SECURITY+ V4 LAB SERIES

Lab 13: IoT Management

Document Version: 2023-02-27

Material in this Lab Aligns to the Following	
CompTIA Security+ (SY0-601) Exam Objectives	2.6: Explain the security implications of embedded and specialized systems
All-In-One CompTIA Security+ Sixth Edition ISBN-13: 978-1260464009 Chapters	14: Embedded and Specialized Systems

Contents

Introduction

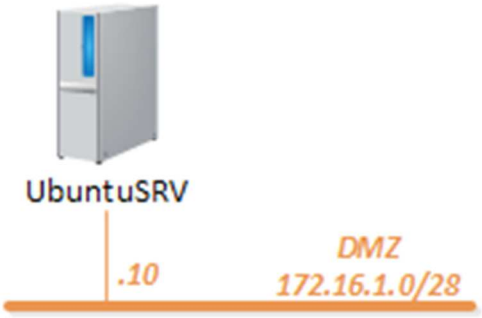
The Internet of Things (IoT) has become part of our daily lives. The more devices involved, the harder it is to secure them. In this lab, you will learn about IoT management.

Objective

In this lab, you will perform the following tasks:

- Be able to host your own IoT Central server
- Be able to send and monitor the IoT traffic

Lab Topology



Lab Settings

The information in the table below will be needed in order to complete the lab. The task sections below provide details on the use of this information.

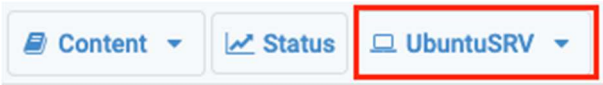
Virtual Machine	IP Address	Account (if needed)	Password (if needed)
UbuntuSRV	`172.16.1.10`	`sysadmin`	`NDGlabpass123!`

1 Start the Service and Create Accounts

1.1 Start ThingsBoard Service

In this section, you will start the ThingsBoard service.

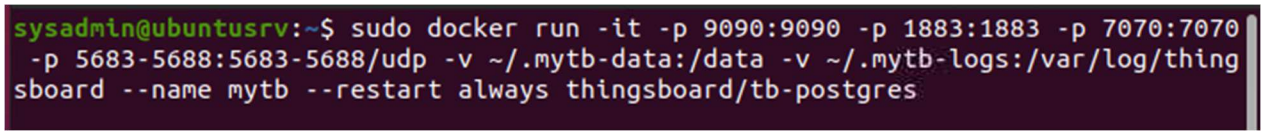
1. Click on the **UbuntuSRV** tab to access the *UbuntuSRV*.



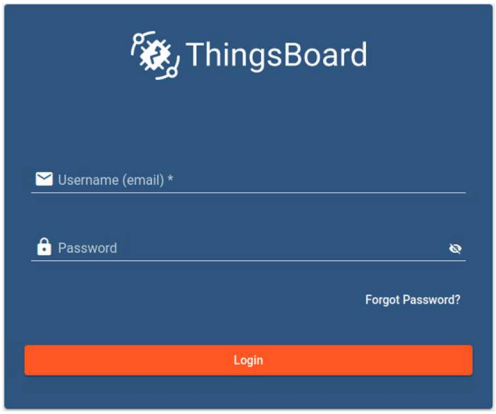
2. Log in to the *UbuntuSRV* as username `sysadmin`, password `NDGlabpass123!`.
3. Click the **Terminal** icon to start a *Terminal.*

4. In the *Termina***l,** type the following command to start the *ThingsBoard* server. When prompted for a password, type `NDGlabpass123!`

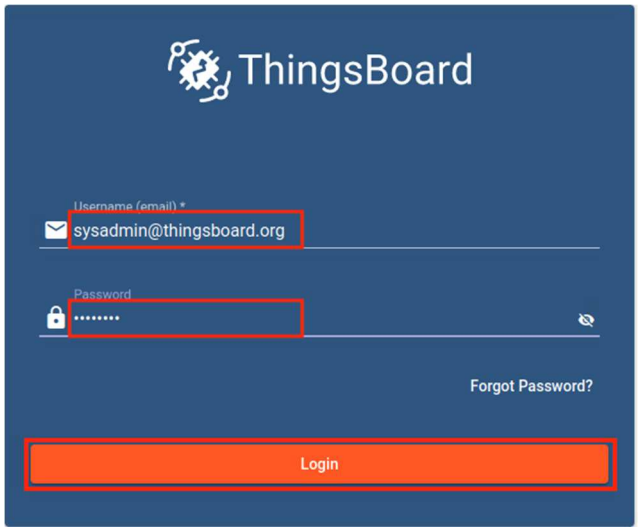
```
sysadmin@ubuntusrv:~$ sudo docker run -it -p 9090:9090 -p 1883:1883 -p 7070:7070 -
p 5683-5688:5683-5688/udp -v ~/.mytb-data:/data -v ~/.mytb-
logs:/var/log/thingsboard --name mytb --restart always thingsboard/tb-postgres
```



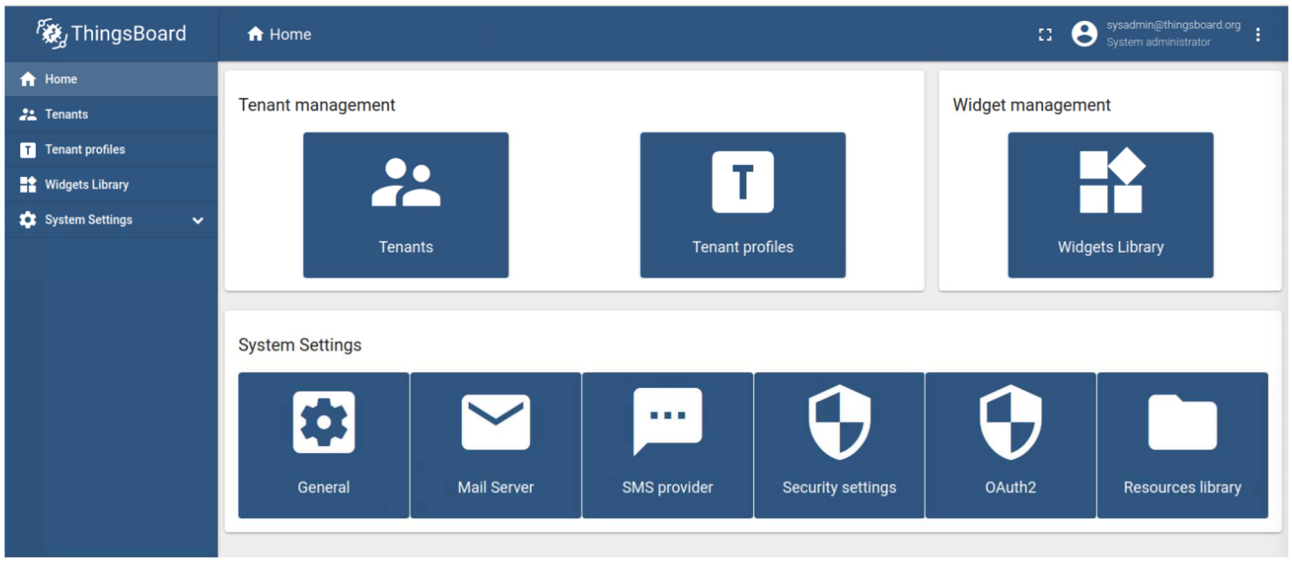
5. After a few minutes, the *ThingsBoard* should finish booting. You can check it by visiting the address `http://localhost:9090` in a browser. When the server is ready, you should see the login below.



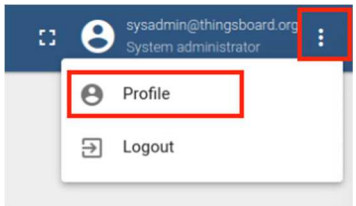
6. Fill in the default login information.
   Username: `sysadmin@thingsboard.org`
   Password: `sysadmin`



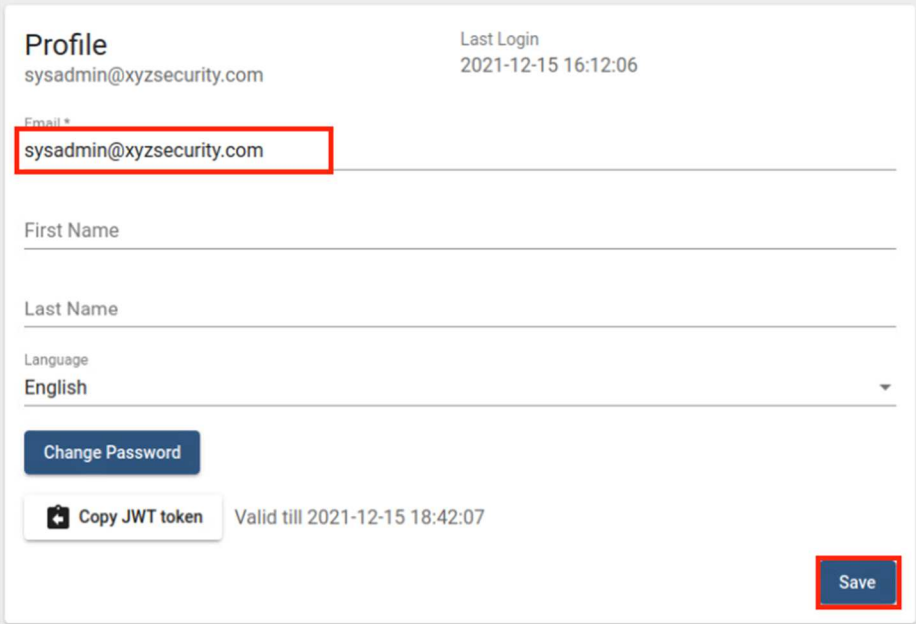
7. Once you log in, you should see something like the image below; you may need to change the window's size if the window is too small**.**



8. Click the menu button (three vertical dots) at the upper-right corner, and select **Profile.**



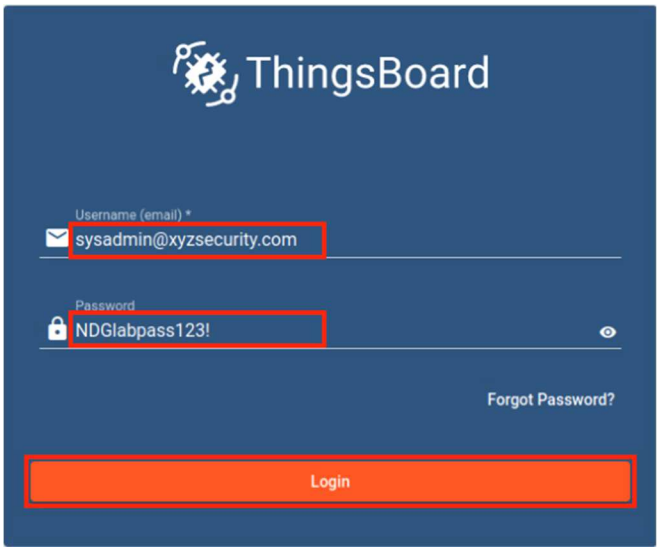
9. For security purposes, we will change the default login credentials. Click and change the *Email address* to `sysadmin@xyzsecurity.com` then click the **Save** button to save the change.



10. Then, click the **Change Password** button. In the pop-up window, fill in the current password `sysadmin` and type the new password `NDGlabpass123!` twice, then click **Change Password** to change it.

11. Once you are brought back to the *Profile* page, click the menu at the upper-right corner again, and click **Logout** to log out of the current session. Notice the user email address is already changed.

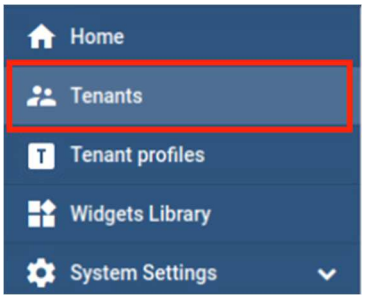
12. Log back in using the new credentials.
    username: `sysadmin@xyzsecurity.com`
    password: `NDGlabpass123!`



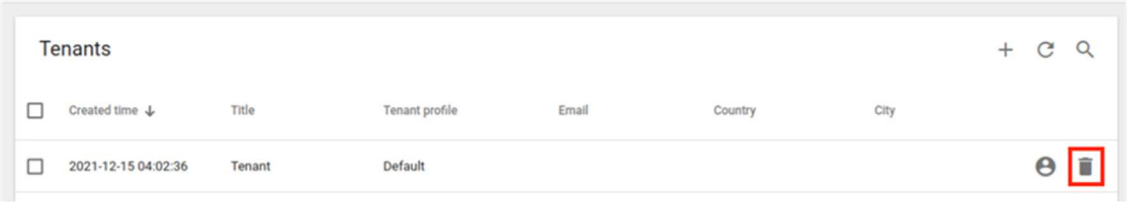
1.2 Create Different Accounts

In this section, you will make changes to the existing account and add necessary accounts.

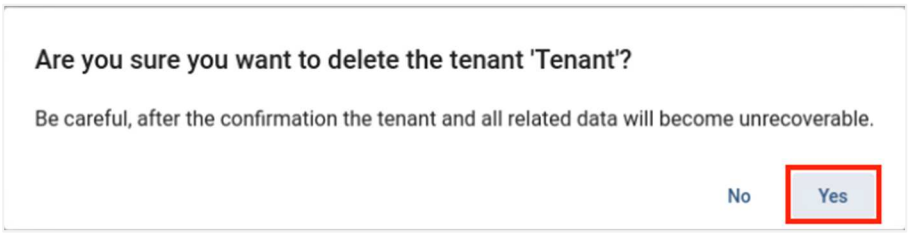
1. First, we will start by creating a *Tenant*. Click **Tenants** on the left side.



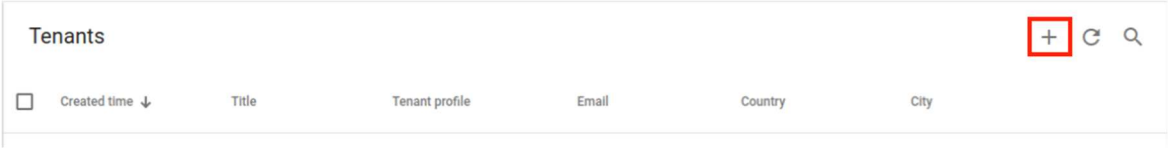
2. To the right side, we will first delete the default *Tenant* account (again, for security purposes). Click the **trash can** icon.



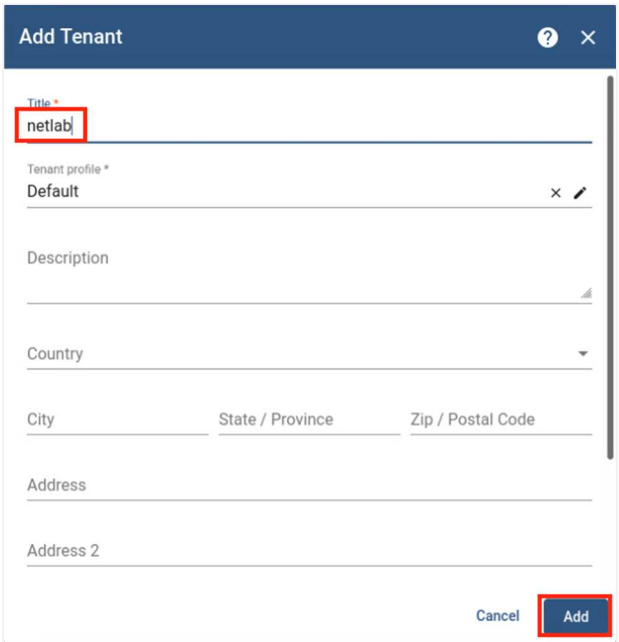
3. A pop-up question will appear; click **Yes** to confirm.



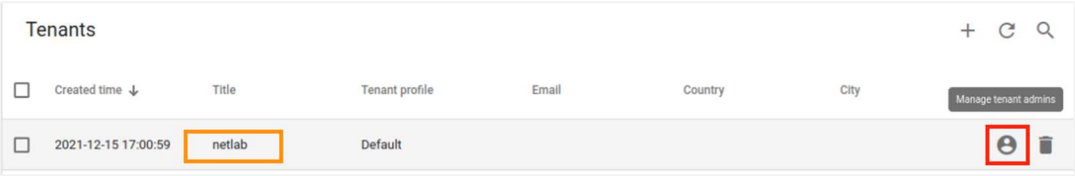
4. As the default *Tenant* is gone, we will create a new *Tenant*. Click the **+** button in the upper-right corner.



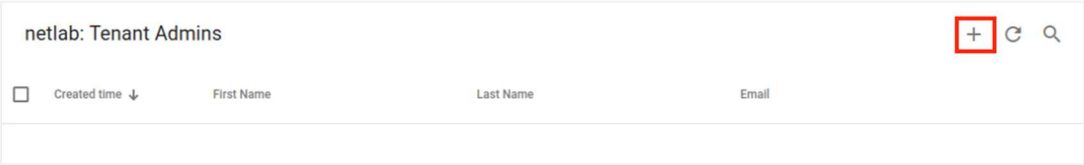
5. A window will pop-up. For practice purposes, we will only fill in the *Title* field and leave the *Tenant profile* as **Default**. Type `netlab` as the *Title* and click the **Add** button.



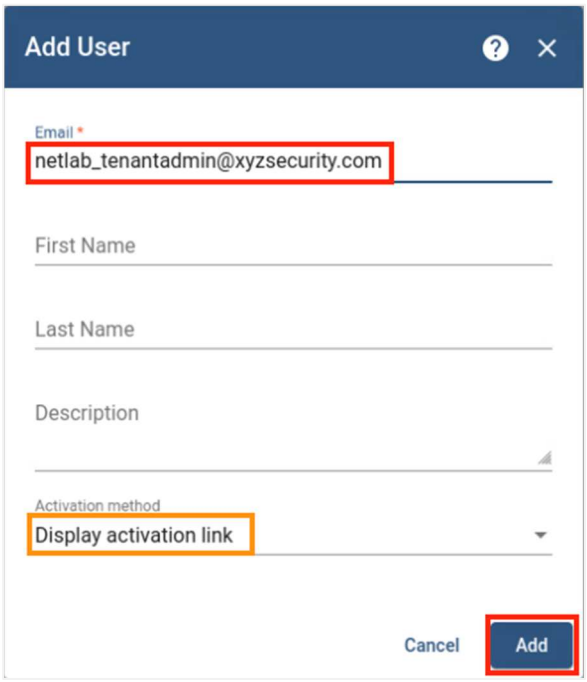
6. You should see that the **netlab** *Tenant* is created. Click the **Manage tenant admins** button.



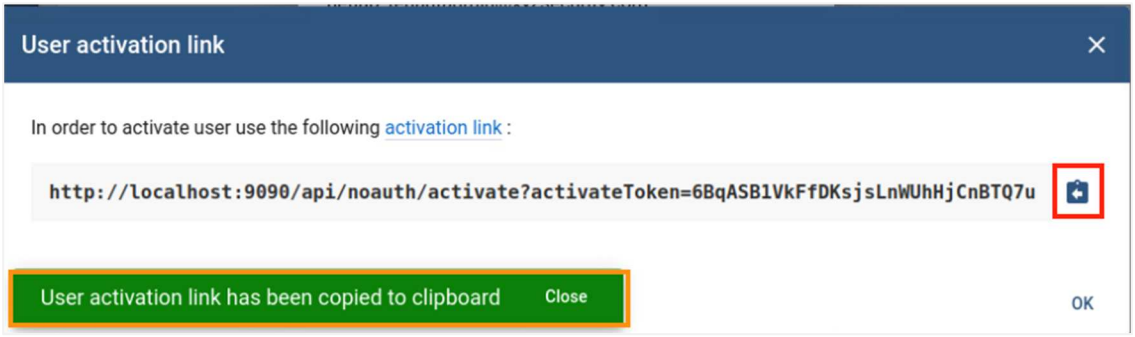
7. On the new page, click the **+** button to create a *Tenant Admin*.



8. In the pop-up window, fill the email field as `netlab_tenantadmin@xyzsecsecurity.com` leave the **Activation method** as the default setting, and click the **Add** button.



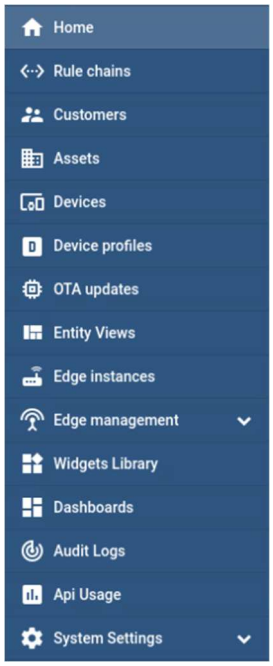
9. After you click the **Add** button, a new window will show. Click the **Copy** button to copy the activation link. It will prompt with, *User activation link has been copied to clipboard*, click **Close**.



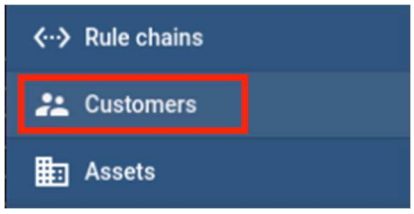
10. Start a new tab in the browser, and paste the copied link to the address bar. Press **Enter** to visit that page.

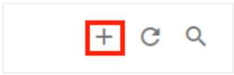
11. You will be asked to create a password for the account; type `NDGlabpass123!` and then click **Create Password**.

12. You will be brought to the main admin page, and the upper-right corner should show that you are logged in as *the netlab_tenantadmin@xyzsecurity.com* account. To the left side, there will be more options showing than before.

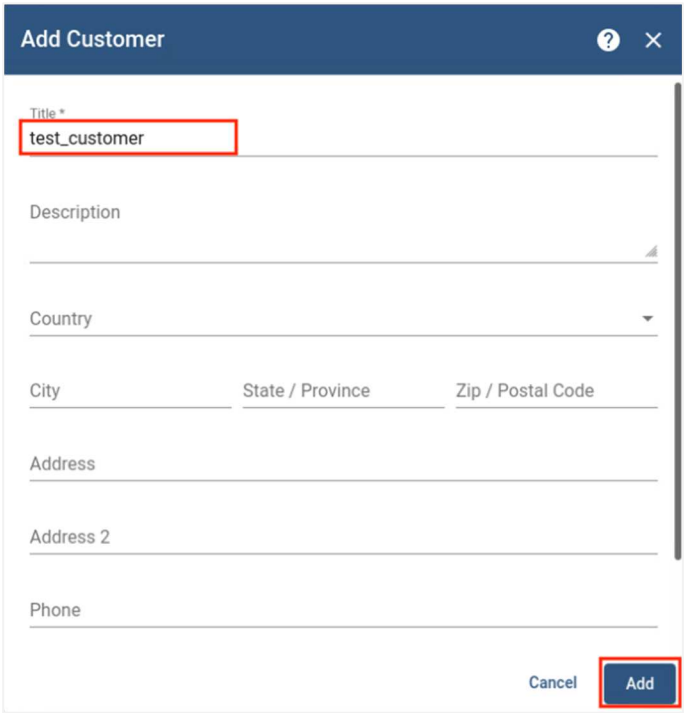


13. Click the **Customers** button, then on the right side, click the **+** to add a new customer.

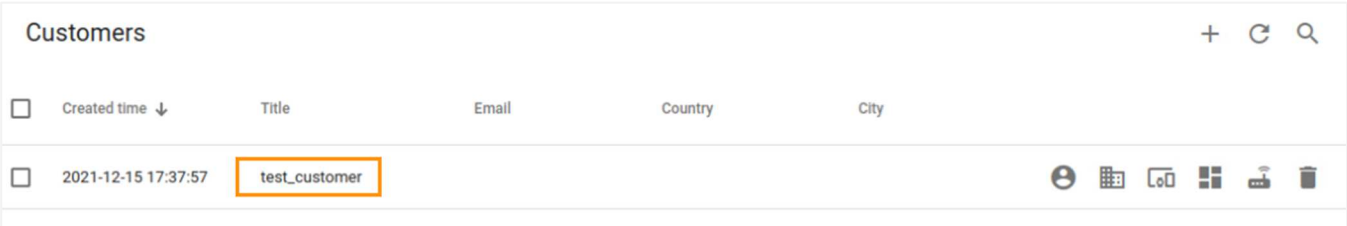




14. In the pop-up window, we will fill the title field with `test_customer` as our customer and leave the rest blank. Click the **Add** button.



15. The customer should be created and shown on the *Customers* page. Leave the window open and proceed to the next step.

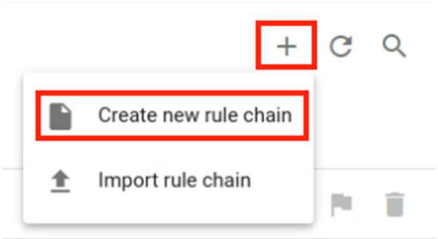


2 Create and Add an IoT Device

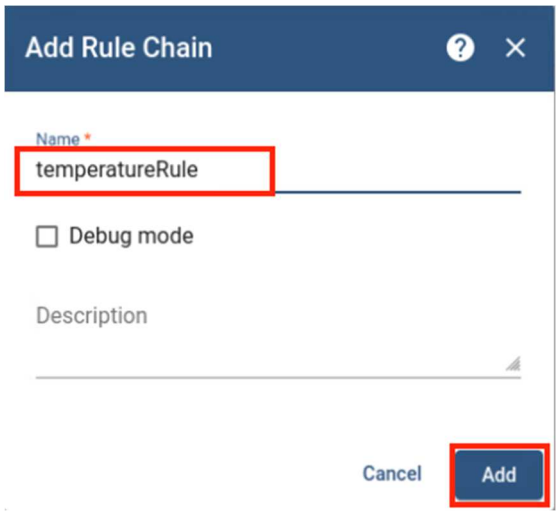
In this section, you will create and add a device to the ThingsBoard server.

2.2 Add a New Rule Chain

1. We will create a rule chain first. This will be used in the new device. Click on the **Rule Chains** button from the left panel. Then click the **+** button at the upper-right corner and select the **Create new rule chain** option.

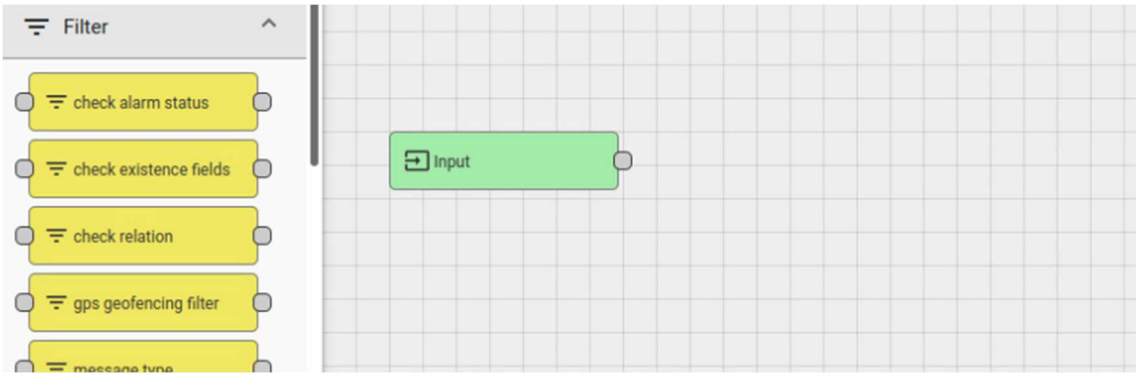


2. In the pop-up window, type `temperatureRule`. Then, click **Add** to confirm.

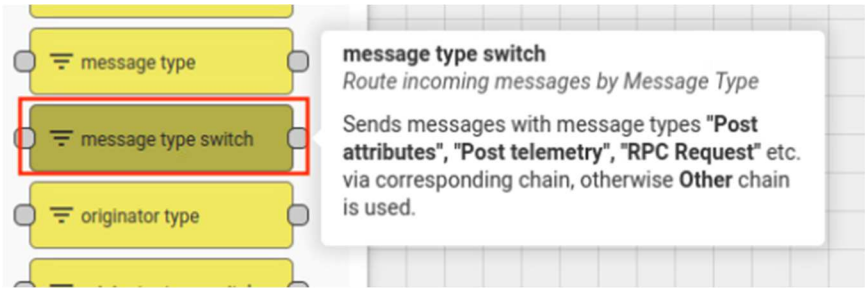


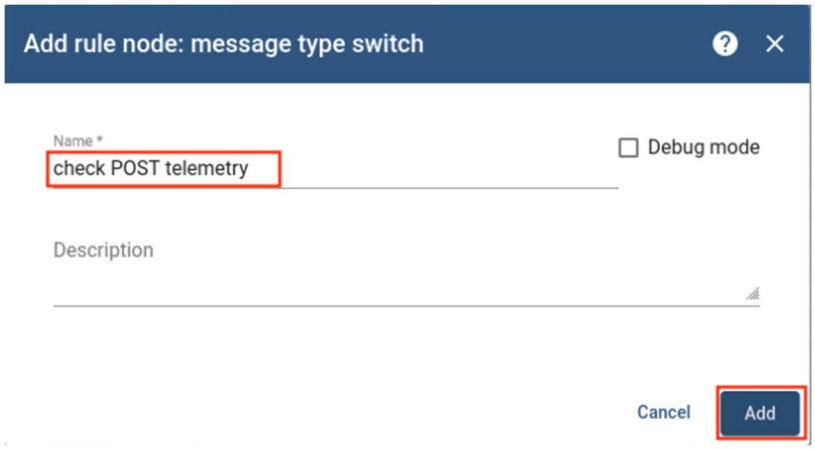
3. You will have two rule chains; click the **Open rule chain** button on the right side of the **temperatureRule.**

4. You will see something like this:

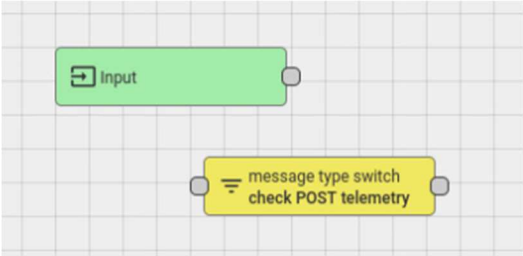


5. To the left side, find **message type switch**, click and drag it to the grids on the right. When prompted, type `check POST telemetry` as the *Name*. Then, click **Add.**

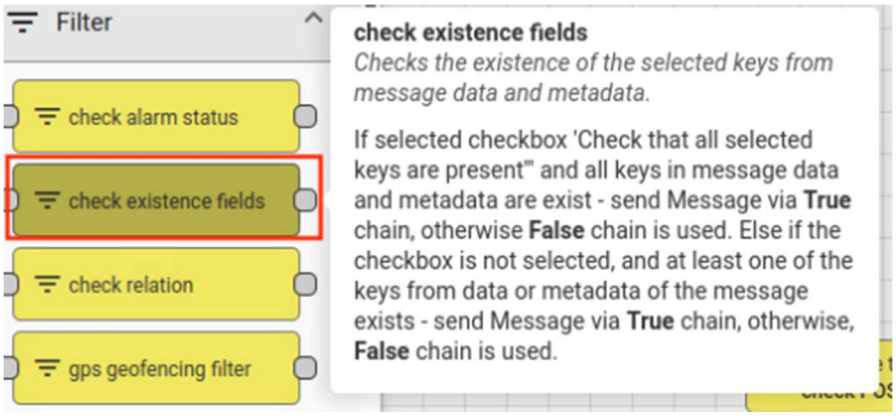




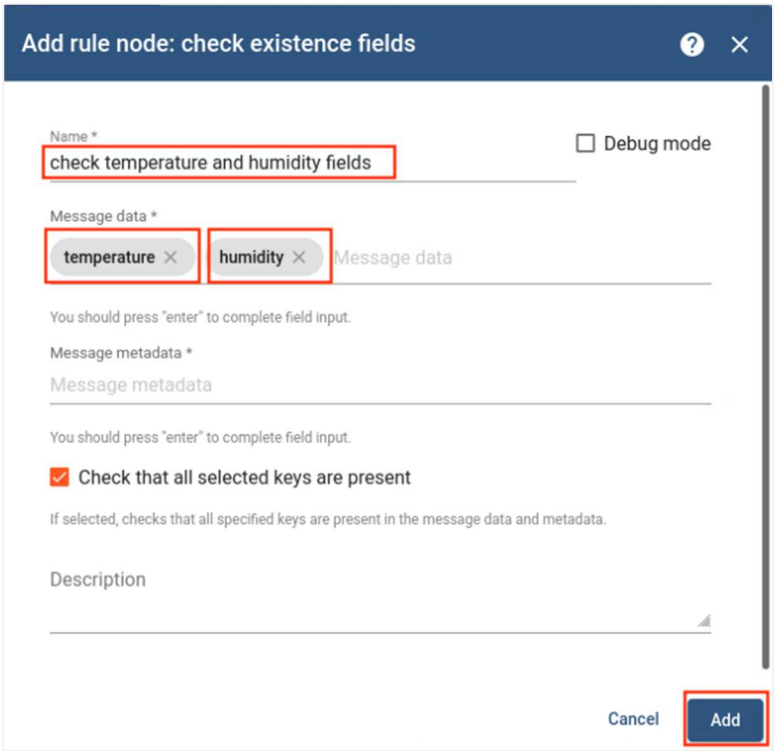
6. You should have something like this now:



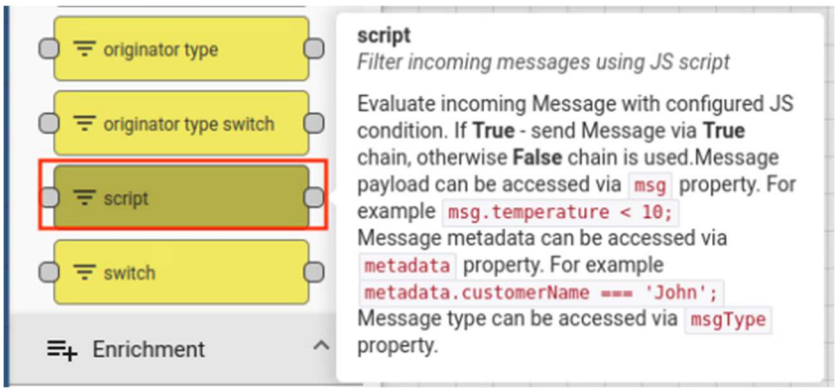
7. Next, find **check existence fields** and drag it to the grids.



8. When prompted, type `check temperature and humidity fields` as the *Name*. In the **Message data** area, type `temperature` and press **Enter**; type `humidity` and press **Enter**. You should have something like what is shown below. Leave the *Message metadata* empty and click **Add** to confirm.



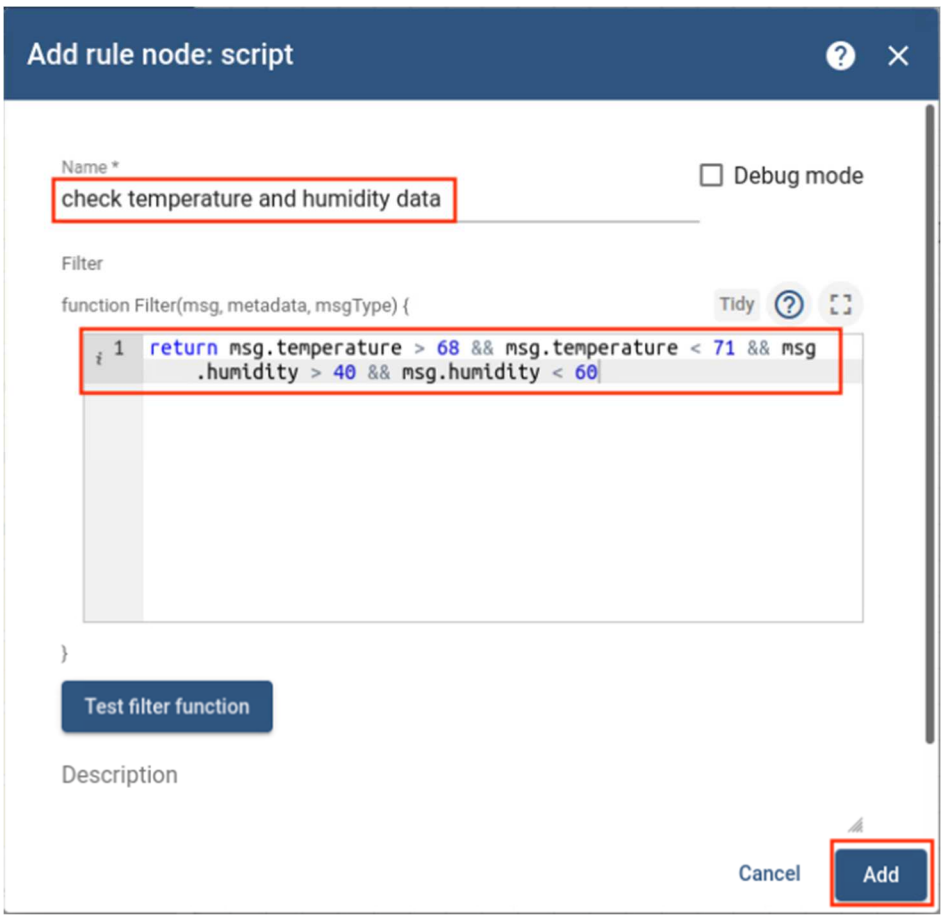
9. Next, find **script** and drag it to the grids.



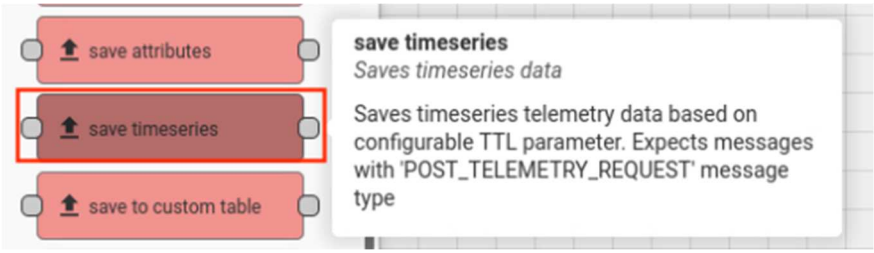
10. When prompted, type `check temperature and humidity data` as the *Name*, then change the script in the *function Filter* area. When finished, click **Add** to confirm.

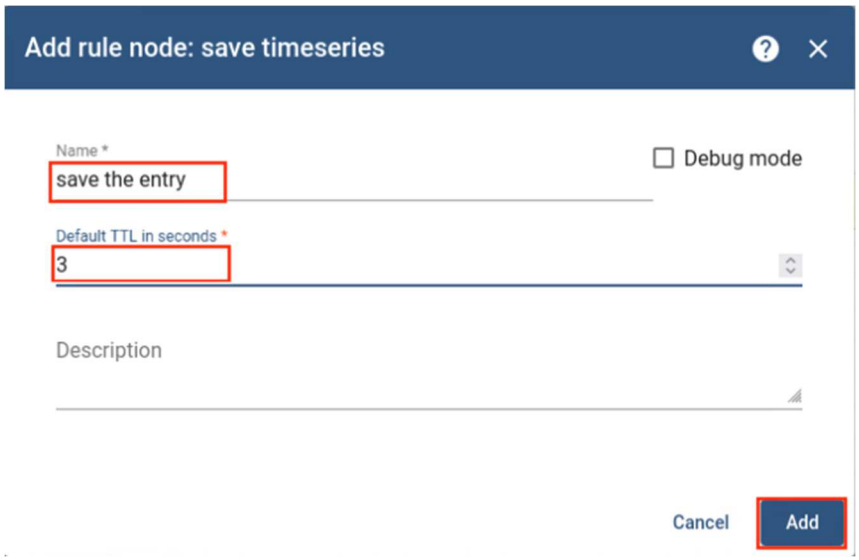
    The script should be:

```
return msg.temperature > 68 && msg.temperature < 71 && msg.humidity > 40 &&
msg.humidity < 60
```

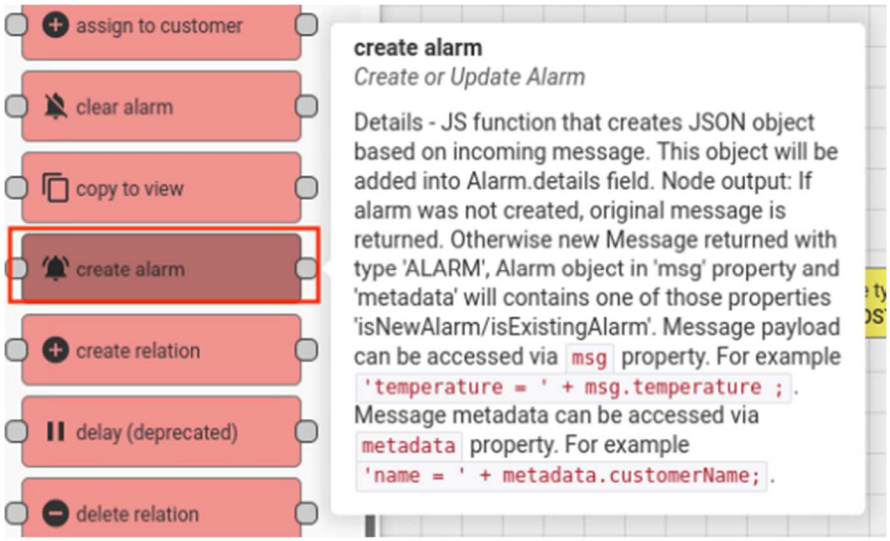


11. Once again, on the left side, find **save timeseries** and drag it to the grids. When prompted, type `save the entry` as the *Name*. Change the *Default TTL in seconds* to 3 and click **Add** to confirm.





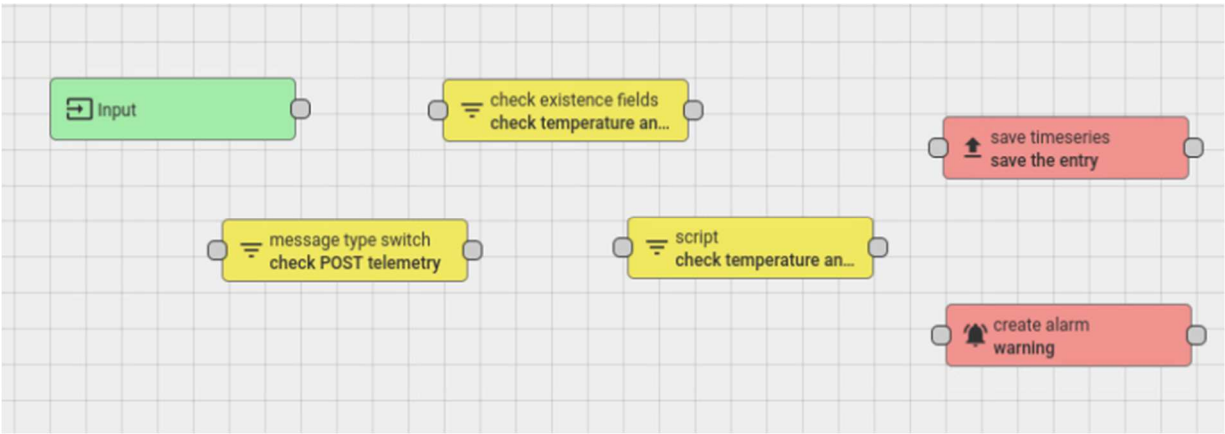
12. For the last time, on the left side, find **create alarm** and drag it to the grids.



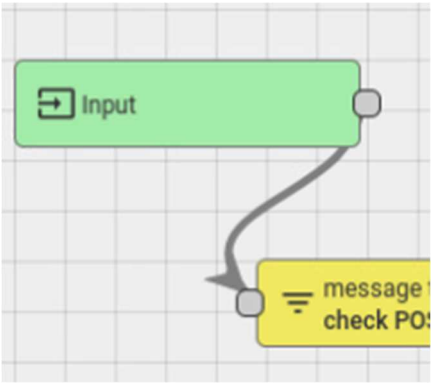
13. When prompted, type **warning** as the *Name*. Then, add the following script to the *function Details* area. When finished, click **Add** to confirm.

```
details.temperature = msg.temperature;
details.humidity = msg.humidity;
```

14. Your grid area should look something like this. The next step is to connect them to make a chain.



15. Click on the round connection point to the right side of **Input.** Click and drag it to the connection point on the left side of the **message type switch**. After you release the mouse, it should create a link with the arrow pointing to the direction of the data flow.



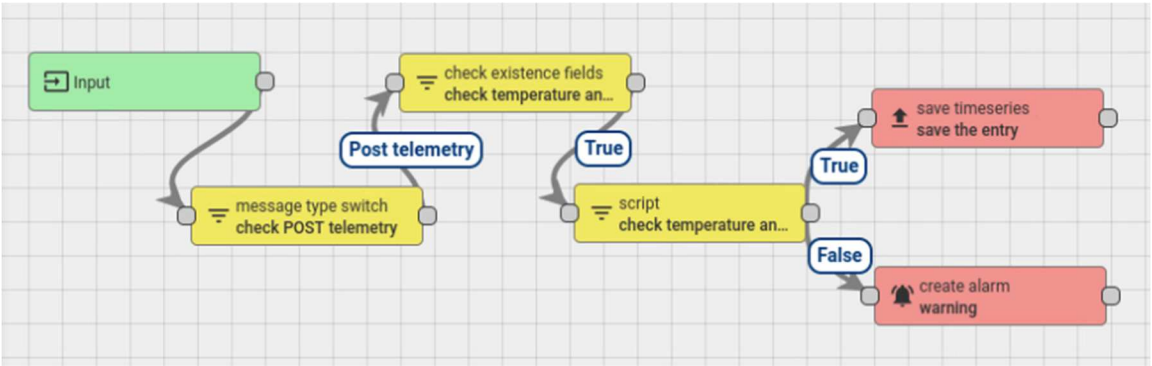
16. Use the same method to create a link between **message type switch** and **check existence fields**. When prompted, select **Post telemetry** as the *Link label*.

17. Then, add a link between **check existence fields** and **script**. When prompted, select **True** as the *Link label*. Click **Add** to confirm.

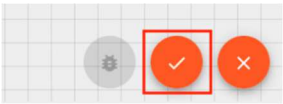
18. Add a link from **script** to **save timeseries.** When prompted, select **True**. Click **Add** to confirm.

19. Add a link from **script** to **create alarm.** When prompted, select **False**. Click **Add** to confirm.

20. With all links added, everything should look like this:



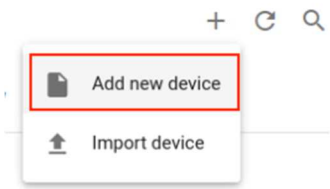
21. Save the changes by clicking the orange checkmark button at the lower-right corner.



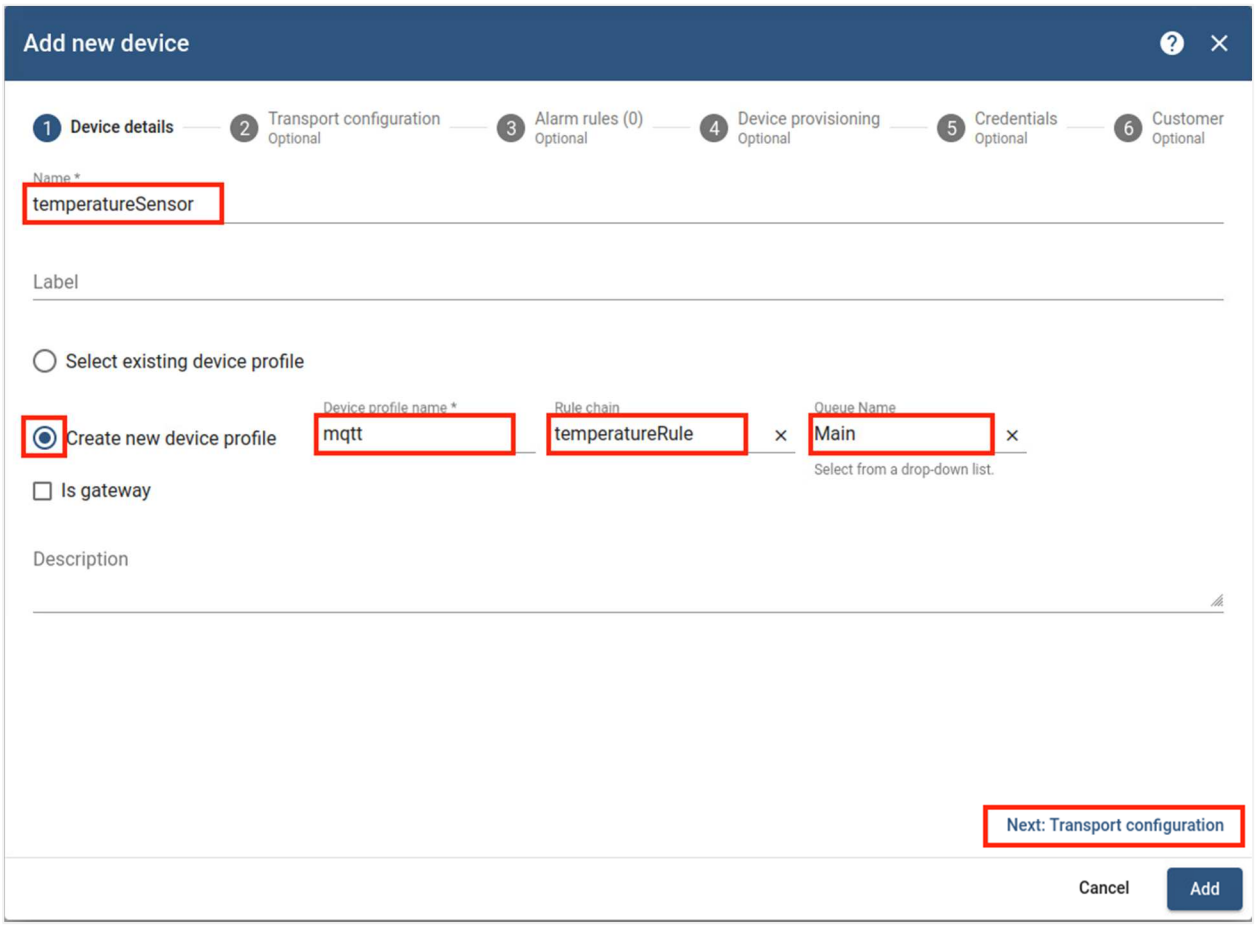
22. Leave the window open and proceed to the next step.

2.3 Add New Device

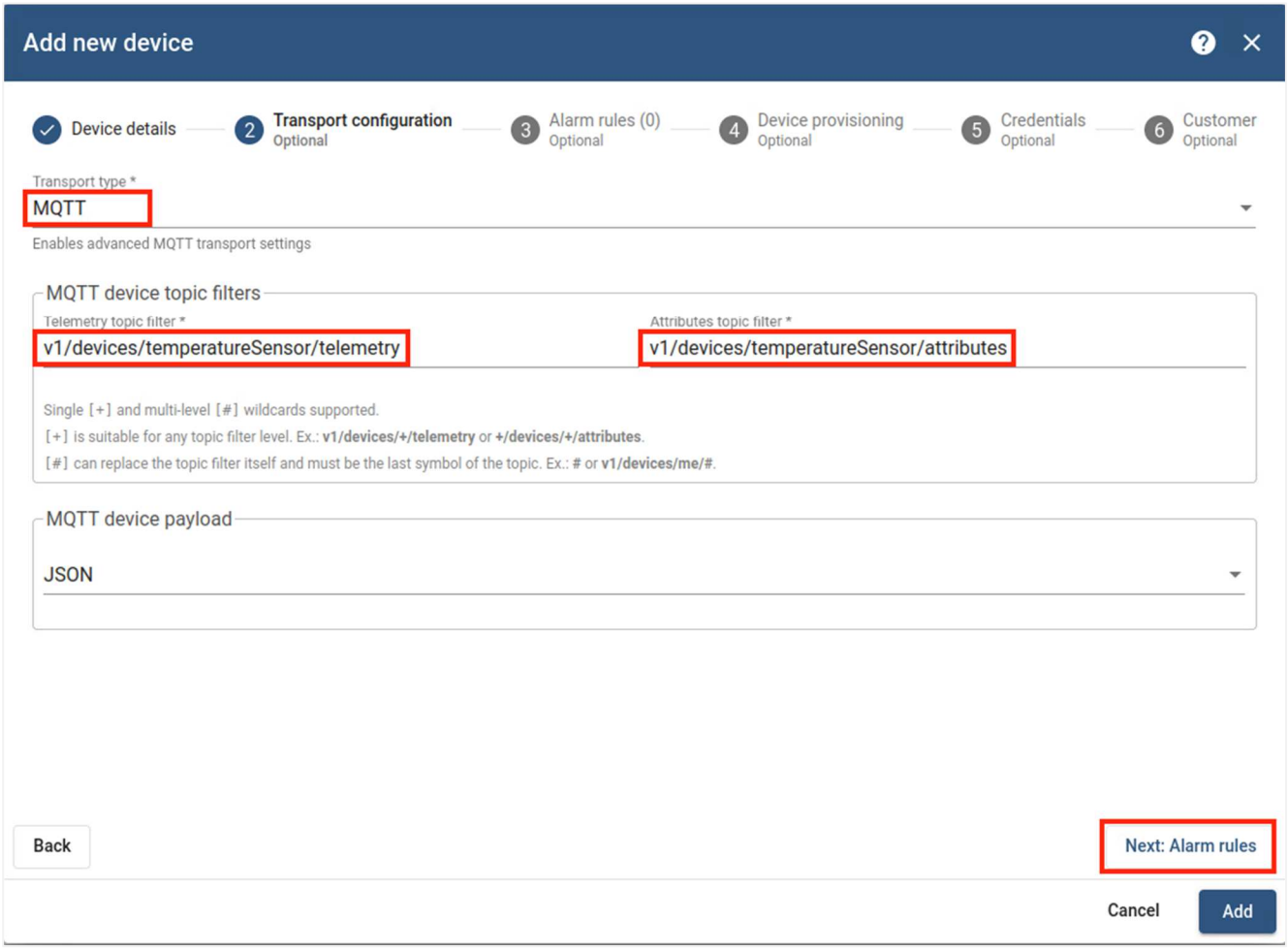
1. Click on *Devices* on the left side. Then, click the **+** button in the upper-right corner and select the **Add new device** option.



2. The *Add new device* window will appear. Type `temperatureSensor` as the *Name*. Then, select to check **Create new device profile.** Type `mqtt` as the *Device profile name*. Select **temperatureRule** for the *Rule chain* option, and **Main** for the *Queue Name*. Double-check everything; once done, you can then click the **Next: Transport configuration** button.

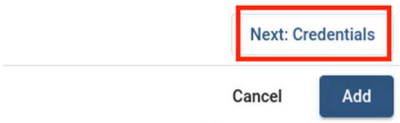


3. On the *Transport Configuration* page, click to change the **Transport type** to **MQTT.** Then, change the *Telemetry topic filter* to `v1/devices/temperatureSensor/telemetry` and change the *Attributes topic filter* to `v1/devices/temperatureSensor/attributes`. These paths will be used for the MQTT message later on. Click **Next: Alarm rules** to continue.

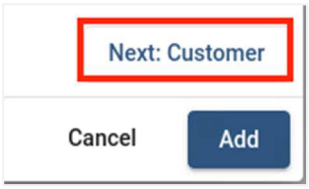


4. On the *Alarm rules* page, we will not add any rules. Click **Next: Device provisioning** to continue.

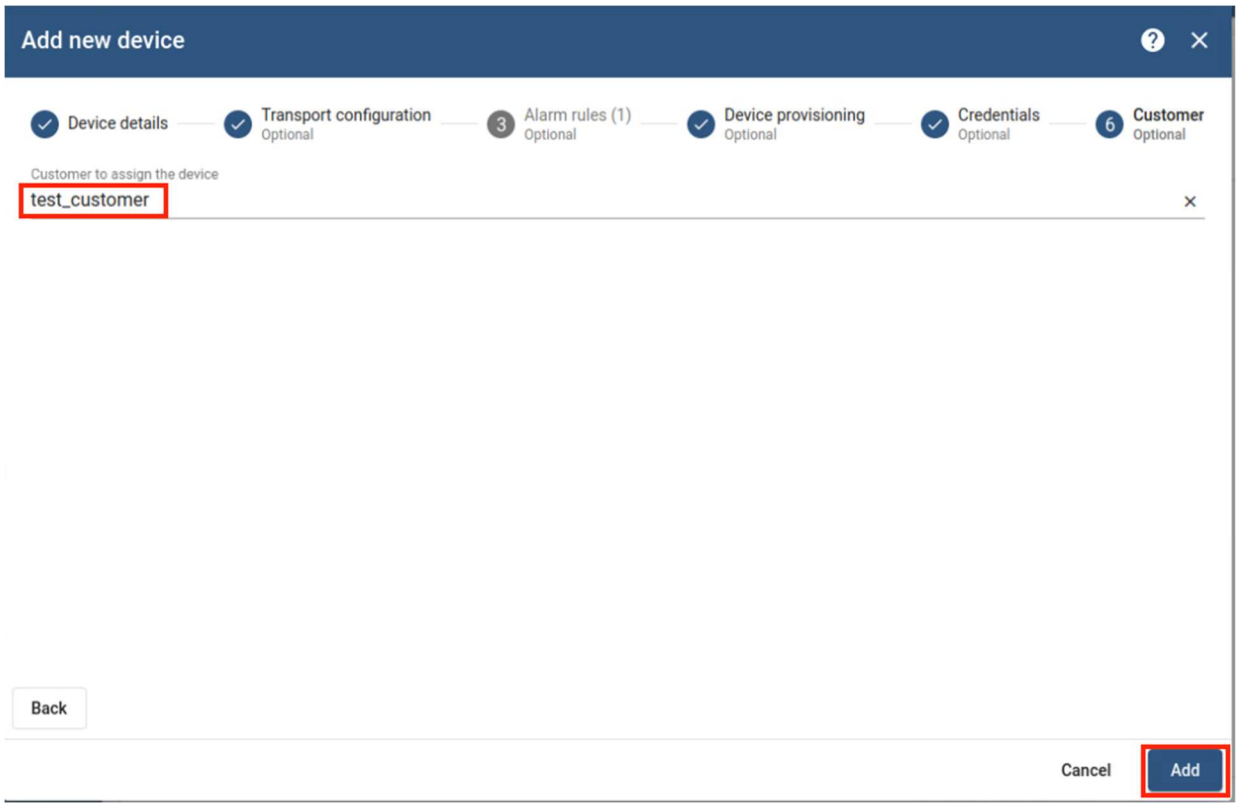
5. On the *Device provisioning* page, do not change anything, click **Next: Credentials** to continue.



6. On the *Credentials* page, we will not add credentials. Click **Next: Customer** to continue.



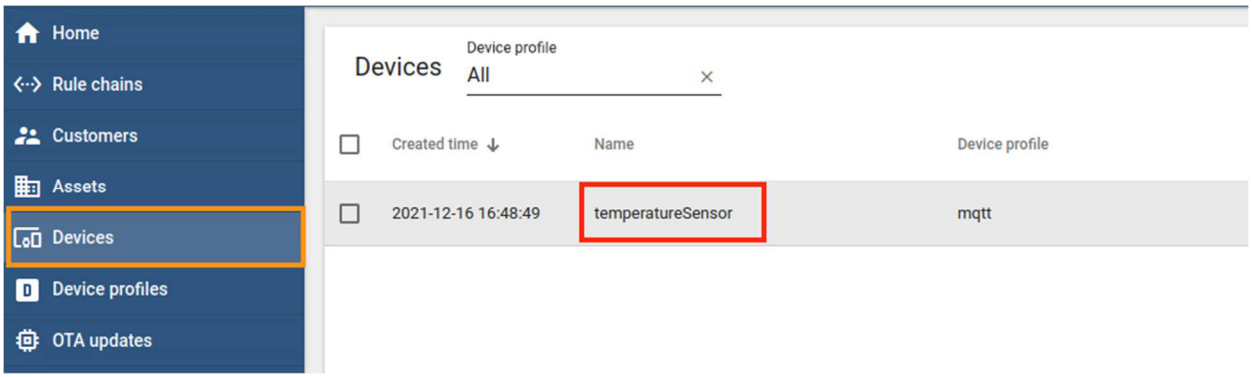
7. Click to select **test_customer** in the *Customer to assign the device* field. Click **Add** to add the device.



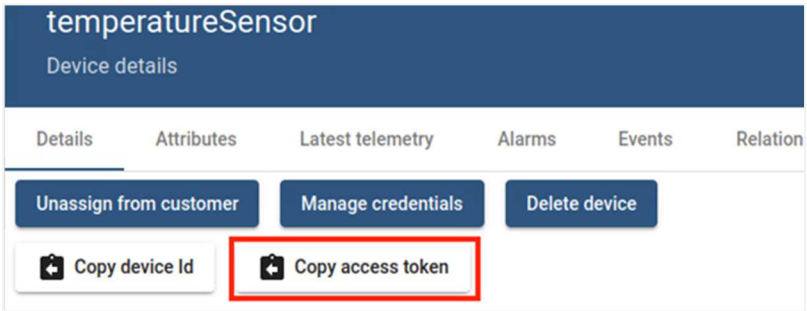
8. Leave the *ThingsBoard* window open and proceed to the next section.

3 Testing the Device

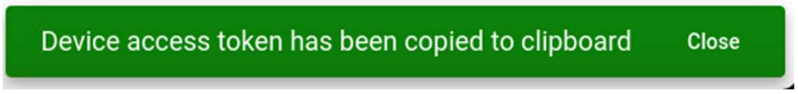
1. A quick way to test the device we created is to send an MQTT message to the ThingsBoard server from the terminal. First, we will get the access token from our temperatureSensor device. With the ThingsBoard still open, make sure you are still on the *Devices* page. Then, click on the **temperatureSensor** once.



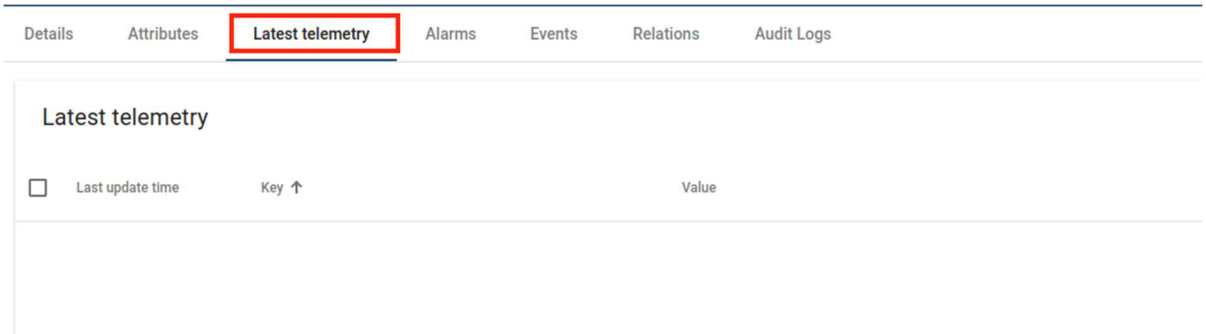
2. A panel will slide open from the right side. Click on **Copy access token**.



3. A pop-up message will show quickly at the lower-right corner, indicating that the *Device access token has been copied to clipboard***.** Click **Close.**



4. Once the token is copied, click **Latest temeletry** and we will observe the data from this tab. Right now, there is no telemetry at all.



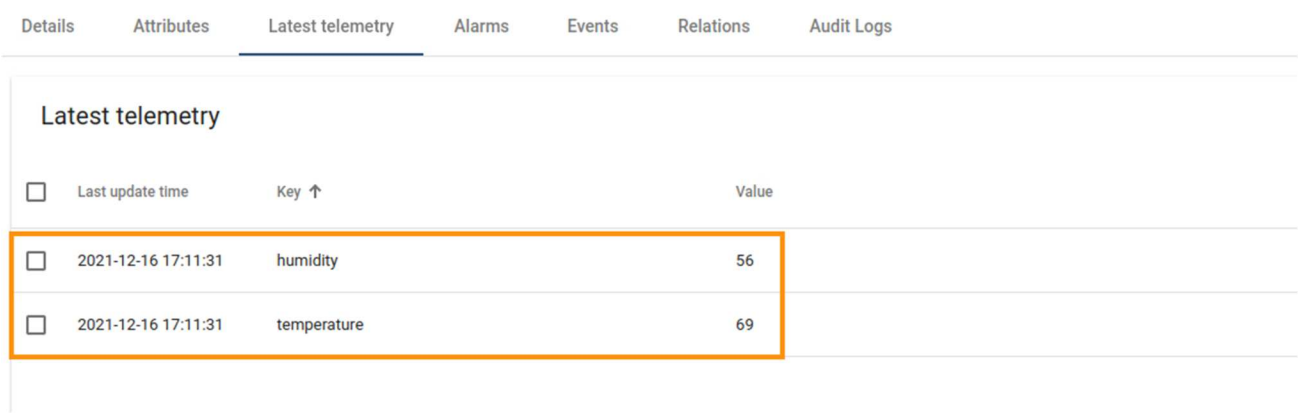
5. Start a new terminal and enter the following command. Replace the *$ACCESS_TOKEN* with the token we just copied. Press **Enter** to send the message to the *ThingsBoard* server.

```
sysadmin@ubuntusrv:~$ mosquitto_pub –d –q 1 –h "127.0.0.1" –t
"v1/devices/temperatureSensor/telemetry" –u "$ACCESS_TOKEN" –m
"{"temperature":69,”humidity”:56}"
```

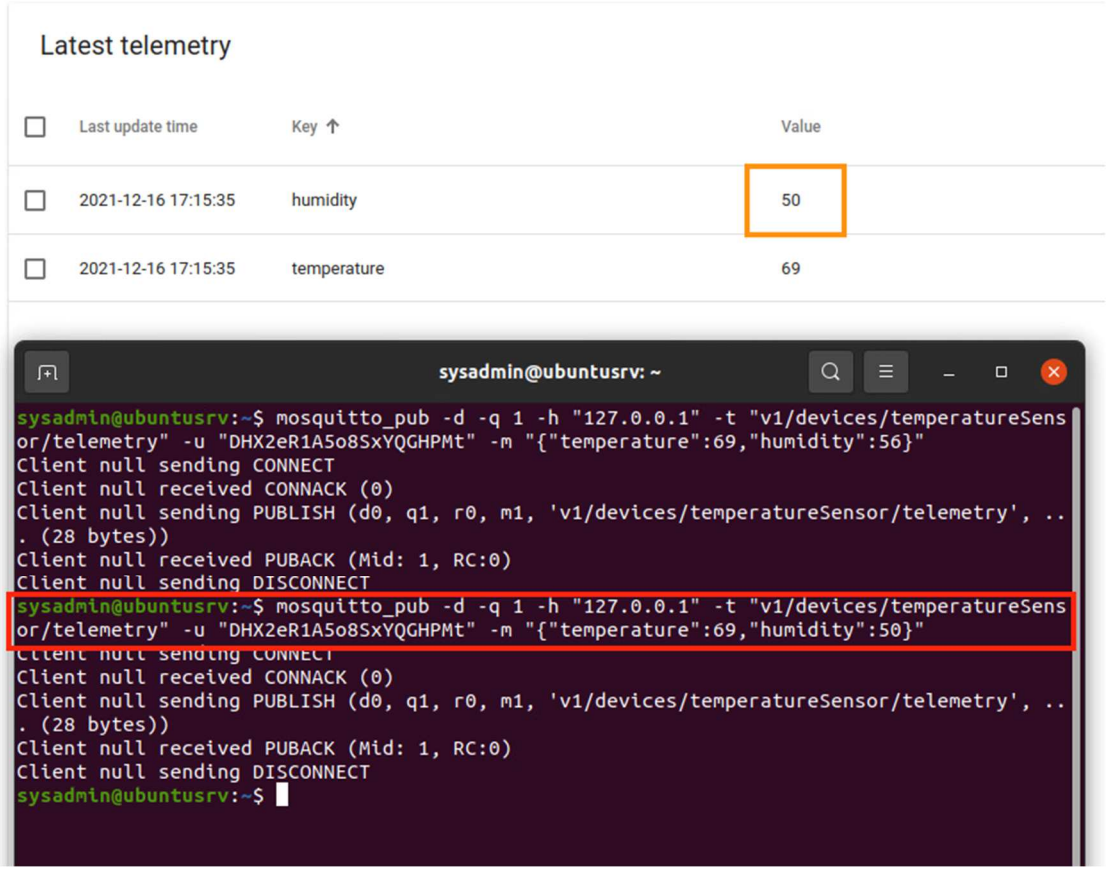
```
sysadmin@ubuntusrv:~$ mosquitto_pub -d -q 1 -h "127.0.0.1" -t "v1/devices/temperatureSensor/telemetry
" -u "DHX2eR1A5o8SxYQGHPMt" -m "{"temperature":69,"humidity":56}"
Client null sending CONNECT
Client null received CONNACK (0)
Client null sending PUBLISH (d0, q1, r0, m1, 'v1/devices/temperatureSensor/telemetry', ... (28 bytes)
)
Client null received PUBACK (Mid: 1, RC:0)
Client null sending DISCONNECT
sysadmin@ubuntusrv:~$
```

The **$ACCESS_TOKEN** must be replaced for the message to work. The token in the example will be different from yours.

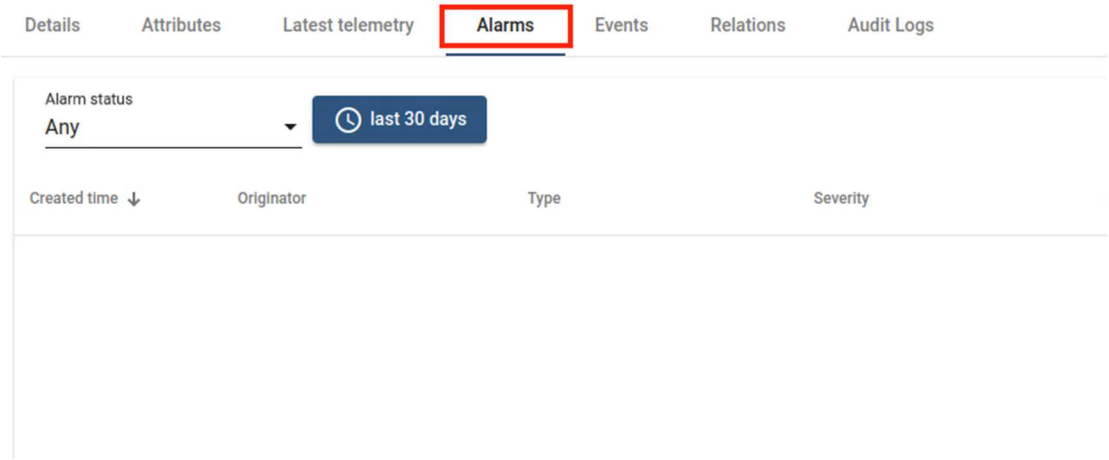
6. Immediately, you should see a telemetry show up in the *ThingsBoard*, under the **Latest telemetry** tab.



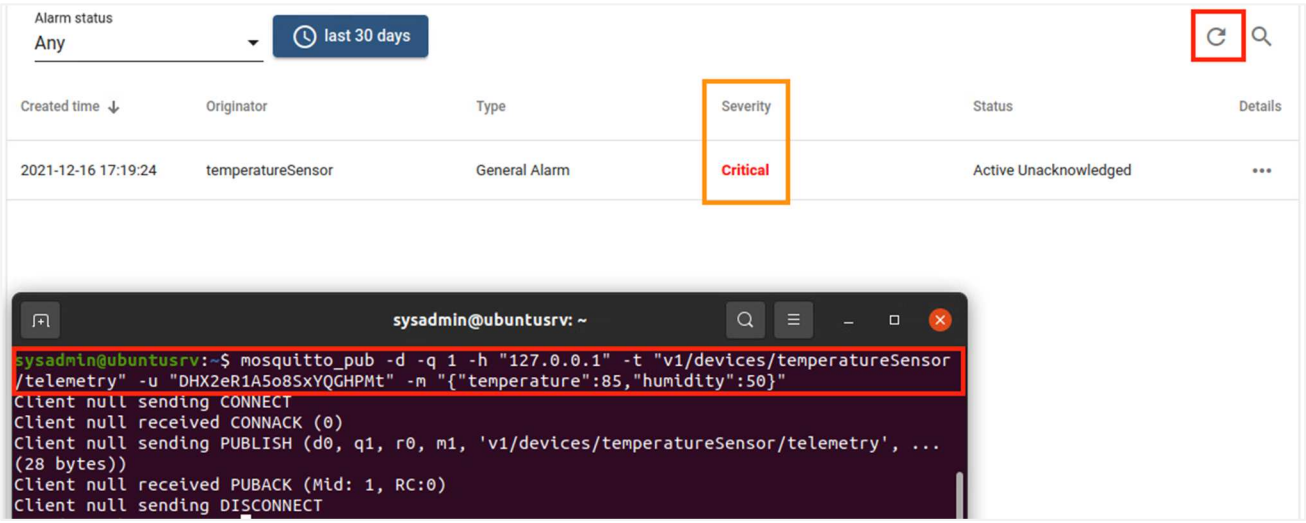
7. Alternatively, you could move the *Terminal* window to show the *Latest telemetry* in the background. Then, change the humidity to **50** and run the command again.



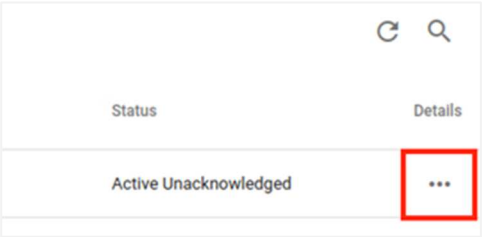
8. Now, we will set a higher temperature to create an alarm. Go back to the *ThingsBoard* and click on the *Alarms* tab. There is nothing right now.



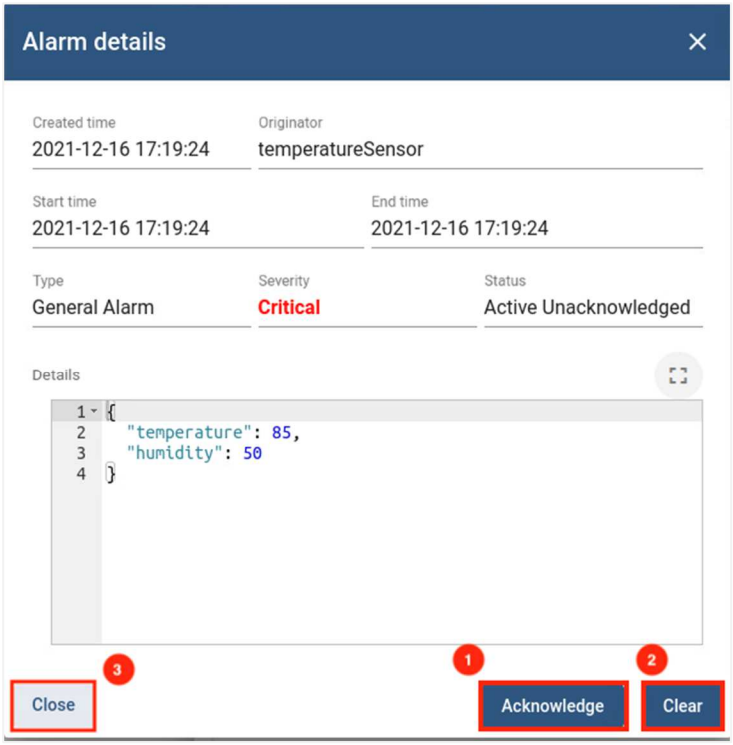
9. Switch back to the *Terminal window*; we will send another MQTT message but with a temperature of 85. An alarm will show up with a *Severity level* of **Critical**. If the *Alarm* page does not refresh itself, click the **Refresh** button.



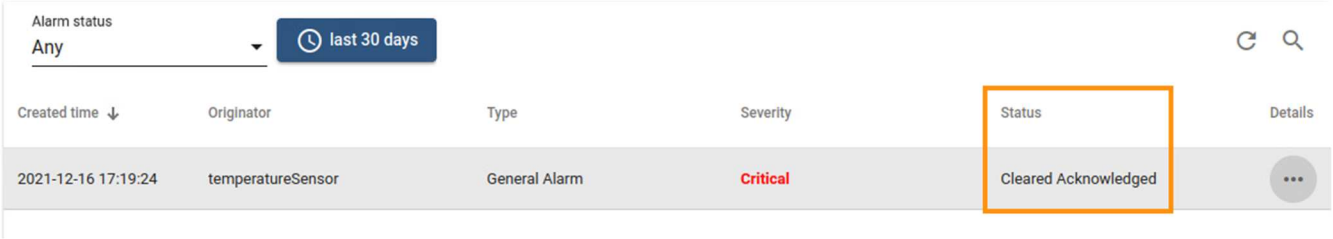
10. We can acknowledge the alarm and even clear the alarm once it has been dealt with. Click the **Details** button.



11. In the pop-up window, click **Acknowledge**, then click **Clear**. Once cleared, you can click the **Close** to exit the pop-up window.



12. Now the *Status* should indicate **Cleared Acknowledged**.



13. The lab is now finished; you may end the reservation.