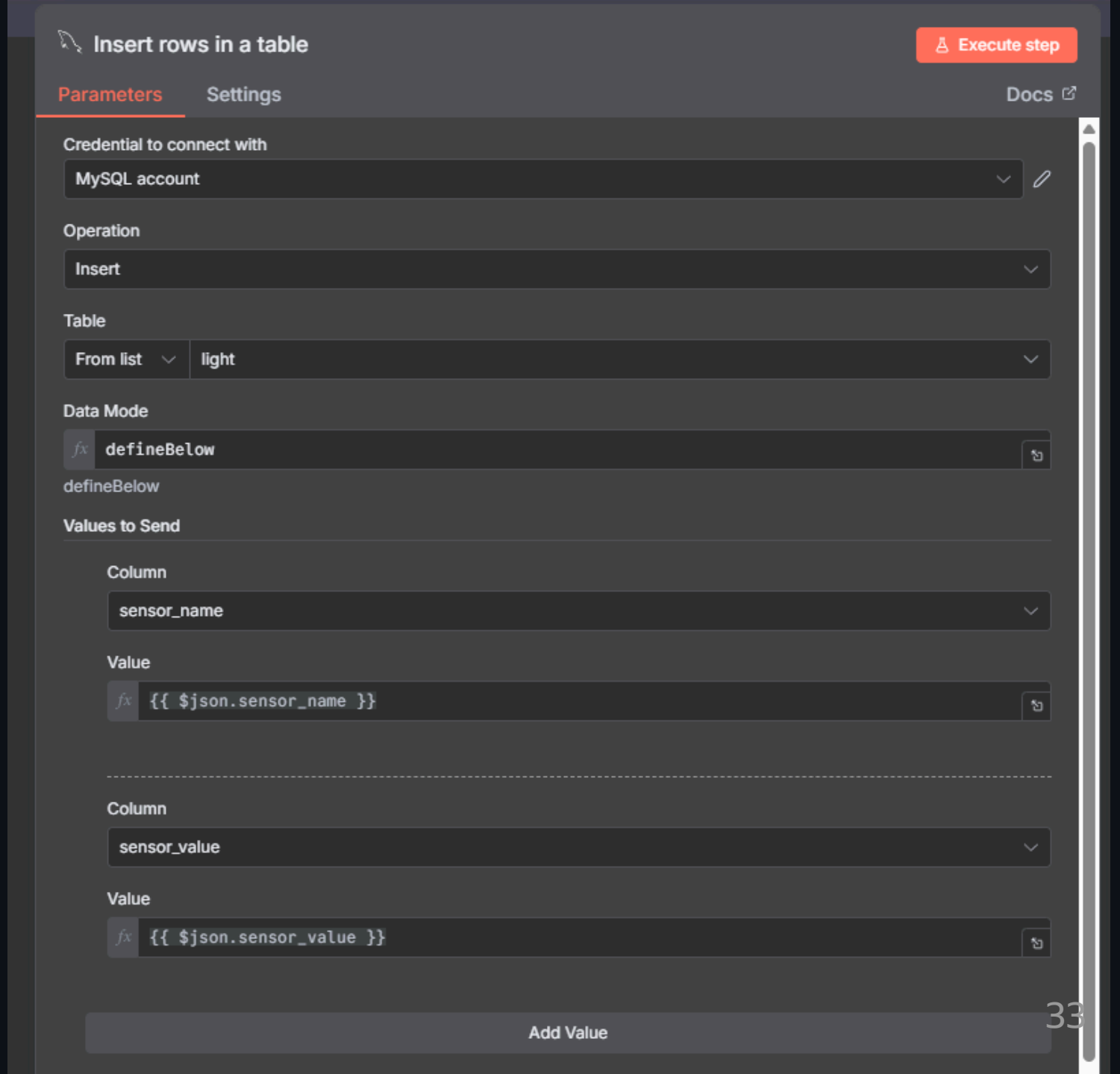
- Topic: `Test00/Light/Value`



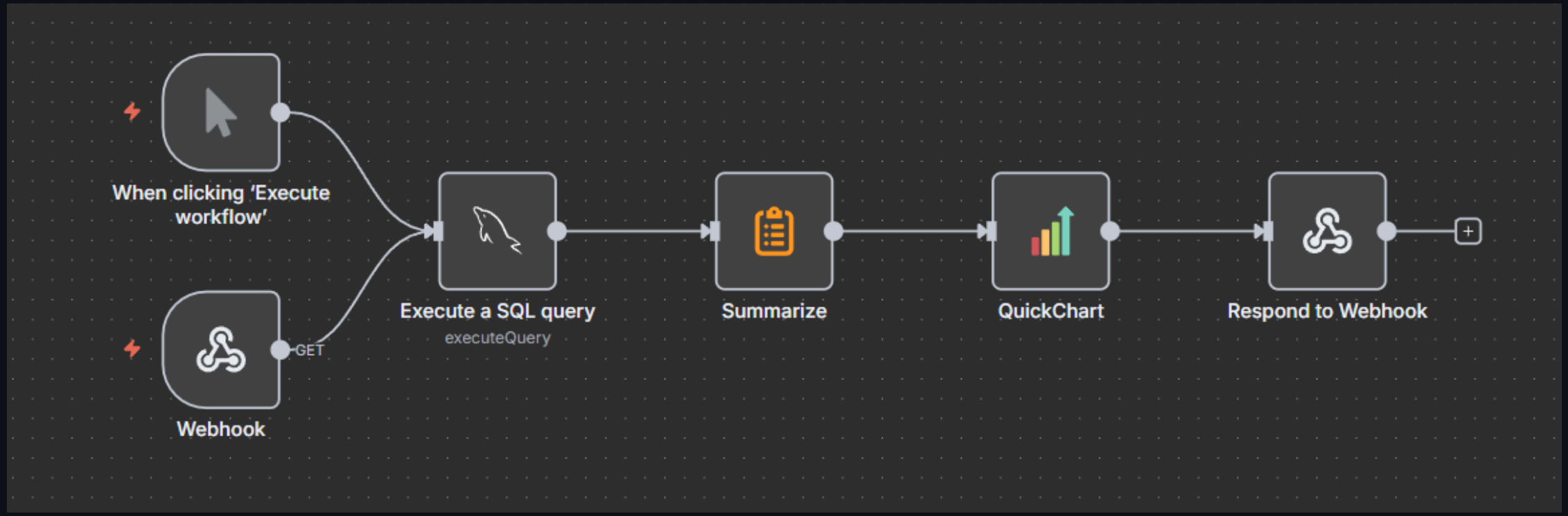
Edit Fields


Edit Fields
Execute step
Parameters
Settings
Docs
Mode
Manual Mapping
Fields to Set
sensor_value
Number
= {{ $json.message }}
sensor_name
AB String
nr_sensor
Drag input fields here or Add Field

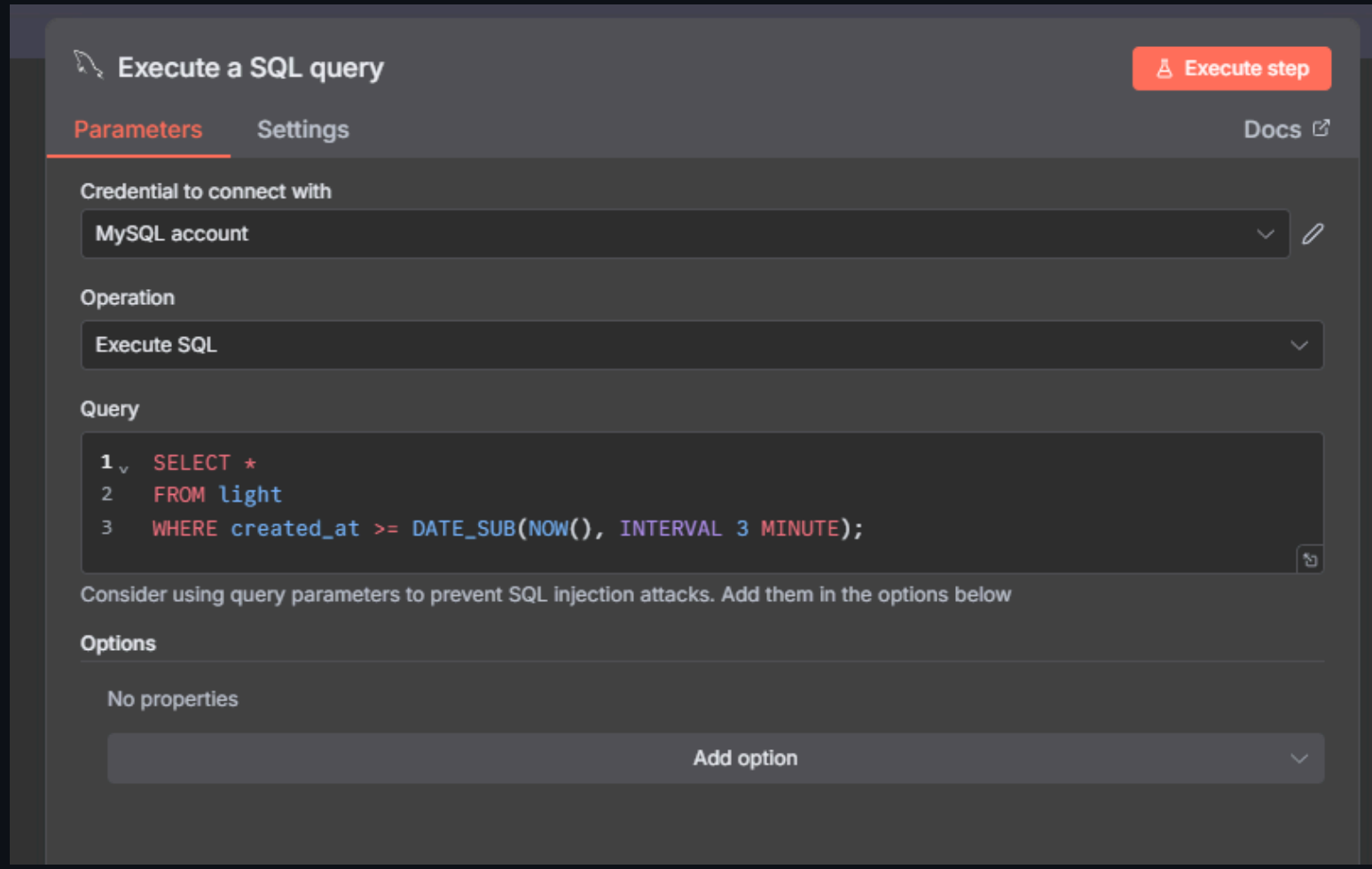
MySQL Node


Insert rows in a table
Execute step
Parameters
Settings
Docs
Credential to connect with
MySQL account
Operation
Insert
Table
From list
light
Data Mode
defineBelow
defineBelow
Values to Send
Column
sensor_name
Value
{{ $json.sensor_name }}
Column
sensor_value
Value
{{ $json.sensor_value }}
Add Value

Viewing Data



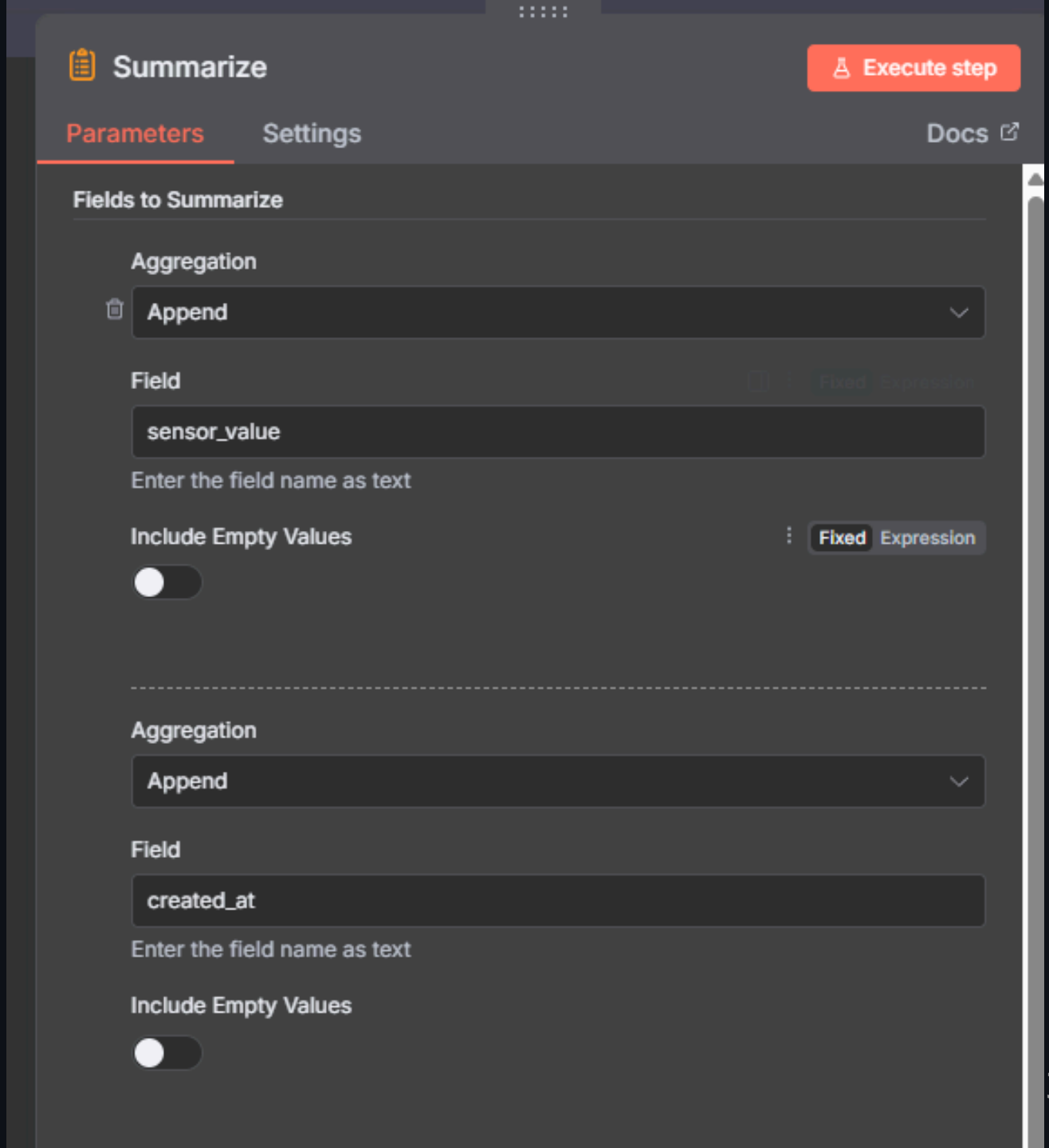
MySQL


Execute a SQL query
Execute step
Parameters
Settings
Docs
Credential to connect with
MySQL account
Operation
Execute SQL
Query
1 SELECT *
2 FROM light
3 WHERE created_at >= DATE_SUB(NOW(), INTERVAL 3 MINUTE);
Consider using query parameters to prevent SQL injection attacks. Add them in the options below
Options
No properties
Add option

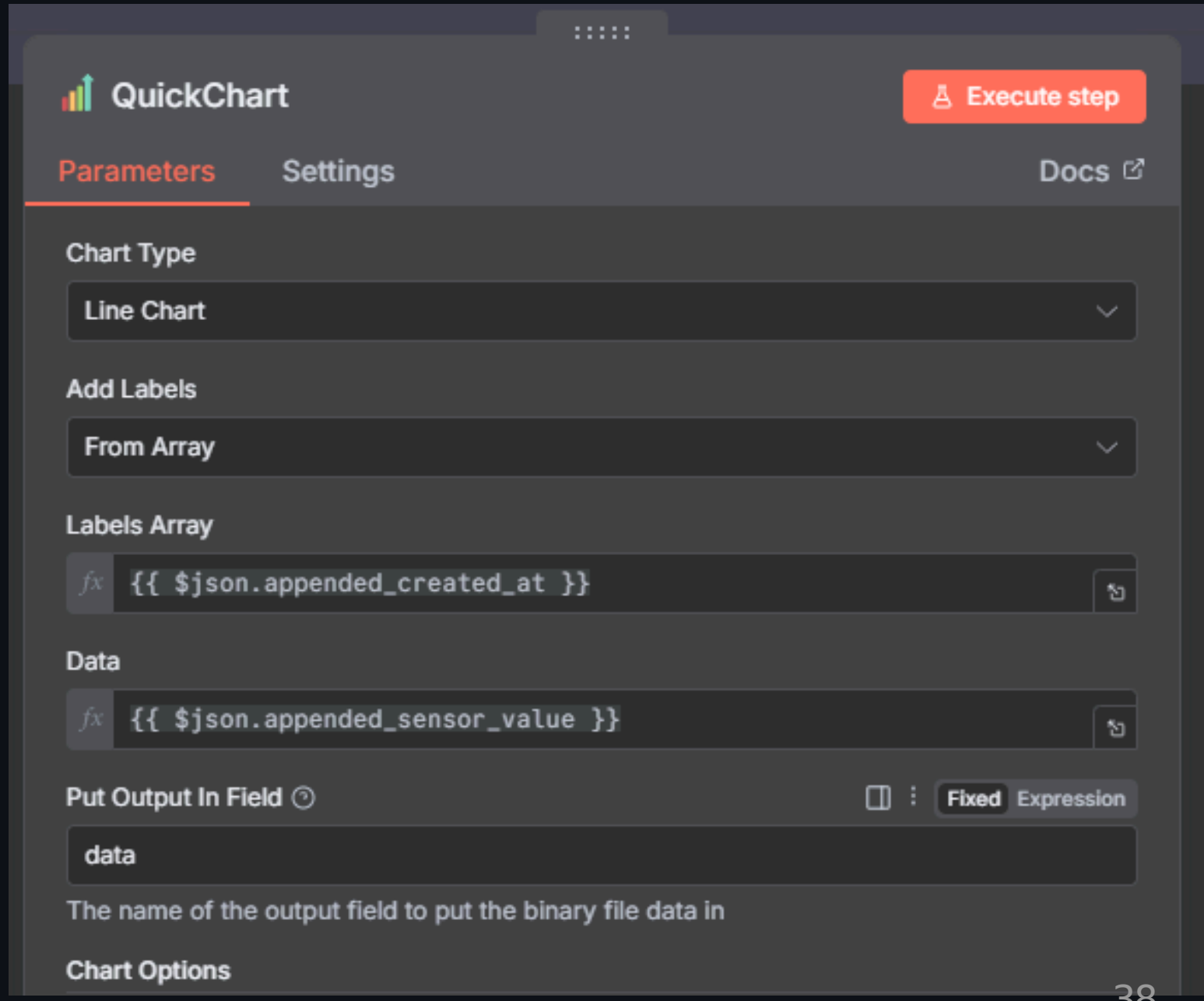
MySQL

```sql
SELECT *
FROM light
WHERE created_at >= DATE_SUB(NOW(), INTERVAL 3 MINUTE);
```

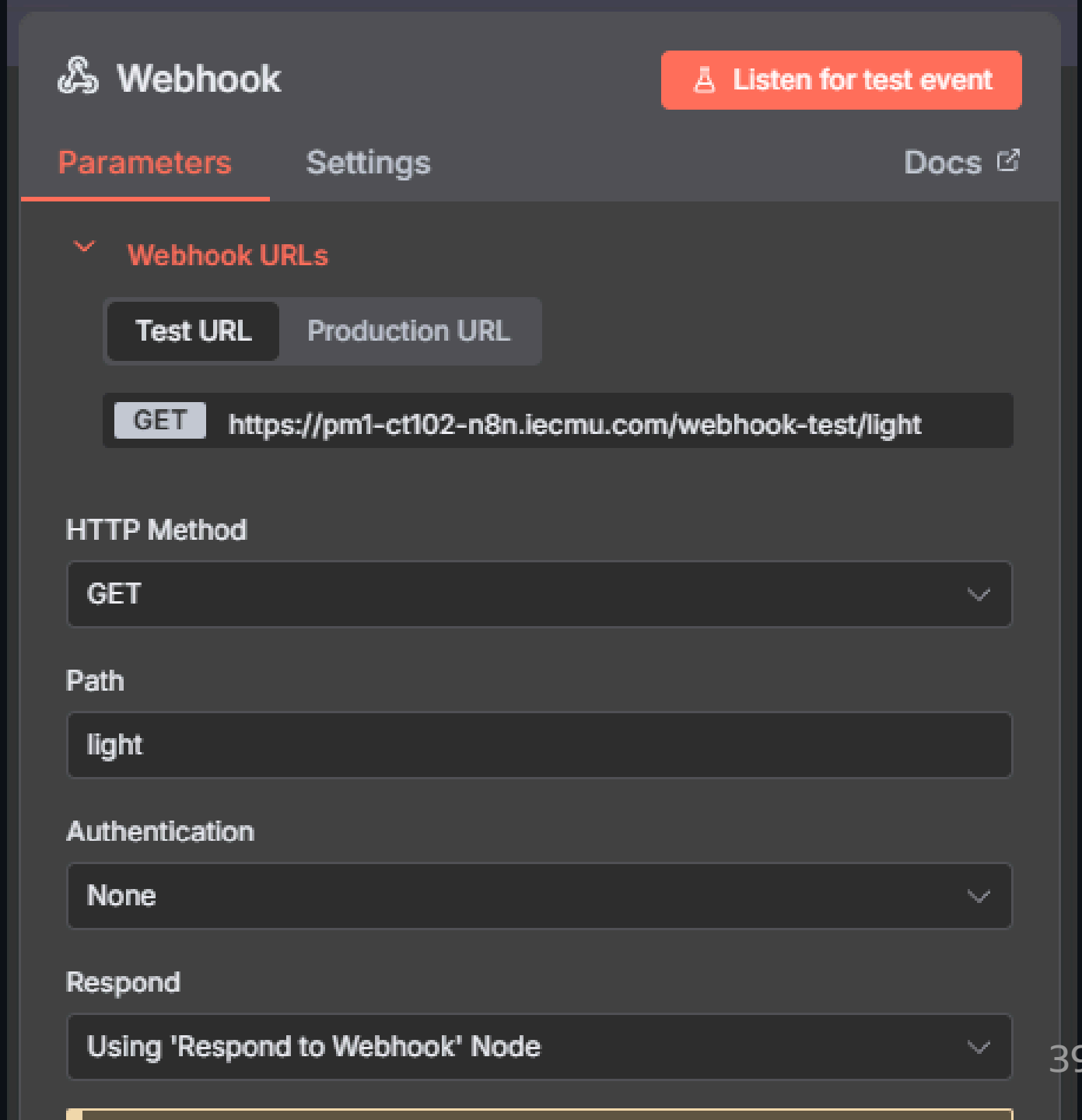
Summarize


Summarize
Execute step
Parameters
Settings
Docs
Fields to Summarize
Aggregation
Append
Field
sensor_value
Enter the field name as text
Include Empty Values
Fixed
Expression
Aggregation
Append
Field
created_at
Enter the field name as text
Include Empty Values

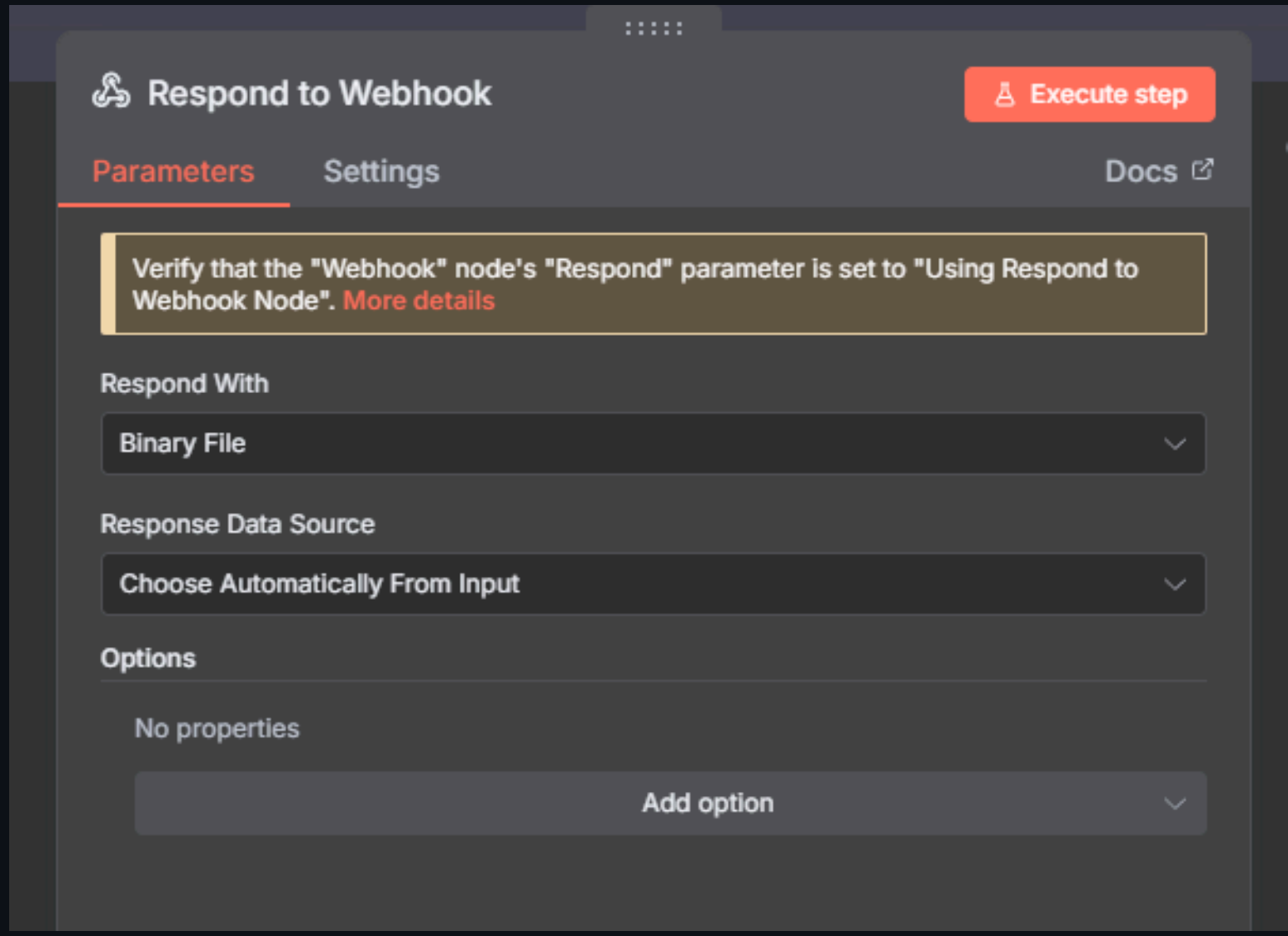
Quick Chart


QuickChart
Execute step
Parameters
Settings
Docs
Chart Type
Line Chart
Add Labels
From Array
Labels Array
{{ $json.appended_created_at }}
Data
{{ $json.appended_sensor_value }}
Put Output In Field
Fixed
Expression
data
The name of the output field to put the binary file data in
Chart Options

Webhook

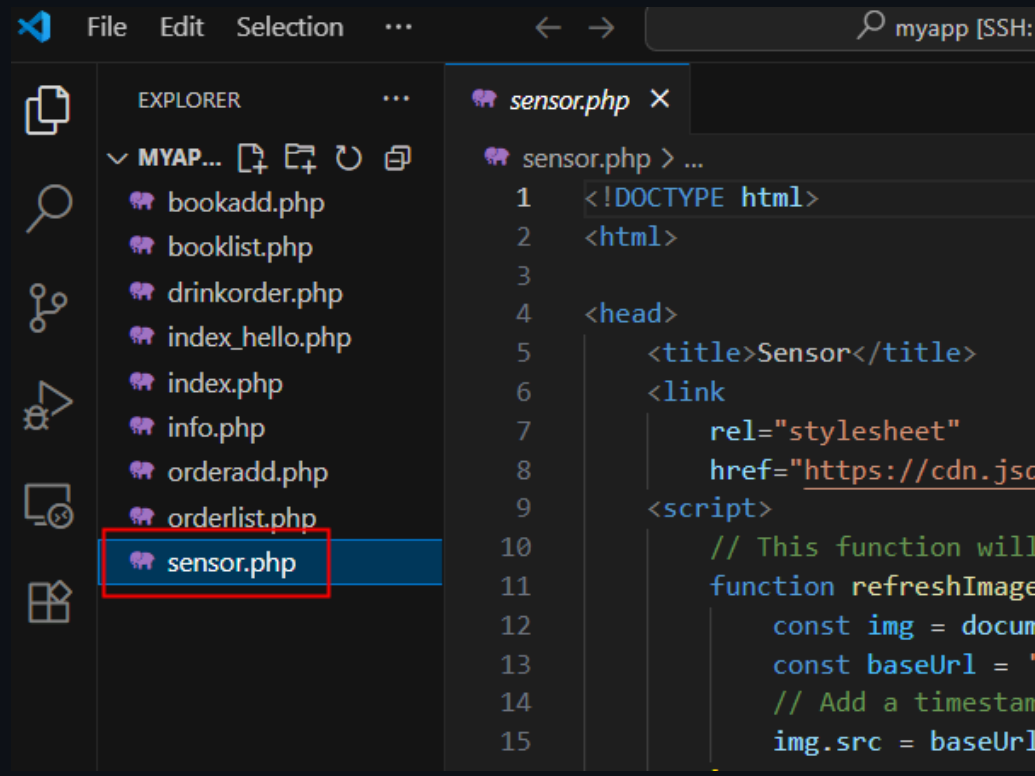

Webhook
Listen for test event
Parameters
Settings
Docs
Webhook URLs
Test URL
Production URL
GET
https://pm1-ct102-n8n.iecmu.com/webhook-test/light
HTTP Method
GET
Path
light
Authentication
None
Respond
Using 'Respond to Webhook' Node

Respond to Webhook



Web Application

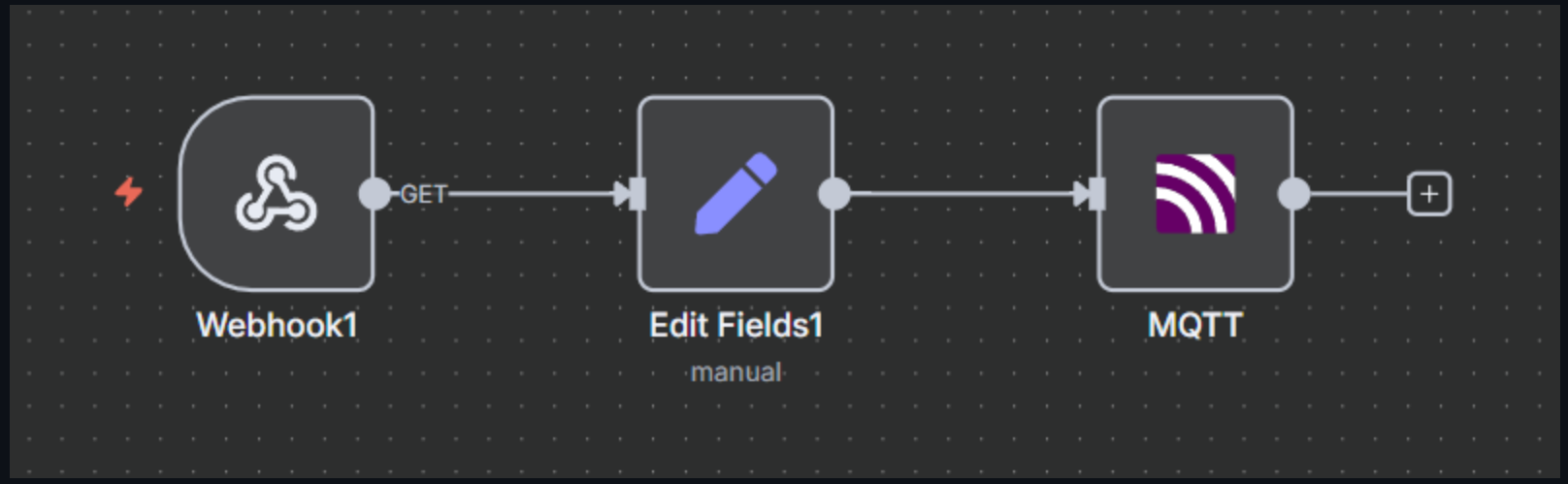
- Create `sensor.php` on the webserver. (Link)
  - Fix the webhook link accordingly.



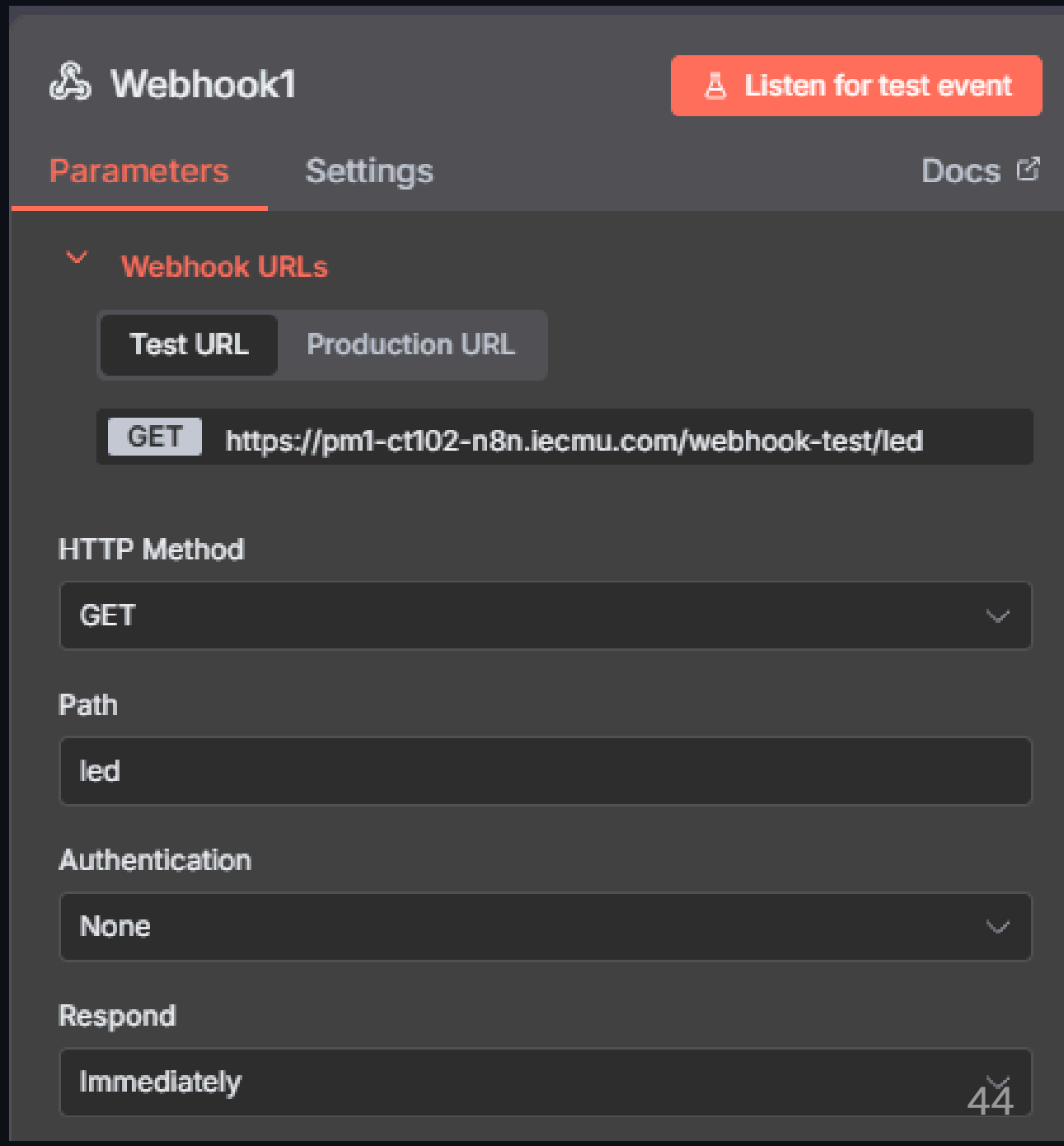
Actuator

> Controlling devices

Control Flow



Webhook

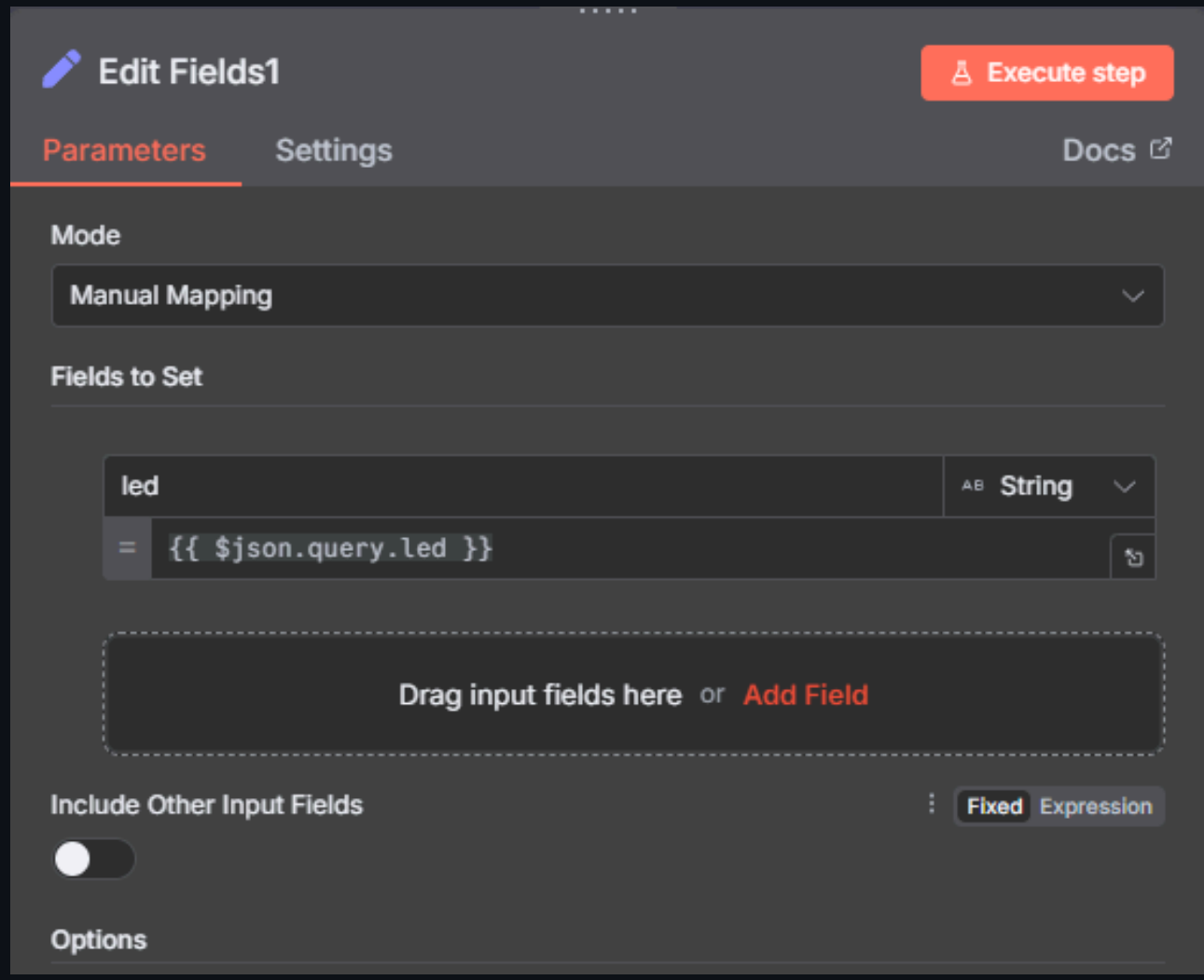

Webhook1
Listen for test event
Parameters
Settings
Docs
Webhook URLs
Test URL
Production URL
GET
https://pm1-ct102-n8n.iecmu.com/webhook-test/led
HTTP Method
GET
Path
led
Authentication
None
Respond
Immediately

Webhook

We want to send the following (using query parameter)

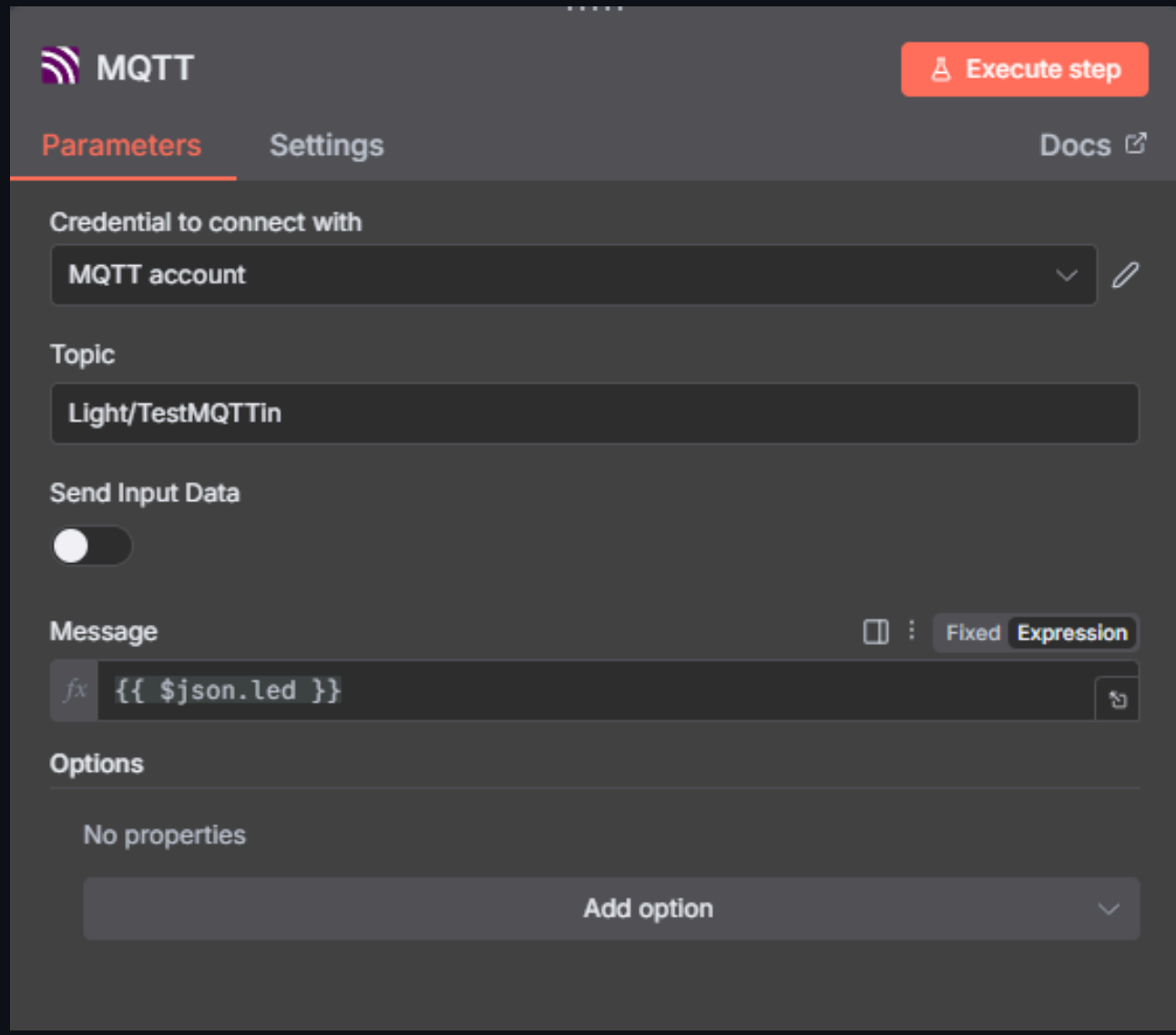
- ON: https://pmX-ctXXX-n8n.iecmu.com/webhook/led?led=on
- OFF: https://pmX-ctXXX-n8n.iecmu.com/webhook/led?led=off

Edit Fields


Edit Fields1
Execute step
Parameters
Settings
Docs
Mode
Manual Mapping
Fields to Set
led
String
{{ $json.query.led }}
Drag input fields here or Add Field
Include Other Input Fields
Fixed
Expression
Options

MQTT

- Topic: `Light/TestMQTTin`



Web Application

- Uncomment

```
<html>
<head>
    <script>
        // This function will refresh the image every second
        function refreshImage() {
            const img = document.getElementById('sensor-img');
            const baseUrl = 'https://pm1-ct102-n8n.iecmu.com/webhook/light';
            // Add a timestamp to bypass browser cache
            img.src = baseUrl + '?t=' + new Date().getTime();
        }

        // Turn LED ON (Uncomment for control)
        // ----------------------------------
        // function turnLedOn() {
        //     fetch('https://pm1-ct102-n8n.iecmu.com/webhook/led?led=on', {
        //             method: 'GET'
        //         })
        //         .then(response => {
        //             alert('LED turned ON');
        //         });
        // }

        // Turn LED OFF (Uncomment for control)
        // ----------------------------------
        // function turnLedOff() {
        //     fetch('https://pm1-ct102-n8n.iecmu.com/webhook/led?led=off', {
        //             method: 'GET'
        //         })
        //         .then(response => {
        //             alert('LED turned OFF');
        //         });
        // }

        // Start refreshing after the page loads
        window.onload = function() {
            refreshImage(); // Initial load
            setInterval(refreshImage, 2000); // Repeat

            // Uncomment for control
            // ----------------------------------
            // document.getElementById('btn-on').addEventListener('click', turnLedOn);
            // document.getElementById('btn-off').addEventListener('click', turnLedOff);

        };
    </script>
    </script>
```