Using Avantec HVAC devices with ThingsBoard

Release 2.4.2

Avantec Manufacturing Limited

Dec 21, 2023

FIRST STEPS

Avantec provides some networking HVAC solutions. A series of networked HVAC devices in these solutions are connected to ThingsBoard IoT platform through MQTT protocol.

CHAPTER

ONE

FIRST STEPS

Are you new to Avantec Thermostats or ThingsBoard IoT platform? Learn about them to help you create fantastic project.

1.1 Why Avantec + ThingsBoard?

Avantec provides some networking HVAC solutions. A series of networked HVAC devices in these solutions are connected to ThingsBoard IoT platform through MQTT protocol.

1.1.1 Why Avantec?

Avantec Manufacturing Limited was founded in 1983. Avantec has been a trusted name in the original equipment and design manufacturing (OEM/ODM) industry. In early years, products manufactured and exported by Avantec were highly diversified, ranging from gaming, electronics dictionary, handheld timers, to corded and cordless telephones.

Over the past decade, we have evolved into product design and serve customers around the world with our branded products. Three major product lines are (1) Telecommunication, (2) Education and (3) HVAC (Heating, Ventilating, Air Conditioning and refrigeration).

Avantec's strength lies in delivering high-quality engineering solutions. We provide one-stop-shop service from product design, structural/mechanical engineering design, tooling maintenance, electronics circuit design, firmware and software coding, to quality control and optimization.

HVAC

- **Device Type:**
  - Thermostat
  - Humidistat
  - Sensor for smart city
  - DDC (Direct Digital Controller)
  - VAV (Variable Air Volume) Controller
  - ...

- **Networking:**
  - Classic
  - Modbus
  - BACnet
  - RF 433/868/915
  - Wi-Fi
  - LoRaWAN
  - ...

1.1.2 Why ThingsBoard?

ThingsBoard IoT platform

ThingsBoard is an open-source IoT platform that enables rapid development, management and scaling of IoT projects. Their goal is to provide the out-of-the-box IoT cloud or on-premises solution that will enable server-side infrastructure for your IoT applications.

- **100% Open-source**
  ThingsBoard is licensed under Apache License 2.0, so **you can use any it in your commercial products for free**. You can even host it as a SaaS or PaaS solution.
- **Telemetry Data Collection**
  Collect and store telemetry data in reliable way, surviving network and hardware failures. Access collected data using customizable web dashboards or server-side APIs.
- **IoT Rule Engine**
  ThingsBoard allows you to create complex Rule Chains to process data from your devices and match your application specific use cases.
- **Data Visualization**
  Provides 30+ configurable widgets out-of-the-box and ability to create your own widgets using built-in editor. Built-in line-charts, digital and analog gauges, maps and much more.
- **Multi-tenancy**
  Support multi-tenant installations out-of-the-box. Single tenant may have multiple tenant administrators and millions of devices and customers.
- **ThingsBoard Community Edition and ThingsBoard Professional Edition**
  ThingsBoard includes `ThingsBoard CE (Community Edition)` and `ThingsBoard PE (Professional Edition)`.

Note: When we developed `TA652FC-W` and `TA652FH-W` Thermostats, we used ThingsBoard CE.

ThingsBoard IoT Gateway

The ThingsBoard IoT Gateway is an open-source solution that allows you to integrate devices connected to legacy and third-party systems with ThingsBoard.

ThingsBoard Mobile Application

The ThingsBoard Mobile Application is an open-source project based on Flutter. It allows you to build your own IoT mobile application with minimum coding efforts. It is powered by ThingsBoard CE IoT platform.

The ThingsBoard PE Mobile Application is an open-source project based on Flutter. It allows you to build your own advanced IoT mobile application with minimum coding efforts. It is powered by ThingsBoard PE IoT platform.

1.1.3 What is Avantec + ThingsBoard?

Avantec Extension

We provide *Avantec widgets* and *Demo Dashboards* based on ThingsBoard IoT platform for demonstration.

Of course, you can also customize your own Web UI and Mobile Application based on them.

Avantec Devices

TA652FC-W

- 2 pipe Fan Coil Wi-Fi Thermostat.
- Firmware ID: `TA652FC-W-TB`.

TA652FH-W

- Floor Heating Wi-Fi Thermostat.
- Firmware ID: `TA652FH-W-TB`.

TA692FC-L-5

- LoRaWAN thermostat for fan coil units.

HA652-W

Coming soon…

TA640FC-W

Coming soon…

TA670-W

Coming soon…

DL10-W

Coming soon…

CDT022-W

Coming soon…

Tip: Firmware ID - a hardware device may have several firmwares, which are respectively connected to different software platforms. Firmware ID are used to distinguish these firmwares.

1.2 Get Started

Tip:

- This section applies when no Avantec HVAC device is added to the ThingBoard server.
- **If you add some Avantec HVAC devices to ThingsBoard Server again, please refer to the instructions of each device.**
  - *Add TA652FC-W to ThingsBoard*
  - *Add TA652FH-W to ThingsBoard*

Reprinted this article from Getting Started with ThingsBoard, slightly modified.

1.2.1 Introduction

The goal of this tutorial is to demonstrate the basic usage of the most popular Avantec HVAC device and ThingsBoard features. You will learn how to:

- Connect devices to ThingsBoard;
- Import real-time end-user dashboards.

We will connect and visualize data from a Avantec HVAC device to keep it simple.

Refer to Getting Started with ThingsBoard to get support for the following features:

- Define thresholds and trigger alarms;
- Push notifications about new alarms over email, SMS or other systems.

1.2.2 Prerequisites

You will need to have ThingsBoard server up and running.

- The easiest way is to use Live Demo server.
- Or ThingsBoard Cloud.
- **The alternative option is to install ThingsBoard using *Installation options*.**
  - **Windows** users should follow this guide.
  - **Linux** users that have docker installed should execute the following commands:

```
mkdir -p ~/.mytb-data && sudo chown -R 799:799 ~/.mytb-data
mkdir -p ~/.mytb-logs && sudo chown -R 799:799 ~/.mytb-logs
docker run -it -p 9090:9090 -p 7070:7070 -p 1883:1883 -p 5683-5688:5683-5688/
↪udp -v ~/.mytb-data:/data \
-v ~/.mytb-logs:/var/log/thingsboard --name mytb --restart always thingsboard/
↪tb-postgres
```

These commands install ThingsBoard and load demo data and accounts. ThingsBoard UI will be available using the URL: http://localhost:8080 . You may use username **tenant@thingsboard.org** and password **tenant**. More info about demo accounts is available.

Some important parameters

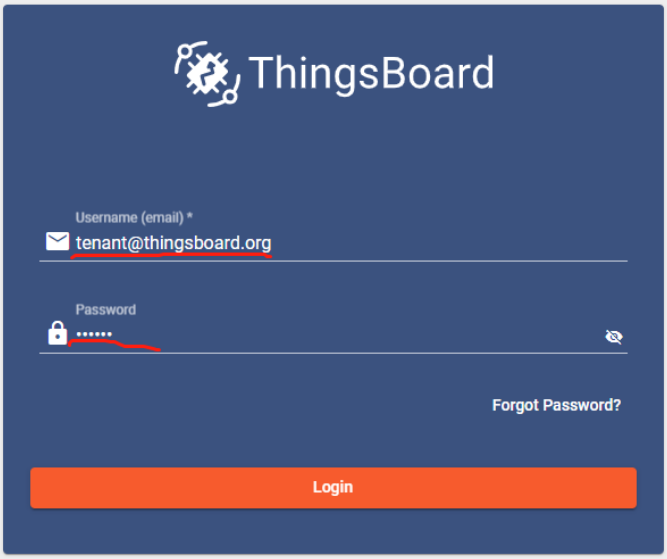
Please remember the following important parameters, which will be used frequently in the following work:

Table 1: Some important parameters

ThingsBoard server	Web URI	Default Tenant Account	MQTT URI / Cloud Host
Live Demo server	https://demo.thingsboard.io		mqtt://demo.thingsboard.io
ThingsBoard Cloud (Subscription plans)	https://thingsboard.cloud		mqtt://mqtt.thingsboard.cloud
Installation	local: http://localhost:8080 remote: http://your_server_ip:8080	username: tenant@thingsboard.org password: tenant See demo accounts	mqtt://your_server_ip

1.2.3 Step 1. Tenant Login

- Open ThingsBoard Web UI in browser, e.g. http://localhost:8080
- Tenant Administrator login ThingsBoard.



Tenant default username and password, refer to *Some important parameters*.

1.2.4 Step 2. Import Avantec Widgets

- See *Import Avantec Widgets*.

1.2.5 Step 3. Import device profile

- See *Import Device Profile of TA652FC-W Thermostat*, or
- See *Import Device Profile of TA652FH-W Thermostat*.

1.2.6 Step 4. Import Dashboards

- See *Import TA652FC-W Detail Dashboard* and *Import TA652FC-W List Dashboard* , or
- See *Import TA652FH-W Detail Dashboard* and *Import TA652FH-W List Dashboard*.

1.2.7 Step 5. Provision device

- See *Step 4. Provision TA652FC-W device*, or
- See *Step 4. Provision TA652FH-W device*.

1.2.8 Step 6. Connect device

- See *Step 5. Connect TA652FC-W device*, or
- See *Step 5. Connect TA652FH-W device*.

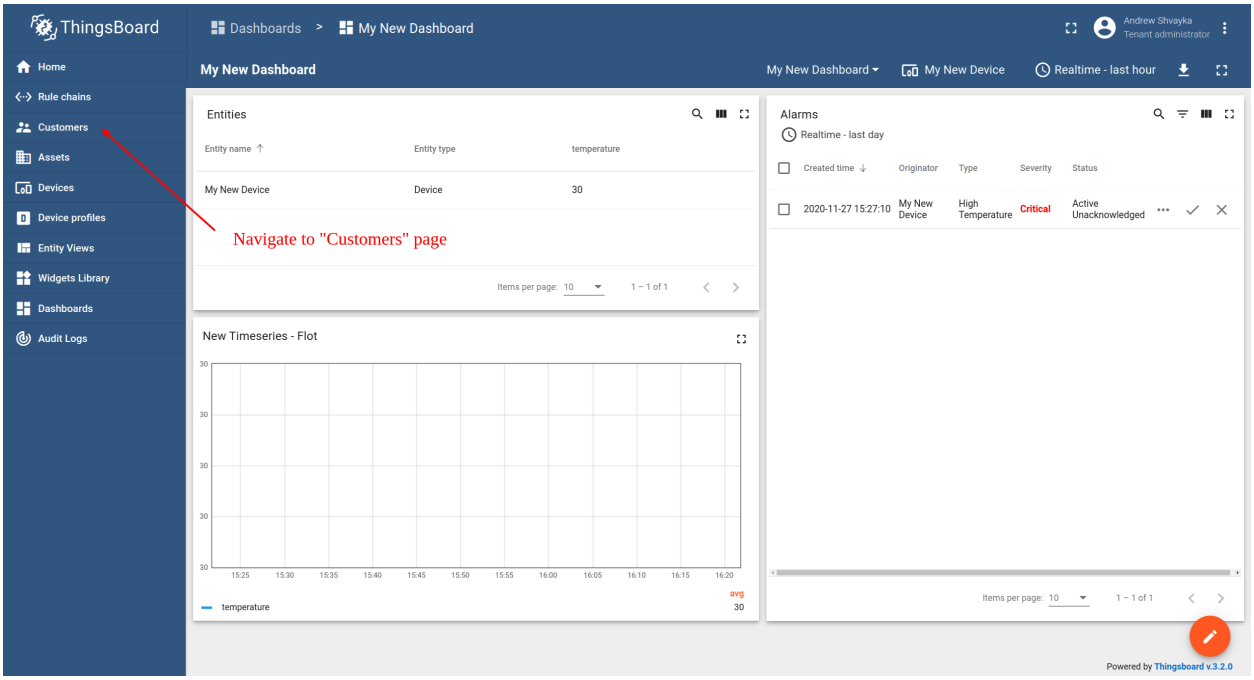
1.2.9 Step 7. Assign Device and Dashboards to Customer

One of the most important ThingsBoard features is the ability to assign Dashboards to Customers. You may assign different devices to different customers. Then, you may create a Dashboard(s) and assign it to multiple customers. Each customer user will see his own devices and will not be able to see devices or any other data that belongs to a different customer.

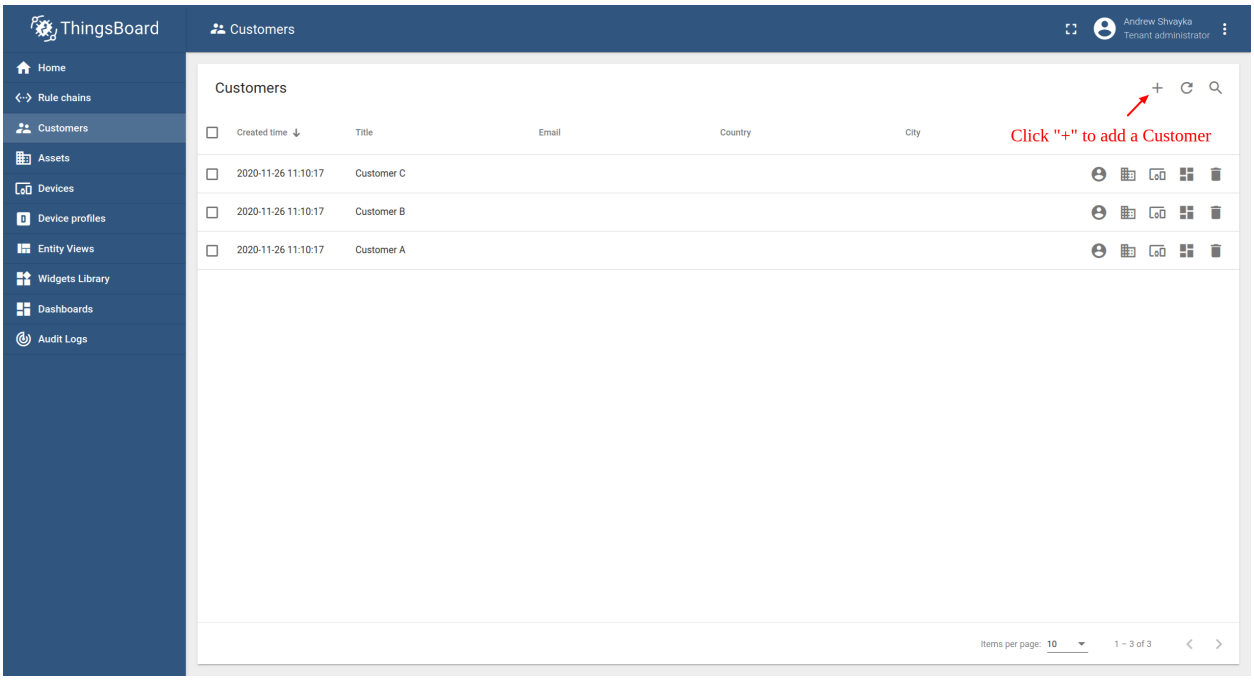
Step 7.1 Create customers

Let's create a customer with title "My New Customer". Please see instruction below:

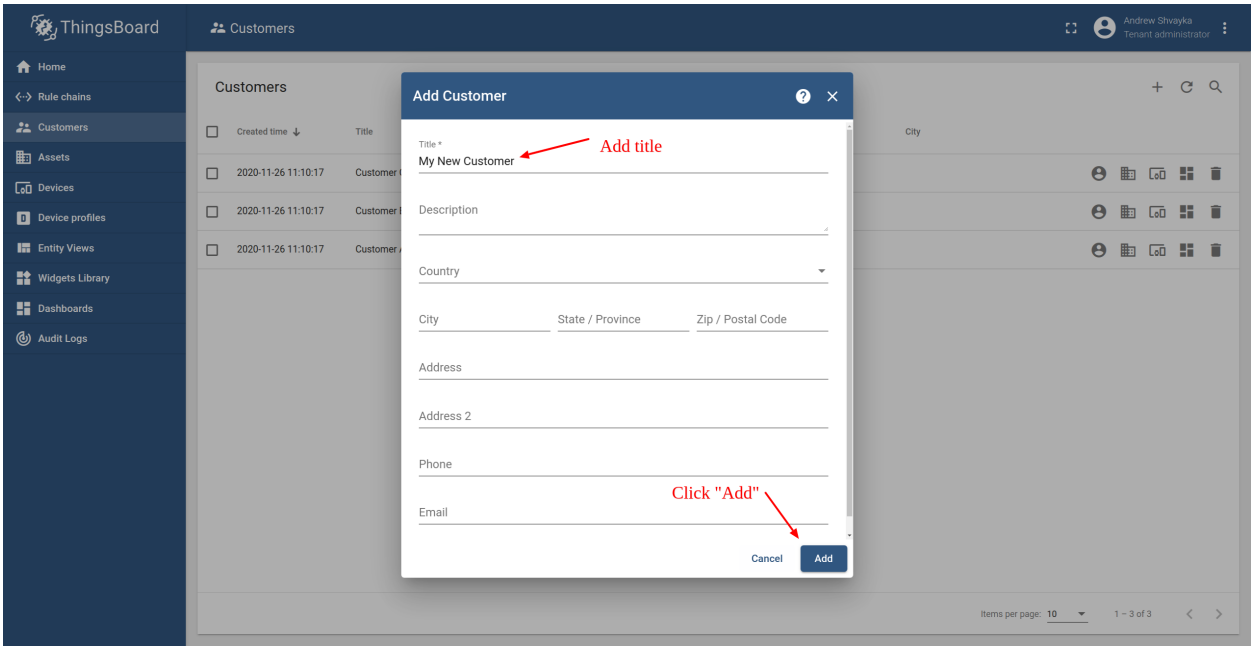
- Navigate to the Customers page.



- Click the "+" sign to add a customer.



- Add customer title and click “Add”.



Step 7.2 Assign dashboards to Customer

Let's share our dashboard with the Customer. The Customer users will have read-only access to the Dashboard.

- See *Step 6.1 Assign dashboards of TA652FC-W to Customer*, or
- See *Step 6.1 Assign dashboards of TA652FH-W to Customer*.

Step 7.3 Assign device to Customer

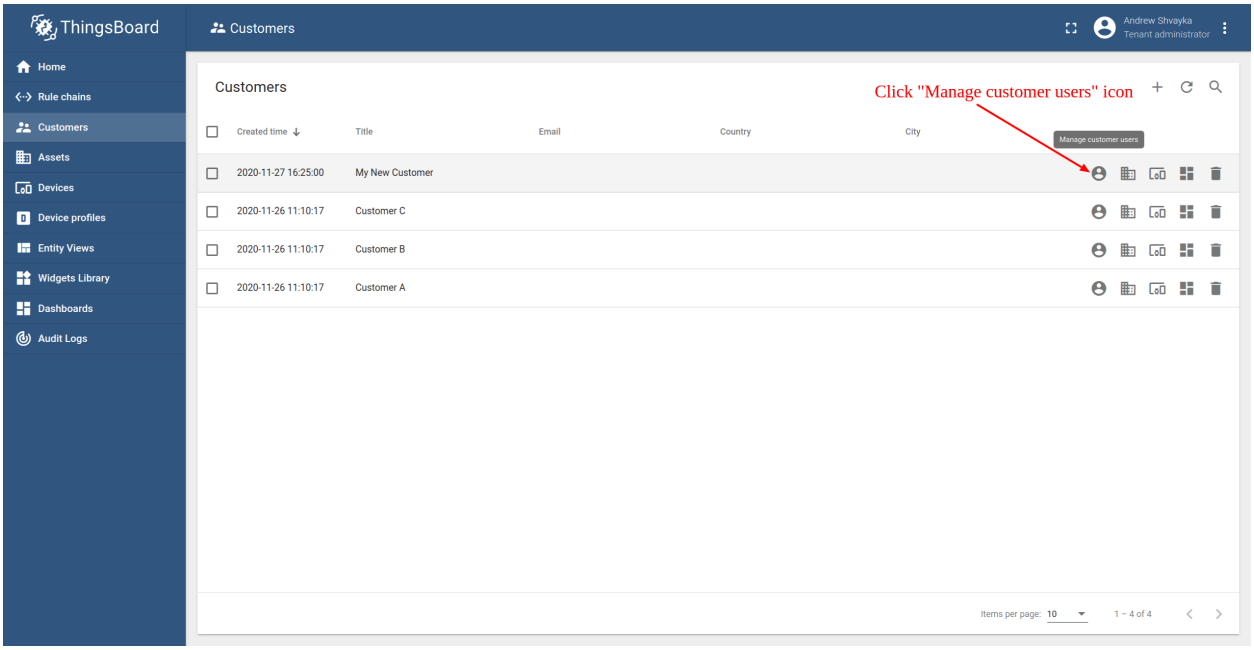
Let's assign device to the Customer. The Customer users will have ability to read and write telemetry and send commands to devices.

- See *Step 6.2 Assign TA652FC-W device to Customer*, or
- See *Step 6.2 Assign TA652FH-W device to Customer*

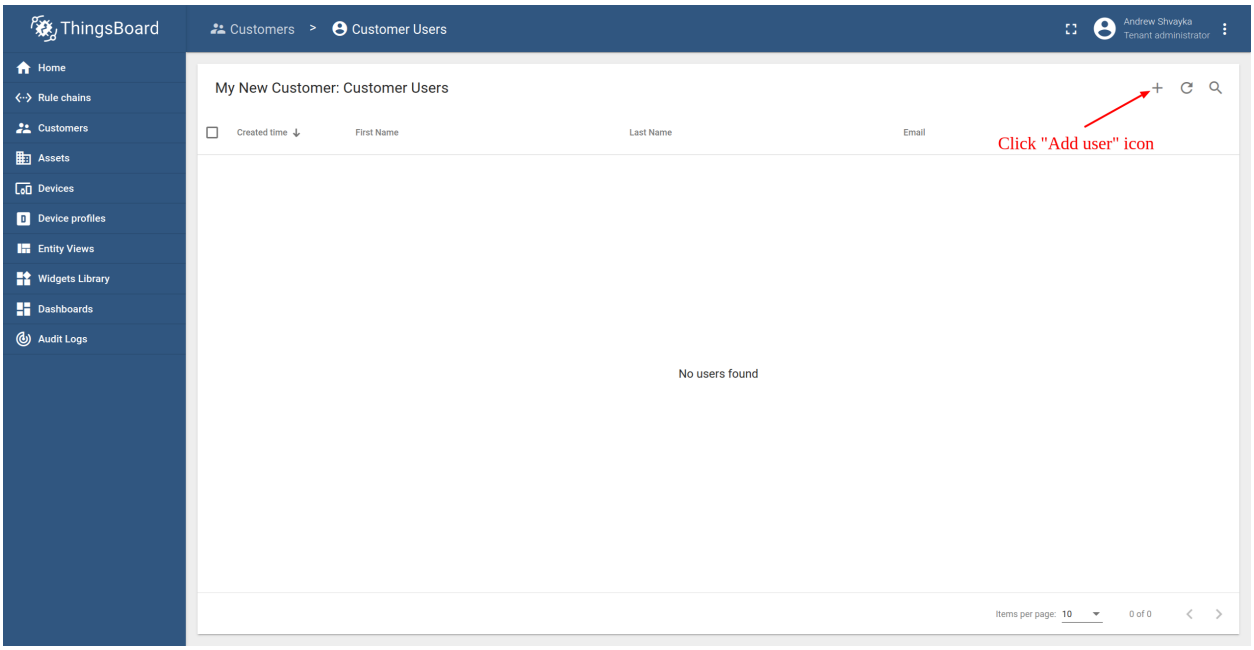
Step 7.4 Create customer user

Finally, let's create a user that will belong to the customer and will have read-only access to the dashboard and the device. You may optionally configure the dashboard to appear just after user login to the platform web UI.

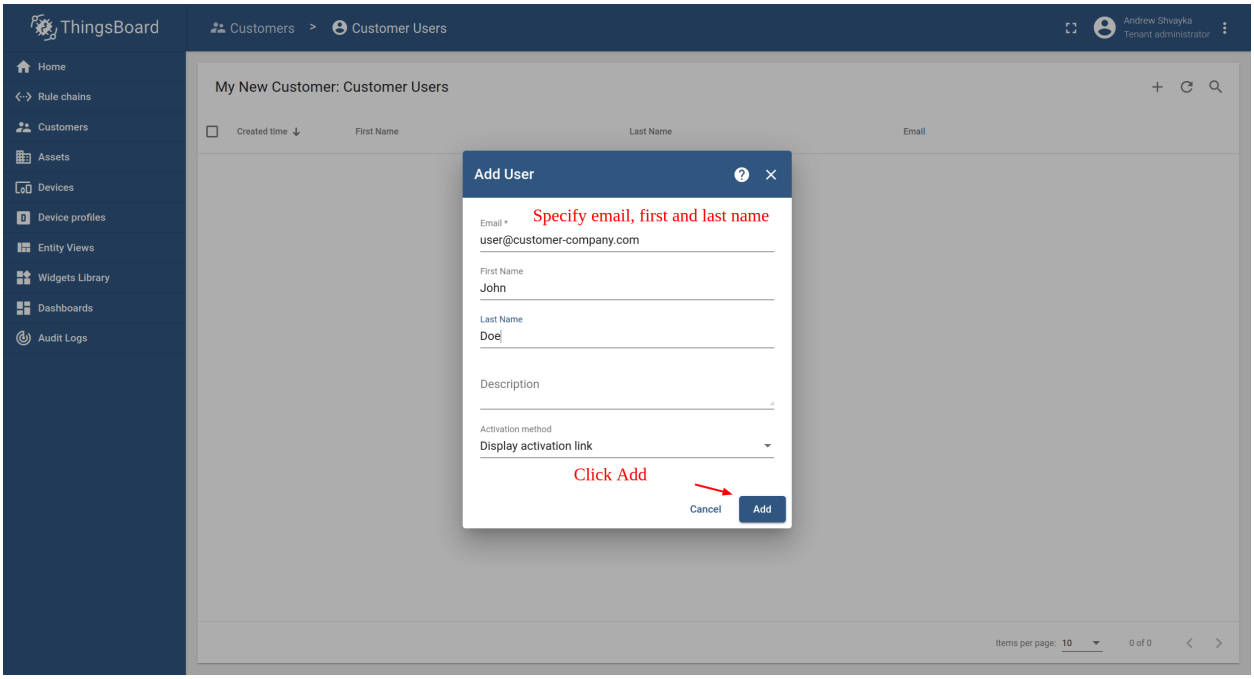
- Navigate back to the "Customers" page and click the "manage customer users" icon.



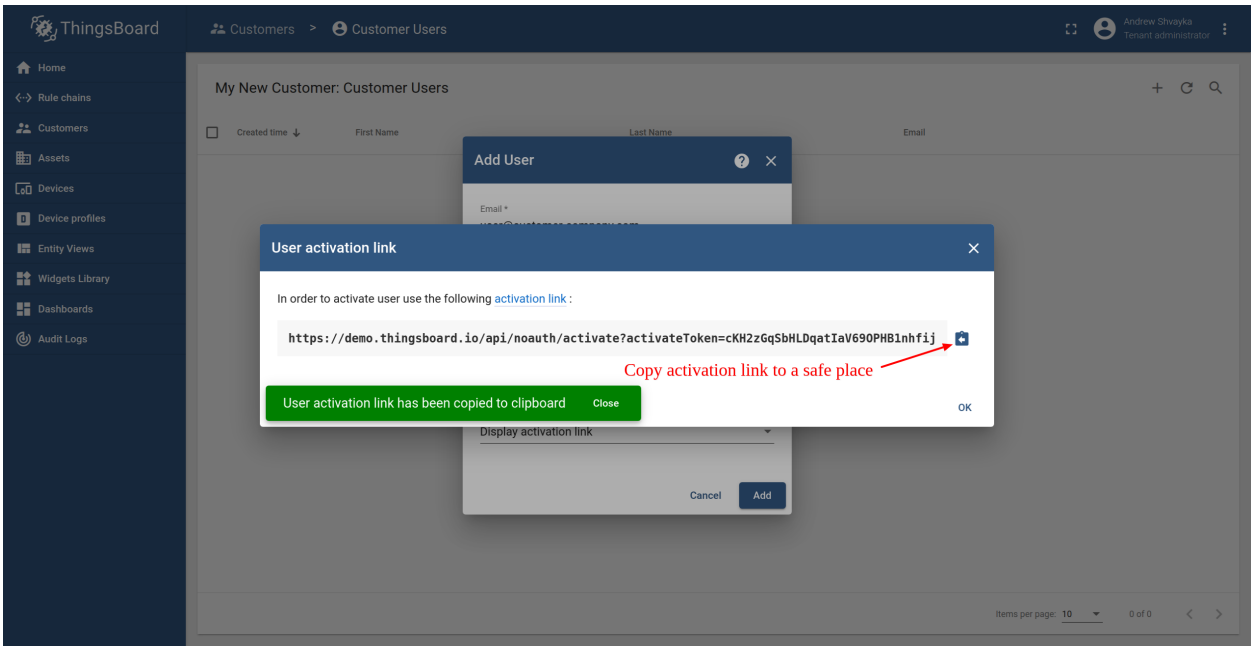
- Click the "Add user" icon.



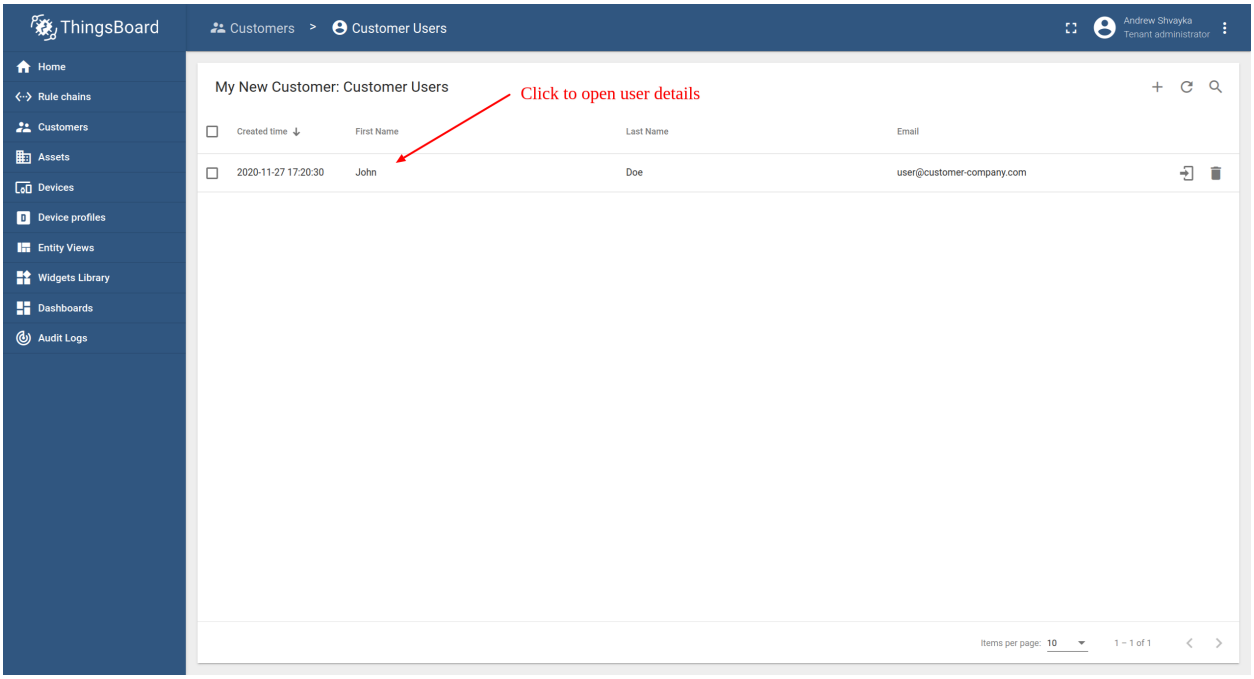
- Specify email that you will use to login as a customer user and click “Add”.



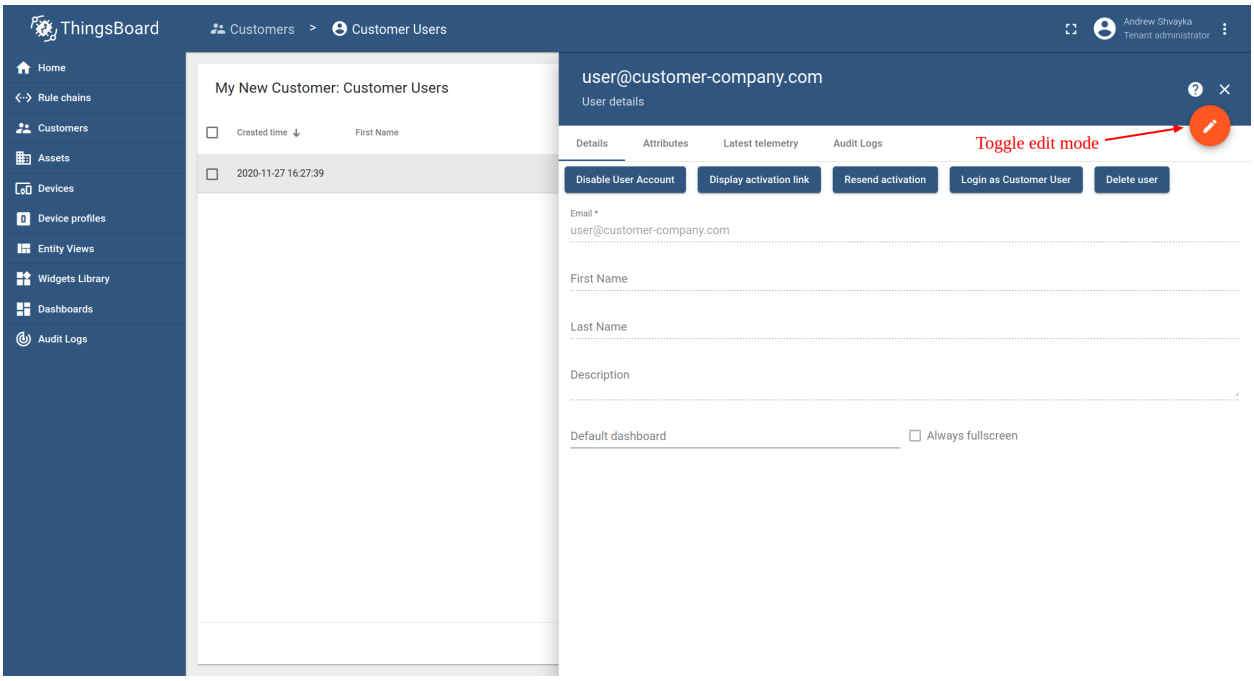
- Copy the activation link and save it to a safe place. You will use it later to set the password.



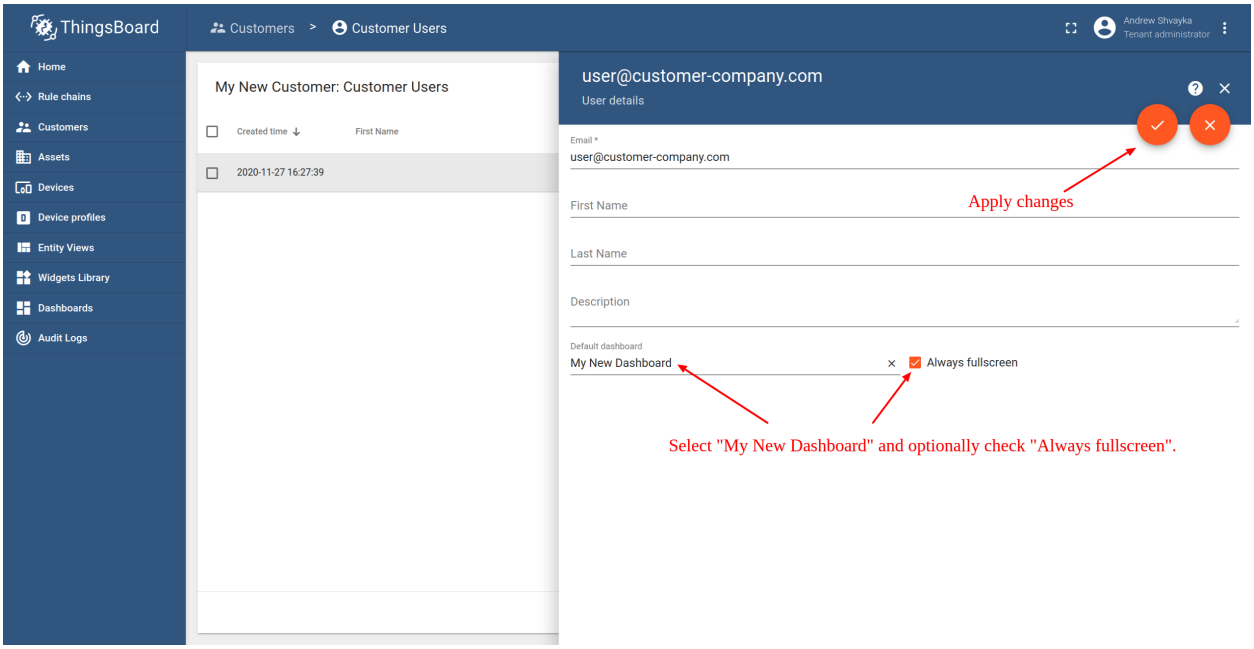
- Open user details.



- (Option) Toggle edit mode.

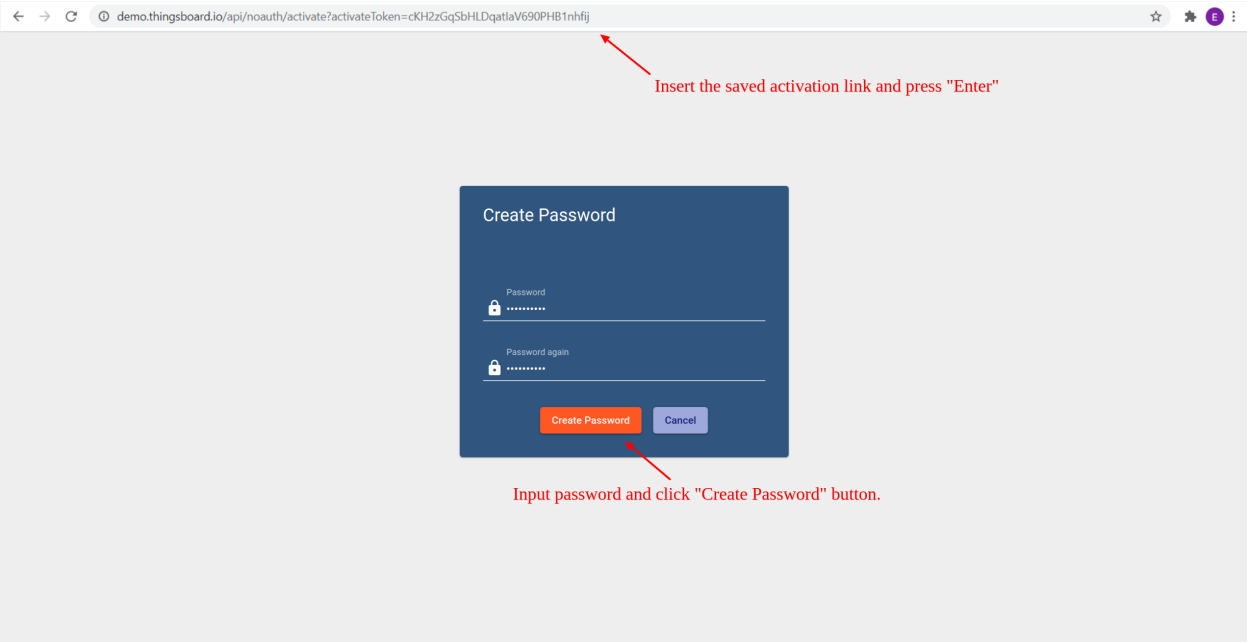


- (Option) Select default dashboard and check “Always fullscreen”. Apply changes.

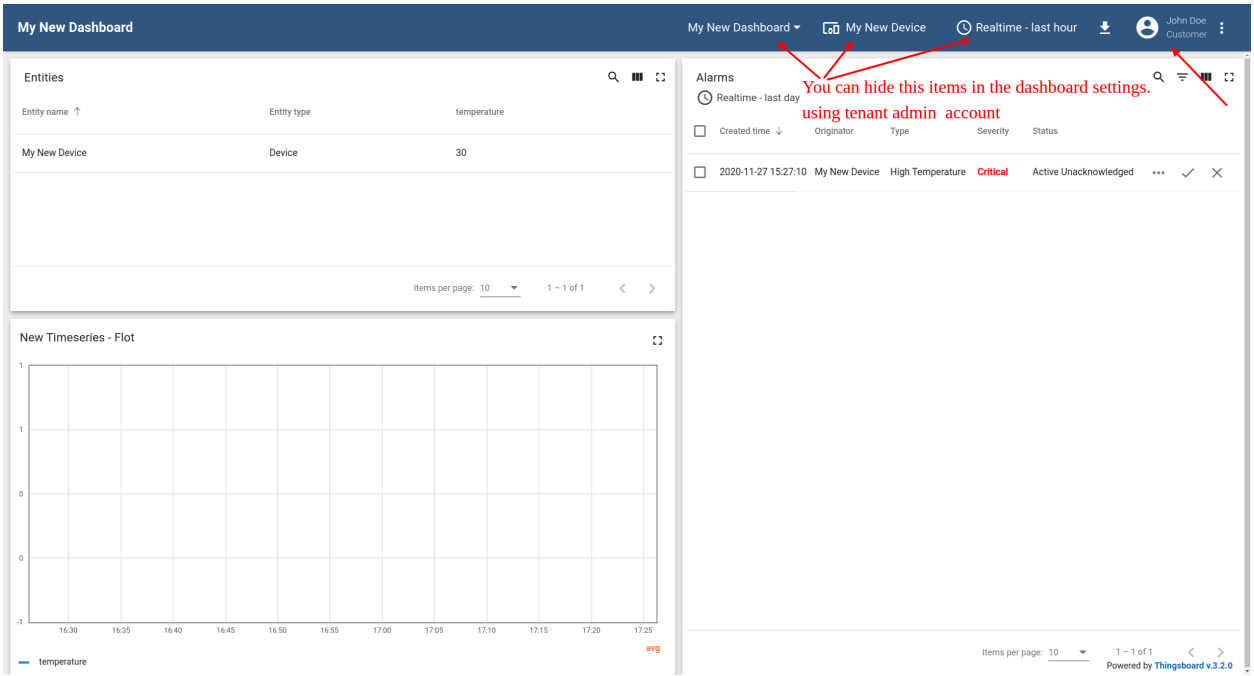


Step 7.5 Activate customer user

- Use the activation link to set the password. Click “Create Password”. You will automatically login as a customer user.



- You have logged in as a Customer User. You may browse the data and acknowledge/clear alarms.



1.2.10 Step 8. Open Dashboards

- See *Step 7. Open Dashboards of TA652FC-W*, or
- See *Step 7. Open Dashboards of TA652FH-W*.

1.2.11 Next Steps

- *Working with IoT Dashboards* - Customize your Dashboard & Widget.
- *Getting Started with Rule Engine* - Customize your event processing with Rule engine.
- *White-labeling* - Customize your company or product logo with ThingsBoard PE.
- Platform Integrations - Connect existing NB IoT, LoRaWAN, SigFox and other devices with specific payload formats directly to ThingsBoard platform.
- Trendz Analytics - Converts the IoT dataset into insights and simplifies the decision-making process.
- *Mobile application* - learn how to customize the mobile application.
- *ThingsBoard MQTT Device API* | *TA652FC-W MQTT API* | *TA652FH-W MQTT API* - Connect Avantec HVAC device to your existing IoT platform.

1.2.12 See also

- Installation guides - Learn how to setup ThingsBoard on various available operating systems.
- Connect your device - Learn how to connect devices based on your connectivity technology or solution.
- Data visualization - These guides contain instructions how to configure complex ThingsBoard dashboards.
- Data processing & actions - Learn how to use ThingsBoard Rule Engine.
- IoT Data analytics - Learn how to use rule engine to perform basic analytics tasks.
- Hardware samples - Learn how to connect various hardware platforms to ThingsBoard.
- Advanced features - Learn about advanced ThingsBoard features.

1.2.13 Your feedback

Don't hesitate to star Avantec on github to help us spread the word.

CHAPTER

TWO

THINGSBOARD

Here is an overview about ThingsBoard.

Key concepts

Installation options

Dashboards | *Rule engine* | *White labeling*

MQTT Device API

2.1 Overview

Reprinted articles: https://thingsboard.io/docs/

2.1.1 Introduction

See What is ThingsBoard?

2.1.2 Features

Entities and relations

See Entities and relations .

Working with telemetry data

See Working with telemetry data.

Working with IoT device attributes

See Working with IoT device attributes.

Attributes are treated key-value pairs. Flexibility and simplicity of the key-value format allow easy and seamless integration with almost any IoT device on the market.

Device specific attributes are separated into two main groups:

- **client-side attributes** - attributes are reported and managed by the device application. For example current software/firmware version, hardware specification, etc.
- **shared attributes** - attributes are reported and managed by the server-side application. Visible to the device application. For example customer subscription plan, target software/firmware version.

Using RPC capabilities

See Using RPC capabilities.

Thinsboard RPC feature can be divided into two types based on originator: device-originated and server-originated RPC calls. In order to use more familiar names, we will name device-originated RPC calls as a **client-side RPC** calls and server-originated RPC calls as **server-side RPC** calls.

Client-side RPC

Server-side RPC

Server-side RPC calls can be divided into one-way and two-way:

- **One-way server-side RPC** request is sent to the device without delivery confirmation and obviously, does not provide any response from the device. RPC call may fail only if there is no active connection with the target device within a configurable timeout period.

- **Two-way server-side RPC** request is sent to the device and expects to receive a response from the device within the certain timeout. The Server-side request is blocked until the target device replies to the request.

Claiming devices

Refer to Claiming devices.

TODO…

Over-the-air firmware and software updates

See *OTA Updates*.

2.1.3 Getting Started Guides

These guides provide quick overview of main ThingsBoard features. Designed to be completed in 15-30 minutes.

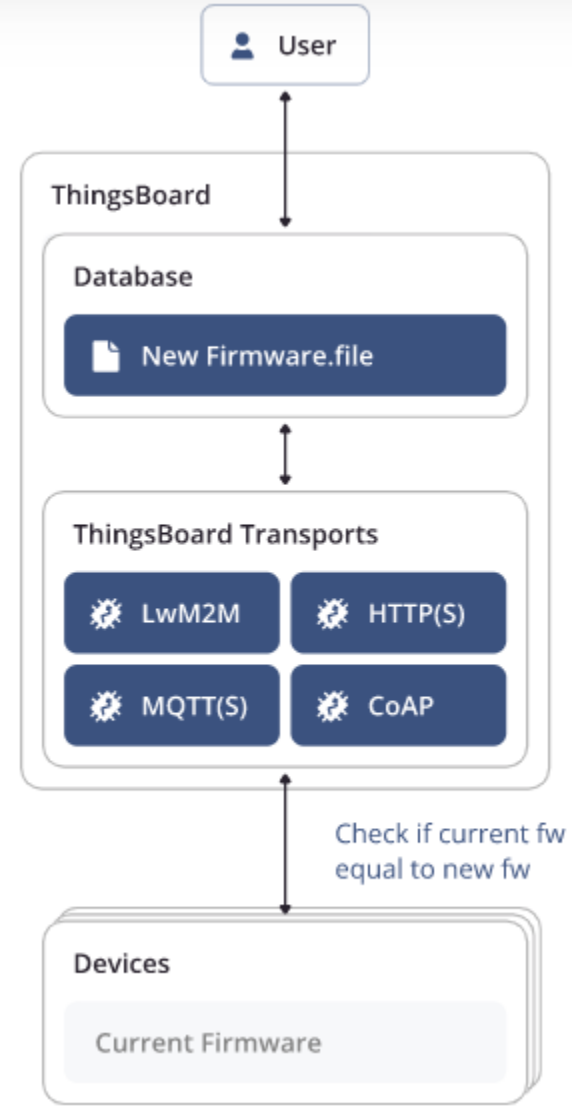
- Hello world : Learn how to collect IoT device data using MQTT, HTTP or CoAP and visualize it on a simple dashboard. Provides variety of sample scripts that you can run on your PC or laptop to simulate the device.
- End user IoT dashboards : Learn how to perform basic operations over Devices, Customers, and Dashboards.
- Device data management : Learn how to perform basic operations over device attributes to implement practical device management use cases.

2.2 Over-the-air firmware updates

Refer to here.

2.2.1 Overview

Since ThingsBoard 3.3, ThingsBoard allows you to upload and distribute over-the-air(OTA) updates to devices. As a tenant administrator, you may upload firmware packages to the OTA repository. Once uploaded, you may assign them to Device Profile or Device. ThingsBoard will notify devices about the available update and provide a protocol-specific API to download the firmware. The platform tracks status of the update and stores history of the updates. As a platform user, you may monitor the update process using the dashboard.

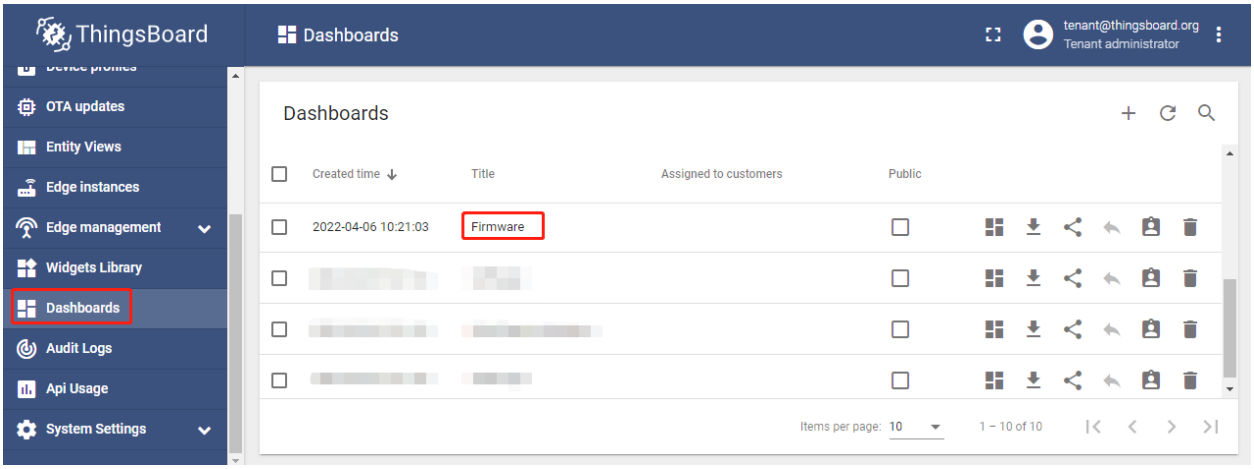


2.2.2 Firmware update monitoring dashboard

ThingsBoard provides the summary of the firmware update to monitor and track the firmware update status of your device, such as which devices are updating right now, any boot issues, and which ones have already been updated.

Check firmware dashboard

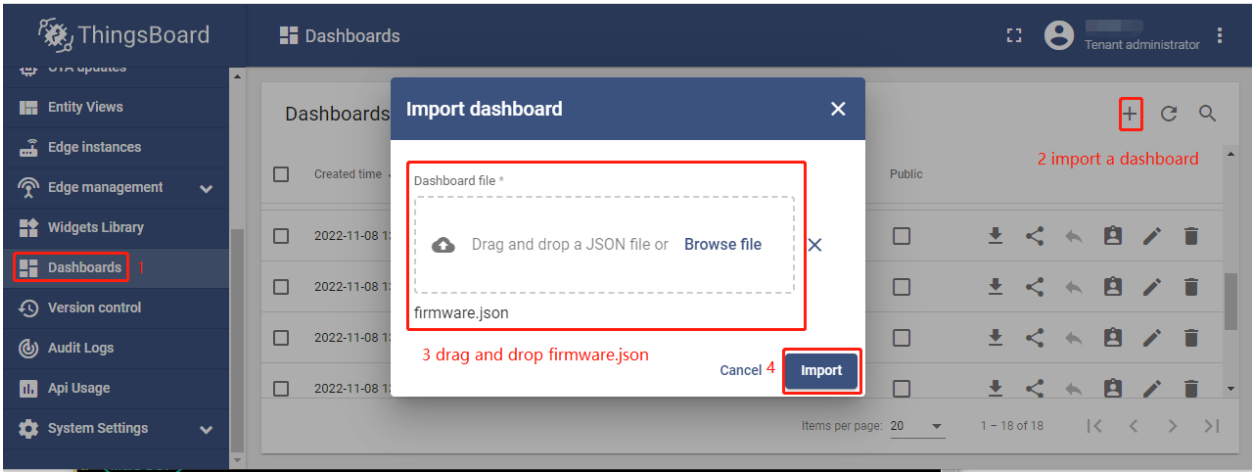
The dashboard is created automatically for each new tenant that you add to ThingsBoard in ThingsBoard CE. But this is not the case in ThingsBoard PE and ThingsBoard Demo. Check if you have a firmware dashboard in your dashboard list:



Import firmware dashboard

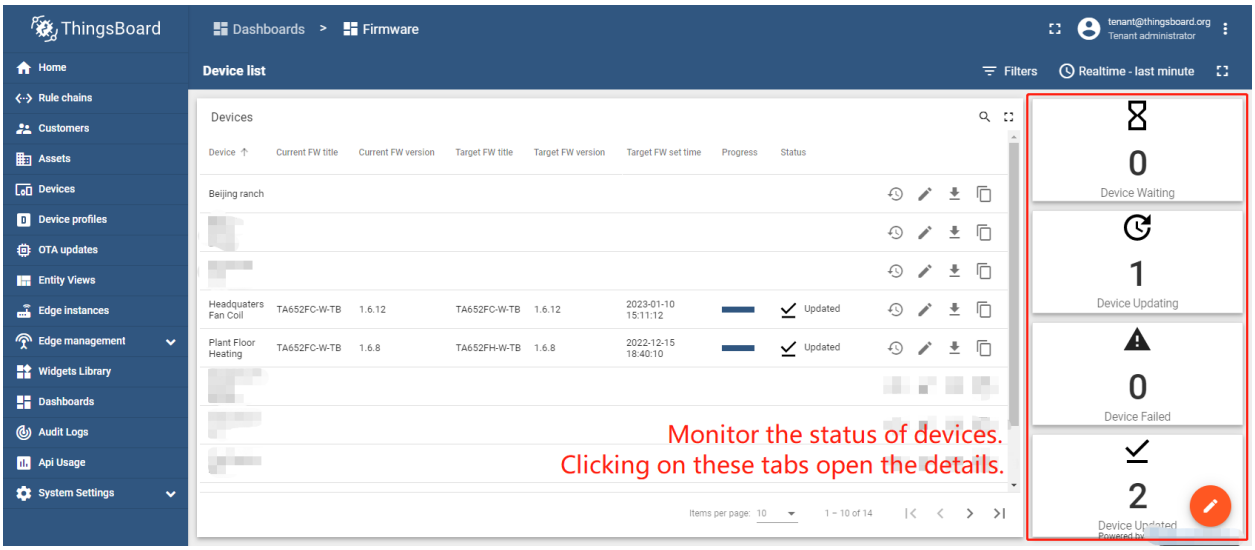
If there is not firmware dashboard, you can also download the dashboard JSON `firmware.json` and import it for existing tenants.

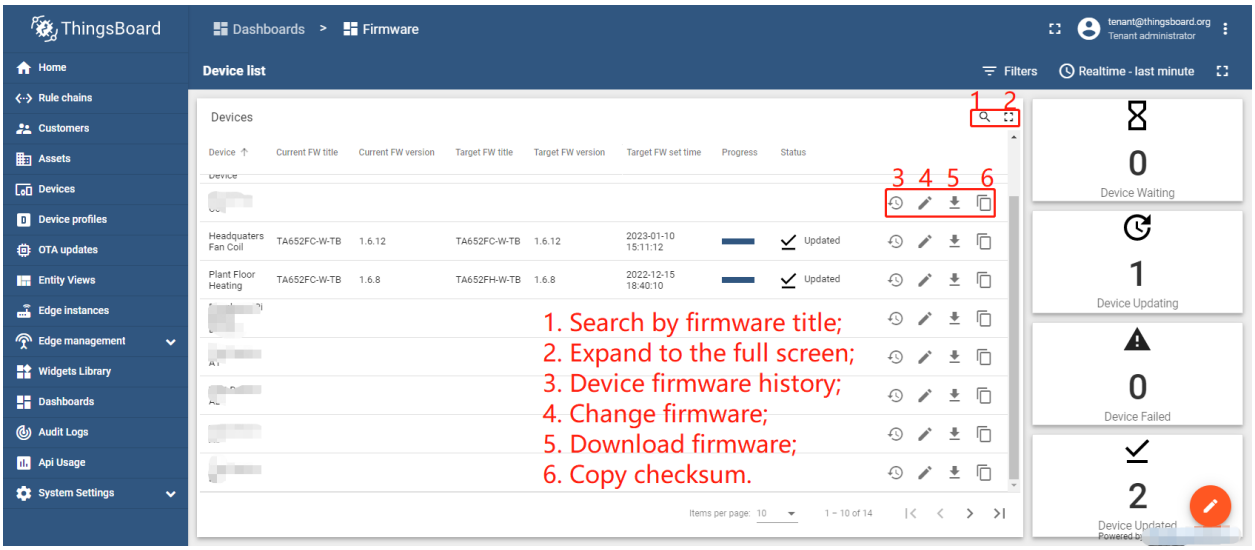
- **Dashboards** –> **+** –> **Import a dashboard** –> Drag and drop **firmware.json** –> **Import**.



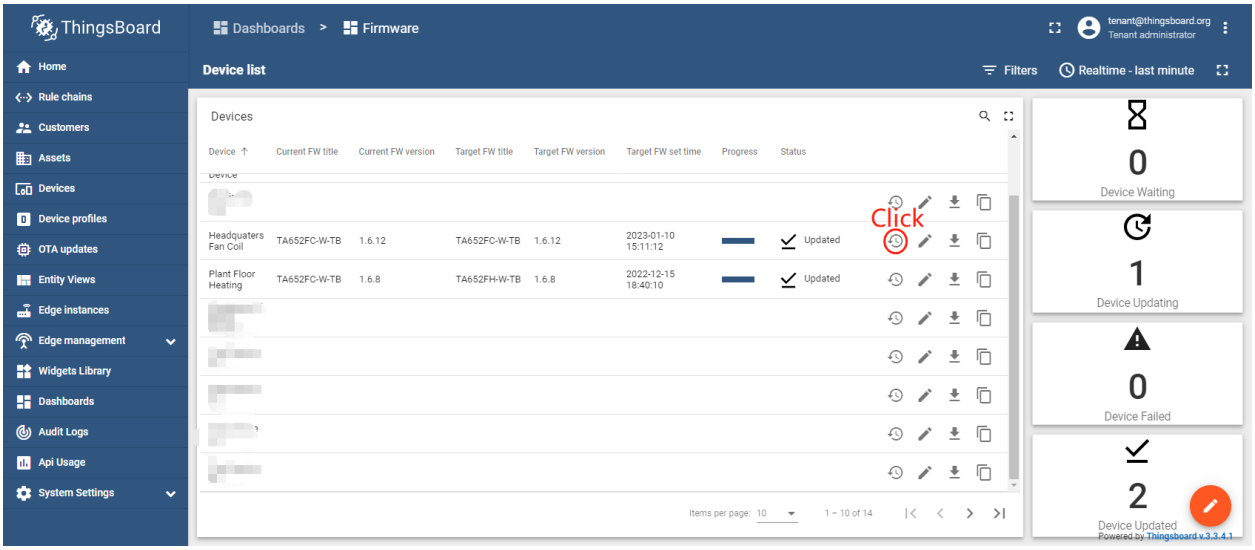
Firmware dashboard details

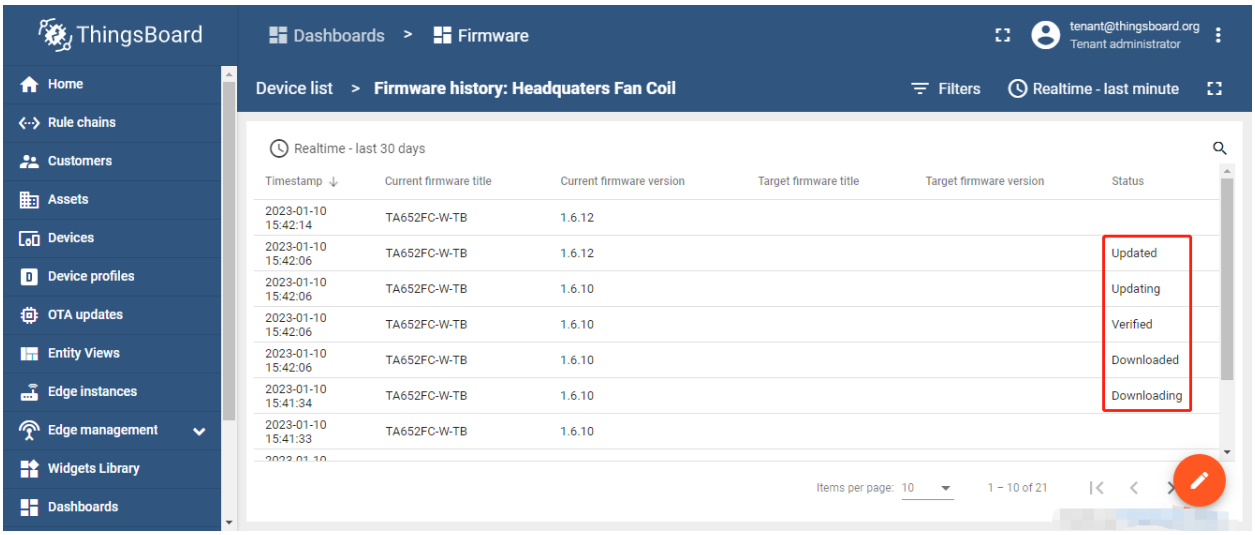
There you can see a list of all devices with full information about their firmware.





Click the “History of the firmware updates” button next to the device name to learn about the firmware update status of specific device.





2.2.3 Provision OTA package to ThingsBoard repository

- **OTA updates** –> **+** –> Input *title* & *version* –> Select **device profile** –> select **Firmware** –> Enable **Upload binary file** –> Drag and drop a package file –> Disable **Audo-generate checksum** –> Select **MD5** checksum algorithm, Checksum is blank –> add.

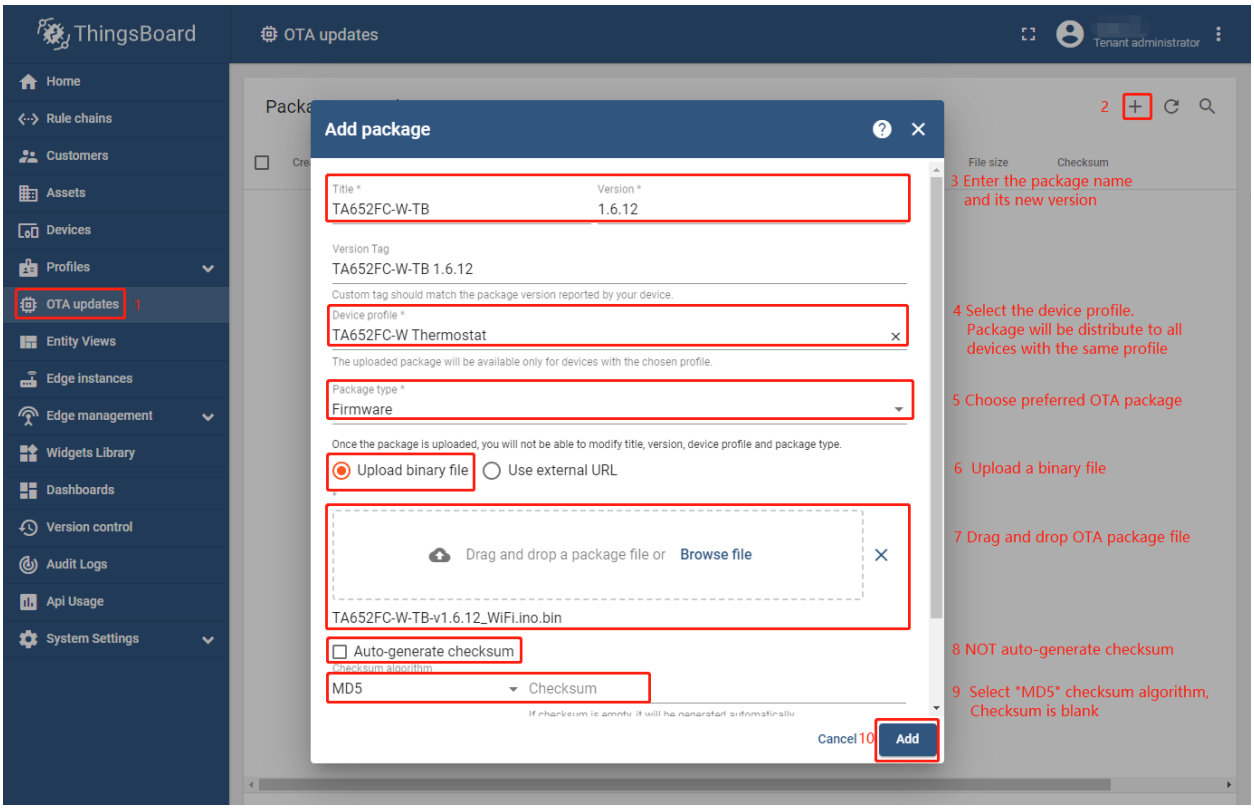
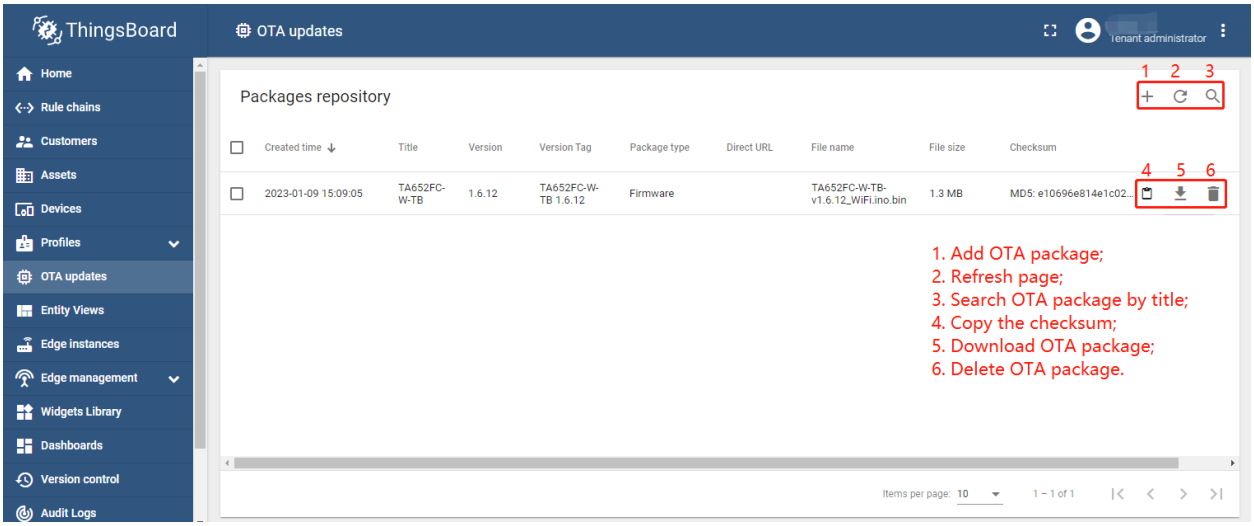


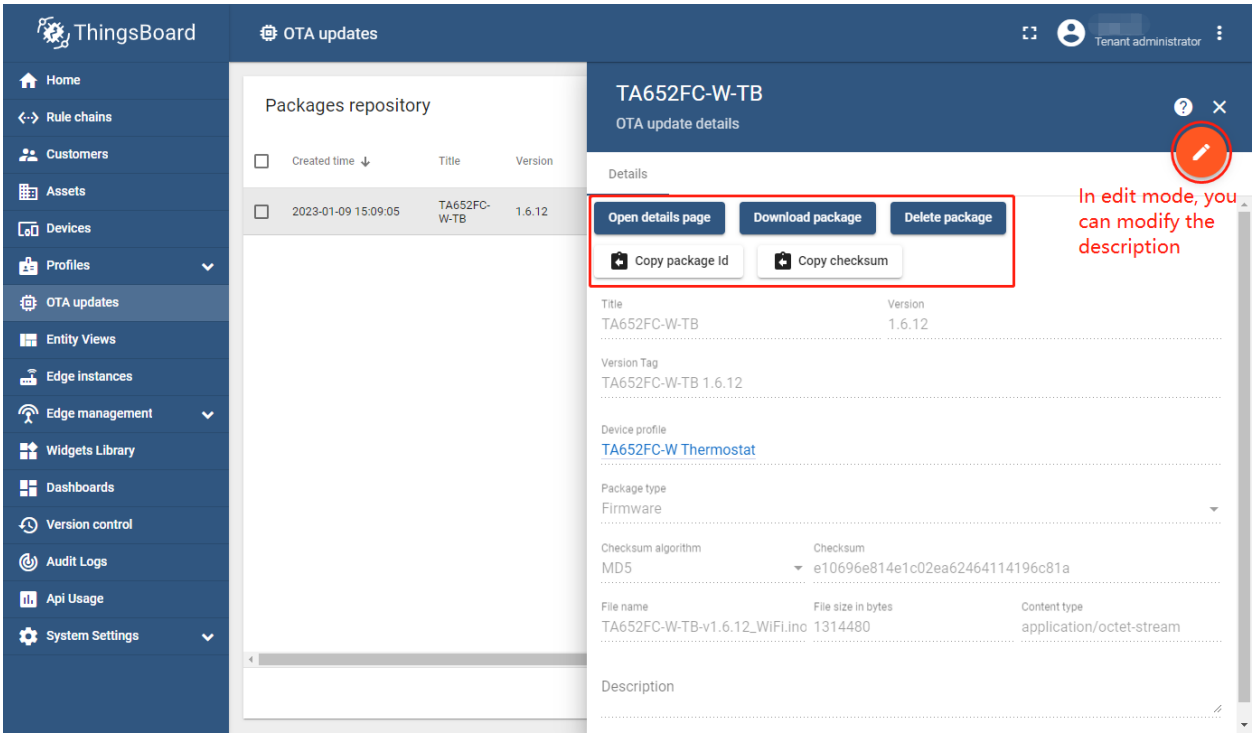
Table 1: OTA package parameters

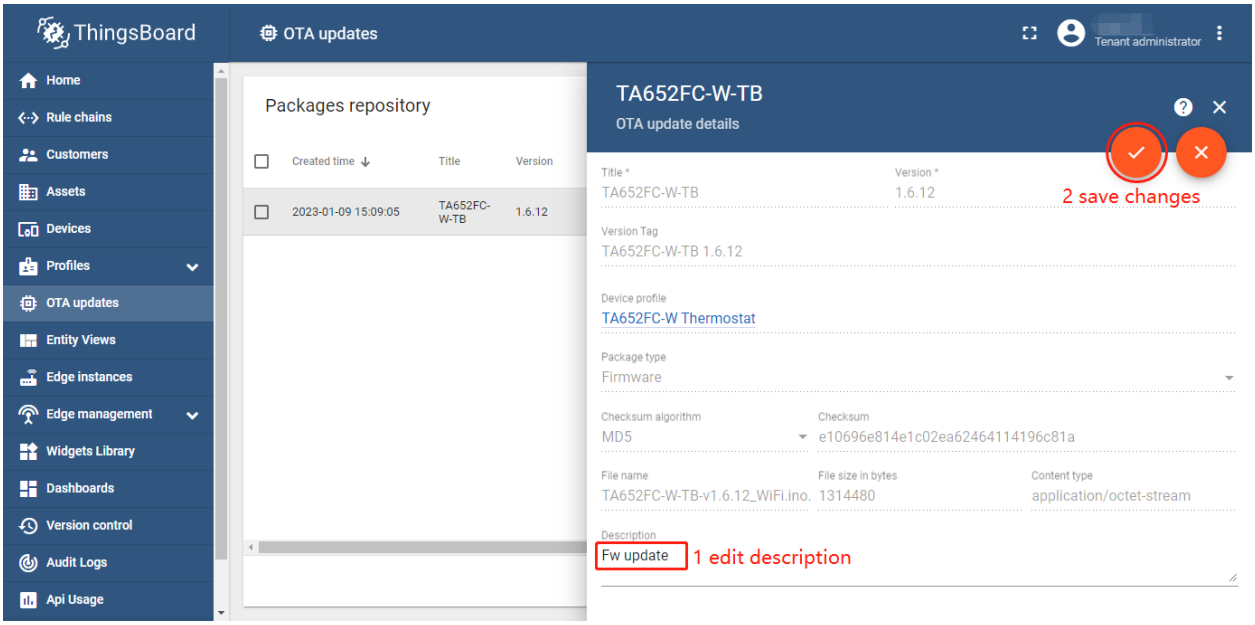
Model	Title	Version	Device profile	Type	Checksum algorithm
TA652FC-W	TA652FC-W-TB	e.g. 1.6.10	TA652FC-W Thermostat	Firmware	MD5
TA652FH-W	TA652FH-W-TB	e.g. 1.6.10	TA652FH-W Thermostat	Firmware	MD5

- Navigate to the "OTA Updates" menu item to list and upload OTA update packages. Each package consist of:
  - Title - the name of your package. You can use different names for production and debug firmware.
  - Version - the version of your package. Combination of the title and version must be unique in scope of a tenant.
  - Device Profile - each package is compatible with one device profile. We track compatibility to prevent accidental updates of devices with incompatible firmware. Link to a device profile means that device that use this profile may be updated to the current package. However, the update is not triggered, until the user or script *assigns* the package to the device profile or device.
  - Type - can be either Firmware or Software.
  - Checksum algorithm - optional parameter, it is a short name of the checksum algorithm to use. Please select **MD5** checksum algorithm.
  - Checksum - optional parameter, it's a value of the file checksum. If no checksum provided by the user, server will use SHA-256 algorithm automatically.
  - Description - optional text description of the firmware.
- You can browse the provisioned packages as well as search them by title. Also, you are able to download and delete packages.

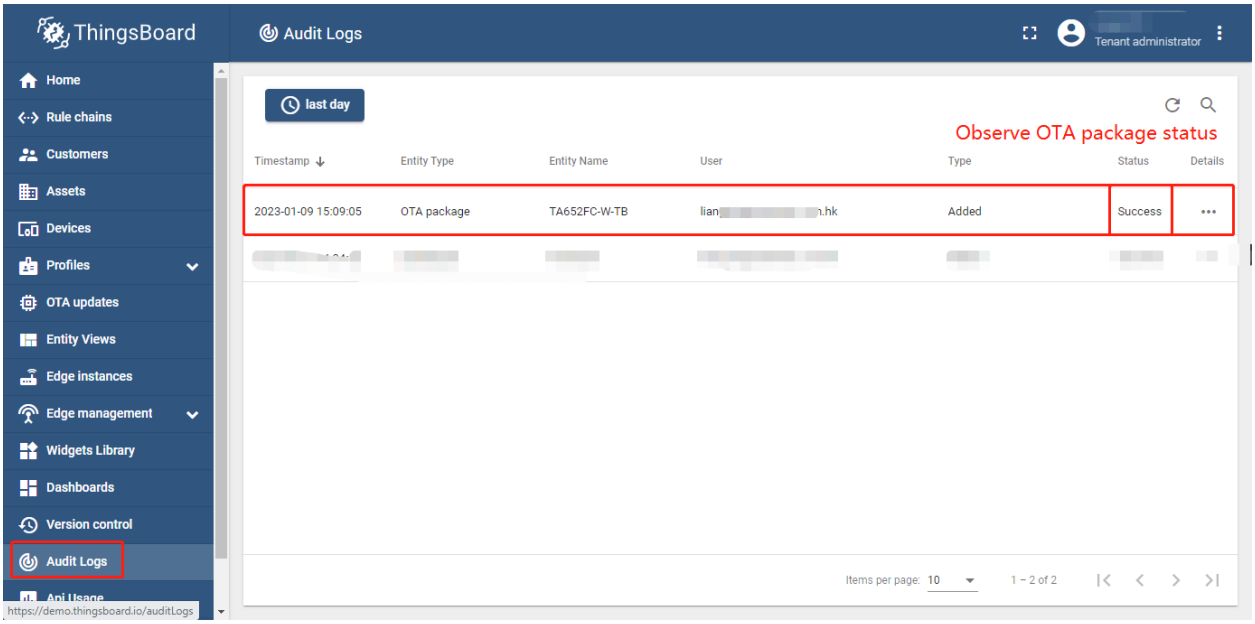


- To open package details, click the table row. Package details allow you to copy package ID and checksum.





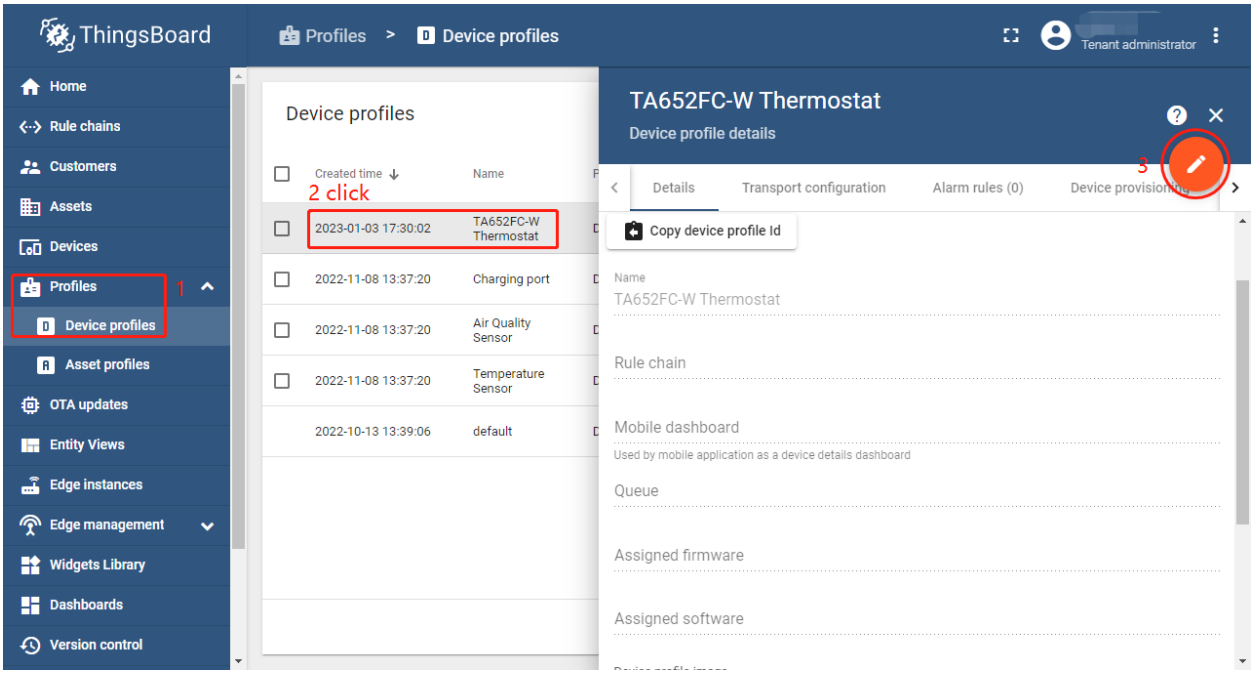
- Also, Audit logs track information about users who provisioned the firmware.

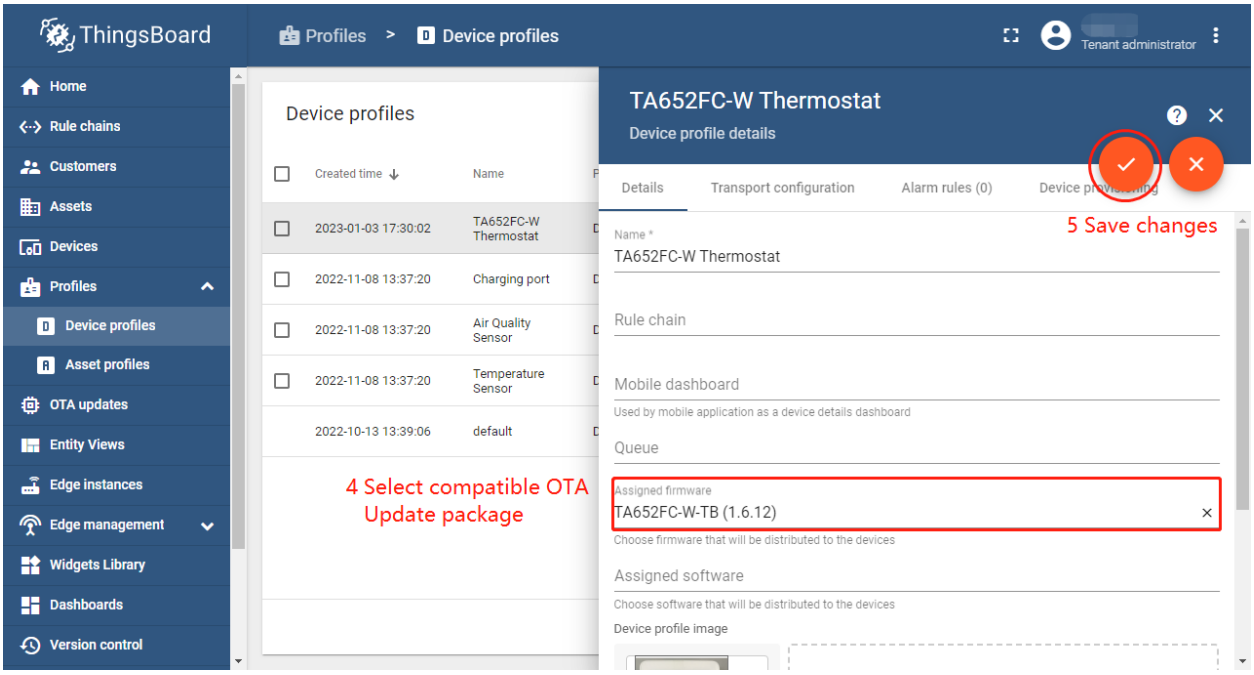


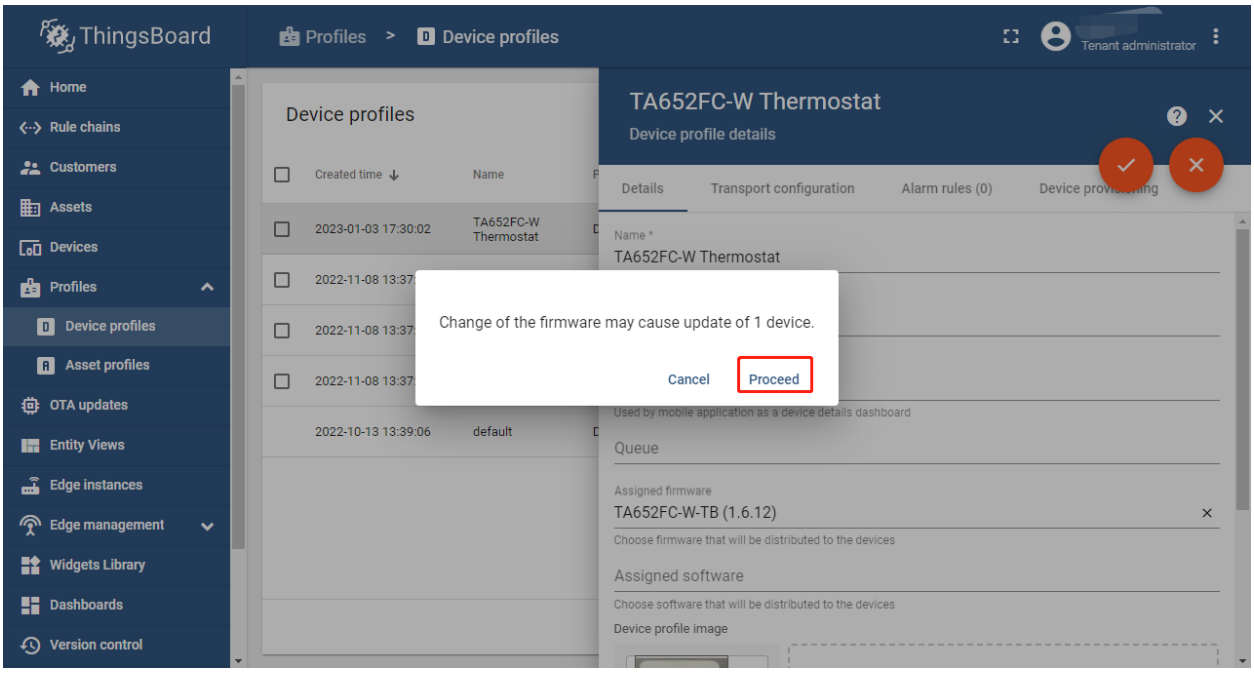
All actions listed are also available via REST API.

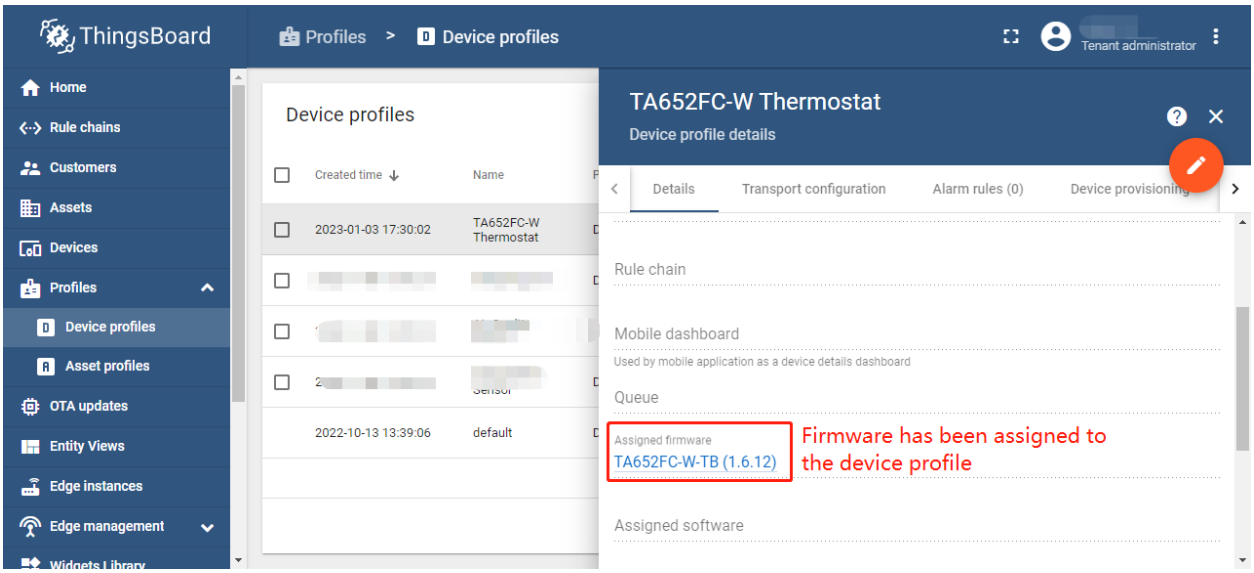
2.2.4 Assign OTA package to device profile

You may assign firmware to the device profile to automatically distribute the package to all devices that share the same profile. See screenshots below.





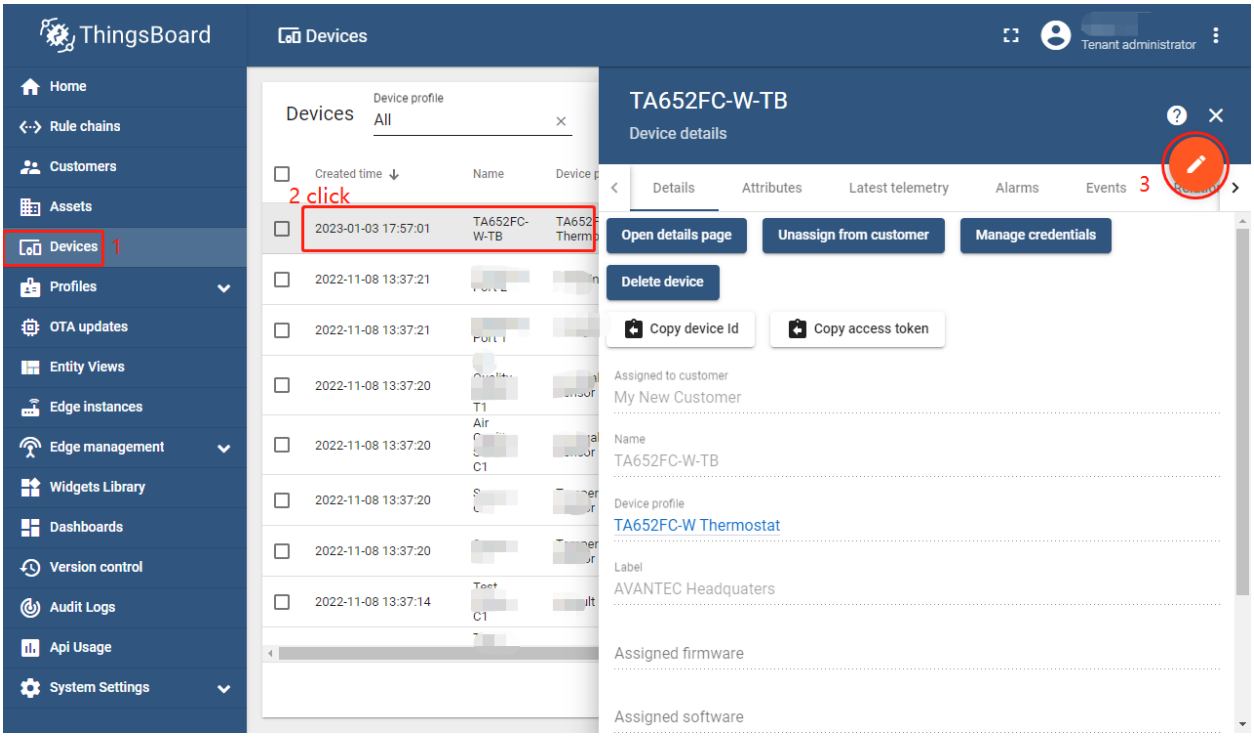


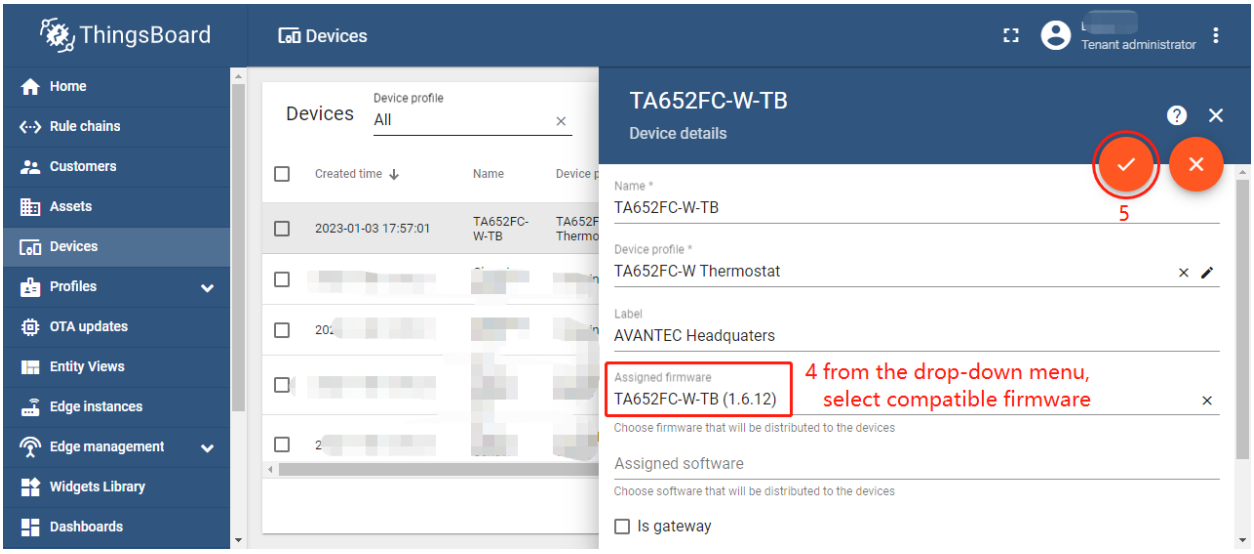


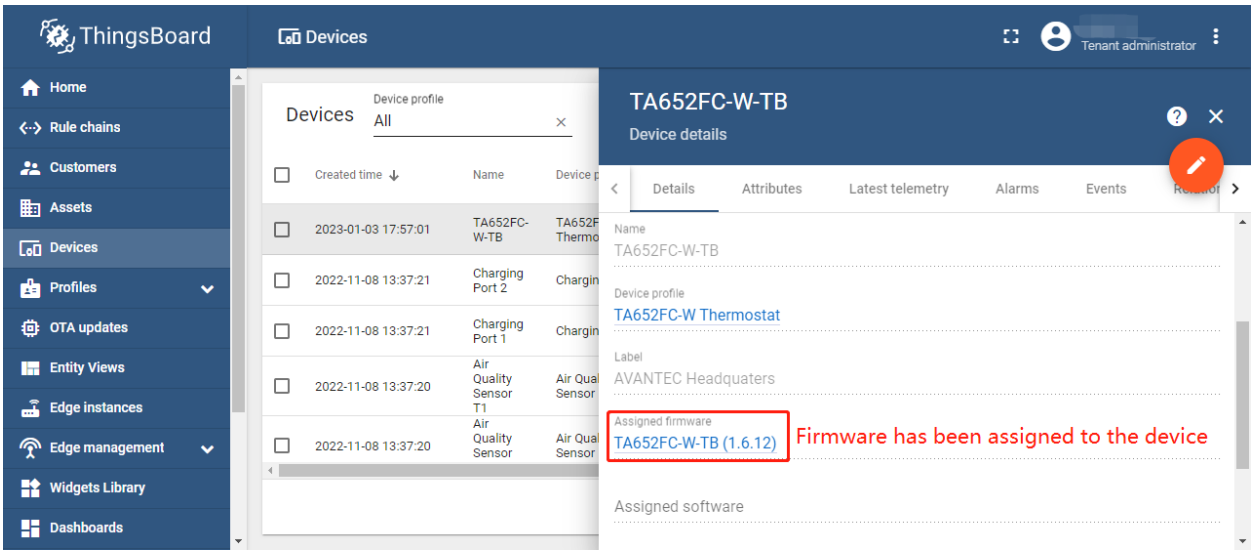
The device profile details will let you choose only compatible OTA update packages (see provisioning for more info). Device profile may be used by thousands of devices. Assignment of the firmware triggers the *Update process*.

2.2.5 Assign OTA package to device

You may also assign firmware to specific device. See screenshots below.







The firmware version assigned to the device will automatically overwrite firmware version that is assigned to the device profile.

For example, let's assume you have Devices D1 and D2 that has Profile P1:

- If you assign package F1 to Profile P1 (via *profile details UI* or REST API), Devices D1 and D2 will be updated to F1.
- If you assign package F2 to Device D1 (via *device details UI* or REST API), Device D1 will be updated to F2.
- Subsequent assignment of the package F3 to the Profile P1 will affect only D2, since it has no specific firmware version assigned on the device level. So, D2 will be updated to F3, while D1 will continue to use F2.

Customers may choose available firmware and assign it to the devices that belong to them. However, customers can't provision or manage firmware packages.

2.2.6 Update process

Assignment of the firmware to the device or device profile triggers the update process. ThingsBoard tracks the progress of the update and persists it to the device attributes.

Update progress may have one of the following states. The state of the update is stored as an attribute of the device and is used to visualize the update process on the *dashboard*.

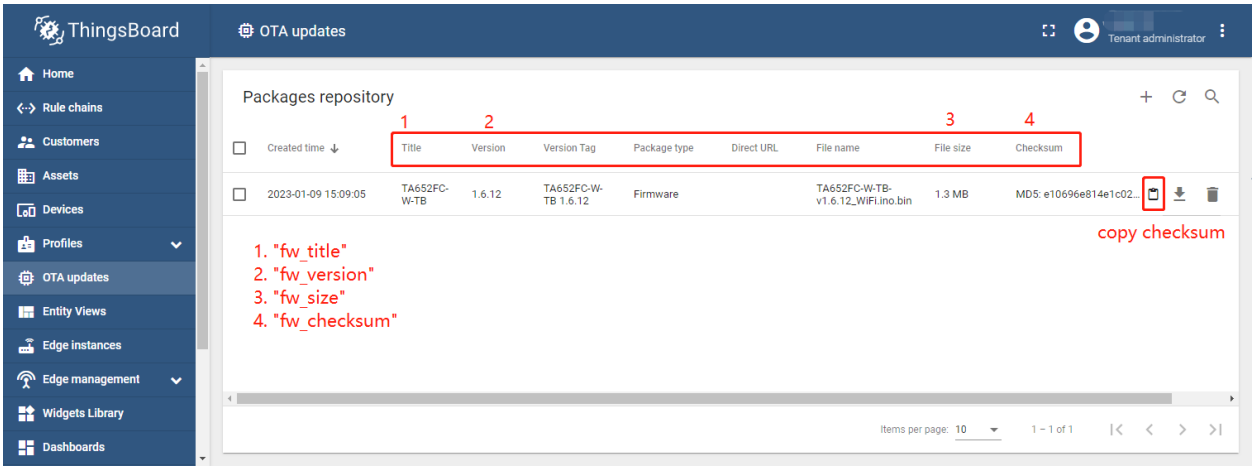
QUEUED state

The very first state of the firmware update. Means that the notification about new firmware is queued but not yet pushed to the device. ThingsBoard queues the update notifications to avoid peak loads. The queue is processed with the constant pace. By default, it is configured to notify up to 100 device per minute. See *configuration properties* for more details.

INITIATED state

Means that the notification about firmware is fetched from queue and pushed to device. Under the hood, ThingsBoard converts notification to the update of the following *shared attributes*:

- fw_title - name of the firmware.
- fw_version - version of the firmware.
- fw_size - size of the firmware file in bytes.
- fw_checksum - attribute that is used to verify integrity of the received file.
- fw_checksum_algorithm - the algorithm used to calculate file checksum.



Device is able to subscribe to shared attribute update using *MQTT API*.

Update states reported by the device

The remaining states are reported by the device firmware that is currently processing the update. We have prepared description of those states and sample applications for the most popular protocols written in python. Sample applications simulate behavior of the device firmware and may used as a reference for the implementation.

- DOWNLOADING - notification about new firmware update was received and device started downloading the update package.
- DOWNLOADED - device completed downloading of the update package.
- VERIFIED - device verified the checksum of the downloaded package.
- UPDATING - device started the firmware update. Typically is sent before reboot of the device or restart of the service.
- UPDATED - the firmware was successfully updated to the next version.
- FAILED - checksum wasn't verified, or the device failed to update. See "Device failed" tab on the Firmware dashboard for more details.
- Once the firmware is updated, ThingsBoard expect the device to send the following telemetry:

for firmware:

```
{"current_fw_title": "TA652FC-W-TB", "current_fw_version": "1.6.3", "fw_state": "UPDATED
↪"}
```

If the firmware update failed, ThingsBoard expect the device to send the following telemetry:

for firmware:

```
{"fw_state": "FAILED", "fw_error":  "the human readable message about the cause of the␣
↪error"}
```

Firmware of the device is updated. To see its status, you should go to the firmware dashboard as it shows in the following paragraph.

To find out about the firmware update, you need to *make a request and subscribe to attributes*.

2.2.7 Configuration

Queue processing pace

To set the max number of devices that will be notified in the chosen time period using the following configuration properties:

```
export TB_QUEUE_CORE_FW_PACK_INTERVAL_MS=60000
export TB_QUEUE_CORE_FW_PACK_SIZE=100
```

Max size setting

By default, the maximum size of firmware that we can save in database is 2 gb. It can not be configured.

2.3 Working with IoT Dashboards

Reprinted articles: https://thingsboard.io/docs/user-guide/dashboards/

ThingsBoard allows you to configure customizable IoT dashboards. Each IoT Dashboard may contain multiple dashboard widgets that visualize data from multiple IoT devices. Once IoT Dashboard is created, you may assign it to one of the customers of you IoT project.

IoT Dashboards are light-weight and you may have millions of dashboards. For example, you may automatically create a dashboard for each new customer based on data from registered customer IoT devices. Or you may modify dashboard via script when a new device is assigned to a customer. All these actions may be done manually or automated via REST API.

You can find useful links to get started below:

- **Dashboards**
  ThingsBoard provides the ability to create and manage dashboards. Each dashboard can contain plenty of widgets. Dashboards display data from many entities: devices, assets, etc. Dashboards can be assigned to Customers.
- **Widgets Library**
  All IoT Dashboards are constructed using ThingsBoard widgets defined in the Widget Library. Each widget provides end-user functionality such as data visualization, remote device control, alarm management and display of static custom HTML content.
  - **Digital** and **analog** gauges for latest real-time values visualization
  - Highly customizable Bar and Line **charts** for visualization of historical and sliding-window data points

  - **Map** widgets for tracking movement and latest positions of IoT devices on Google or OpenStreet maps.
  - **GPIO** control widgets that allow sending GPIO toggle commands to devices.
  - **Card** widgets to enhance your dashboards with flexible HTML labels based on static content or latest telemetry values from IoT devices.

2.3.1 How to customize

- **In Avantec Widgets & Avantec Dashboards:**
  - Change widget title, background, colors, fonts, shadows, etc
  - Add or remove widget
  - Modify dashboard states, aliases and widget actions
  - Visualizing assets data using Maps and Tables
- Create new Widgets
- Create your Dashboards

2.3.2 Next steps

- **ThingsBoard Data visualization**
  - Visualizing assets data using Maps and Tables : Learn how to: create assets and devices and define their relationships; add the server attributes and create a new dashboard; visualize data from the asset attributes using “Entities Table” and “Map” widgets.
  - Dashboard states, aliases and widget actions : Learn how to: add and configure new dashboard states; create various aliases; visualize the attributes data using the Image Map widget; create actions in different widgets in order to navigate between states; visualize the telemetry data using Analogue and Digital gauges and the Time-series widget.
  - Remote device control and alarm management : Learn how to: add and use the Knob Control widget; create alarm rules; handle alarms using the Alarms widget; make a dashboard public.
  - Basic widget settings : Learn how to: change widget title, background, colors, fonts, shadows, etc.
  - Latest Values Map widget : Learn how to create Map widget, based on latitude and longitude, and customize the Map widget layout and properties.
  - Time Series Map widget : Learn how to display your devices with the latest telemetry data on the Time Series Map widget and modify the widget properties.
  - Trip Animation widget : Learn how to display your devices with the latest telemetry data on the Trip Animation widget and modify the widget properties.
- **ThingsBoard Contribution and Development**
  - Widgets Development Guide : Learn how to customize and create custom widgets.

2.4 Getting Started with Rule Engine

2.4.1 What is ThingsBoard Rule Engine?

Rule Engine is an easy to use framework for building event-based workflows. There are 3 main components:

- **Message** - any incoming event. It can be an incoming data from devices, device life-cycle event, REST API event, RPC request, etc.
- **Rule Node** - a function that is executed on an incoming message. There are many different Node types that can filter, transform or execute some action on incoming Message.
- **Rule Chain** - nodes are connected with each other with relations, so the outbound message from rule node is sent to next connected rule nodes.

2.4.2 Typical Use Cases

ThingsBoard Rule Engine is a highly customizable framework for complex event processing. Here are some common use cases that one can configure via ThingsBoard Rule Chains:

- Data validation and modification for incoming telemetry or attributes before saving to the database.
- Copy telemetry or attributes from devices to related assets so you can aggregate telemetry. For example data from multiple devices can be aggregated in related Asset.
- Create/Update/Clear alarms based on defined conditions.
- Trigger actions based on device life-cycle events. For example, create alerts if Device is Online/Offline.
- Load additional data required for processing. For example, load temperature threshold value for a device that is defined in Device's Customer or Tenant attribute.
- Trigger REST API calls to external systems.
- Send emails when complex event occurs and use attributes of other entities inside Email Template.
- Take into account User preferences during event processing.
- Make RPC calls based on defined condition.
- Integrate with external pipelines like Kafka, Spark, AWS services, etc.

See Getting Started with Rule Engine.

2.5 White-labeling

Tip: ThingsBoard PE Feature

Only Professional Edition supports White-labeling feature. Use ThingsBoard Cloud or install your own platform instance.

2.5.1 Feature

ThingsBoard web interface allows you to configure your company or product logo and color scheme in 2 minutes with zero coding efforts and no service restart required. The following configuration options are available:

- Configure color scheme, icon and favicon on System Administrator level;
- Tenant and Customer Administrator UI inherits configuration changes by default;
- Tenant and Customer Administrators are able to set up their own white-labeling configuration;
- System and Tenant Administrator are able to set up custom email server settings and customer email templates to interact with the users;
- Allow System administrator to enable/disable white-labeling for each tenant;
- Allow Tenant administrator to enable/disable white-labeling for each customer;
- Allow Tenant administrator to configure custom translation of system components and end-user dashboard elements.

See White-labeling.

2.5.2 Next steps

- Self-registration - allows tenant to configure sign-up page for its customers to be able to simply sign-up and login to the ThingsBoard with predefined permission configurations.
- Custom Translation - allows you to upload alternative to existing language translations and extend the translation to specific GUI elements on the dashboards.
- Custom Menu - allows you to extend ThingsBoard UI with custom menu items and show/hide existing menu items.

2.6 Installation options

ThingsBoard is designed to run and utilize on majority of hardware, from local Raspberry PI to powerful servers in the cloud

- The alternative option is to install ThingsBoard using Installation Guide.
- **Windows** users should follow this guide.

2.7 Mobile application

2.7.1 ThingsBoard mobile application

The ThingsBoard Mobile Application is an open-source mobile application project based on Flutter. It allows you to build your own IoT mobile application with minimum coding efforts.

This documentation can help you set up and run your first IoT mobile app, learn how to customize the app and publish it to Google Play or App Store.

- Getting started with mobile application - Learn how to setup and run your first IoT mobile app.
- Customize your app with mobile application - Learn how to customize your app without code changes.

- Publish your app with mobile application - Learn how to publish your app to Google Play or App Store.

2.7.2 ThingsBoard PE mobile application

The ThingsBoard **PE** Mobile Application is an open-source PE mobile application project based on Flutter. It allows you to build your own IoT mobile application with minimum coding efforts.

This documentation can help you set up and run your first IoT mobile app, learn how to customize the app and publish it to Google Play or App Store.

- Getting started with PE mobile application - Learn how to setup and run your first IoT mobile app.
- Customize your app with PE mobile application - Learn how to customize your app without code changes.
- Publish your app with PE mobile application - Learn how to publish your app to Google Play or App Store.

2.8 ThingsBoard MQTT Device API

2.8.1 Introduction

See ThingsBoard API reference.

ThingsBoard API consists of two main parts: **Device API** and **Server-side API**.

- **Server-side API is available as *REST API* and *Websocket API*:**
  - ***REST API*:**
    - Administration REST API - The server-side core APIs.
    - Attributes query API - The server-side APIs provided by Telemetry Service.
    - Time-series query API - The server-side APIs provided by Telemetry Service.
    - RPC API - The server-side APIs provided by RPC Service.
    - REST Client
  - ***Websocket API*:**
    - Websocket API duplicates REST API functionality and provides the ability to subscribe to device data changes.
- **Device API is grouped by supported communication protocols:**
  - MQTT Device API
  - CoAP Device API (Not supported!)
  - HTTP Device API (Not supported!)

2.8.2 Getting started

See MQTT Device API Reference.

MQTT basics

MQTT is a lightweight publish-subscribe messaging protocol which probably makes it the most suitable for various IoT devices. You can find more information about MQTT here.

ThingsBoard server nodes act as an MQTT Broker that supports QoS levels 0 (at most once) and 1 (at least once) and a set of predefined topics.

Client libraries setup

You can find a large number of MQTT client libraries on the web. Examples in this article will be based on Mosquitto and MQTT.js. In order to setup one of those tools, you can use instructions in our Hello World guide.

MQTT Connect

We will use access token device credentials in this article and they will be referred to later as **$ACCESS_TOKEN**. The application needs to send MQTT CONNECT message with username that contains **$ACCESS_TOKEN**. Possible return codes and their reasons during connect sequence:

- **0x00 Connected** - Successfully connected to ThingsBoard MQTT server.
- **0x04 Connection Refused, bad user name or password** - Username is empty.
- **0x05 Connection Refused, not authorized** - Username contains invalid **$ACCESS_TOKEN**.

2.8.3 Key-value format

By default, ThingsBoard supports key-value content in **JSON**. Key is always a string, while value can be either string, boolean, double, long or JSON. For example:

```
{
   "stringKey":"value1",
   "booleanKey":true,
   "doubleKey":42.0,
   "longKey":73,
   "jsonKey": {
      "someNumber": 42,
      "someArray": [1,2,3],
      "someNestedObject": {"key": "value"}
   }
}
```

2.8.4 Telemetry upload API

In order to publish telemetry data to ThingsBoard server node, send PUBLISH message to the following topic:

```
v1/devices/me/telemetry
```

The simplest supported data formats are:

```
{"key1":"value1", "key2":"value2"}
```

or

```
[{"key1":"value1"}, {"key2":"value2"}]
```

Please note that in this case, the server-side timestamp will be assigned to uploaded data!

In case your device is able to get the client-side timestamp, you can use following format:

```
{"ts":1451649600512, "values":{"key1":"value1", "key2":"value2"}}
```

In the example above, we assume that "1451649600512" is a unix timestamp with milliseconds precision. For example, the value "1451649600512" corresponds to "Fri, 01 Jan 2016 12:00:00.512 GMT"

Example

Client library	Shell file	JSON file
Mosquitto	*mosquitto-telemetry.sh*	• *telemetry-data-as-object.json* • *telemetry-data-as-array.json*
MQTT.js	*mqtt-js-telemetry.sh*	• *telemetry-data-with-ts.json*

mosquitto-telemetry.sh

```
# Publish data as an object without timestamp (server-side timestamp will be used)
mosquitto_pub -d -h "127.0.0.1" -t "v1/devices/me/telemetry" -u "$ACCESS_TOKEN" -f
↪"telemetry-data-as-object.json"
# Publish data as an array of objects without timestamp (server-side timestamp will be␣
↪used)
mosquitto_pub -d -h "127.0.0.1" -t "v1/devices/me/telemetry" -u "$ACCESS_TOKEN" -f
↪"telemetry-data-as-array.json"
# Publish data as an object with timestamp (server-side timestamp will be used)
mosquitto_pub -d -h "127.0.0.1" -t "v1/devices/me/telemetry" -u "$ACCESS_TOKEN" -f
↪"telemetry-data-with-ts.json"
```

mqtt-js-telemetry.sh

```
# Publish data as an object without timestamp (server-side timestamp will be used)
cat telemetry-data-as-object.json | mqtt pub -v -h "127.0.0.1" -t "v1/devices/me/
↪telemetry" -u '$ACCESS_TOKEN' -s
# Publish data as an array of objects without timestamp (server-side timestamp will be␣
↪used)
cat telemetry-data-as-array.json | mqtt pub -v -h "127.0.0.1" -t "v1/devices/me/telemetry
↪" -u '$ACCESS_TOKEN' -s
# Publish data as an object with timestamp (server-side timestamp will be used)
cat telemetry-data-with-ts.json | mqtt pub -v -h "127.0.0.1" -t "v1/devices/me/telemetry
↪" -u '$ACCESS_TOKEN' -s
```

telemetry-data-as-object.json

```
{
   "stringKey": "value1",
   "booleanKey": true,
   "doubleKey": 42.0,
   "longKey": 73,
   "jsonKey": {
      "someNumber": 42,
      "someArray": [1,2,3],
      "someNestedObject": {"key": "value"}
   }
}
```

telemetry-data-as-array.json

```
[{"key1":"value1"}, {"key2":true}]
```

telemetry-data-with-ts.json

```
{
   "ts": 1451649600512,
   "values": {
      "stringKey": "value1",
      "booleanKey": true,
      "doubleKey": 42.0,
      "longKey": 73,
      "jsonKey": {
         "someNumber": 42,
         "someArray": [1, 2, 3],
         "someNestedObject": {
         "key": "value"
         }
      }
```

(continues on next page)

(continued from previous page)

```
    }
}
```

2.8.5 Attributes API

ThingsBoard attributes API allows devices to

- Request client-side and shared device attributes from the server.
- Upload client-side device attributes to the server.
- Subscribe to shared device attributes from the server.

Request attribute values from the server

Before sending PUBLISH message with the attributes request, client need to **subscribe** to:

```
v1/devices/me/attributes/response/+
```

Once subscribed, the client may request client-side or shared device attributes to ThingsBoard server node, send **PUBLISH** message to the following topic:

```
v1/devices/me/attributes/request/$request_id
```

where **$request_id** is your integer request identifier.

The client should receive the response to the following topic:

```
v1/devices/me/attributes/response/$request_id
```

Example

The following example is written in javascript and is based on mqtt.js. Pure command-line examples are not available because subscribe and publish need to happen in the same mqtt session.

Client library	Shell file	JavaScript file	Result (JSON file)
MQTT.js	*mqtt-js-attributes-request.sh*	*mqtt-js-attributes-request.js*	*attributes-response.json*

mqtt-js-attributes-request.sh

```
export TOKEN=$ACCESS_TOKEN
node mqtt-js-attributes-request.js
```

mqtt-js-attributes-request.js

```
var mqtt = require('mqtt')
var client  = mqtt.connect('mqtt://127.0.0.1',{
   username: process.env.TOKEN
})

client.on('connect', function () {
   console.log('connected')
   client.subscribe('v1/devices/me/attributes/response/+')
   client.publish('v1/devices/me/attributes/request/1', '{"clientKeys":"attribute1,
↪attribute2", "sharedKeys":"shared1,shared2"}')
})

client.on('message', function (topic, message) {
   console.log('response.topic: ' + topic)
   console.log('response.body: ' + message.toString())
   client.end()
})
```

attributes-response.json

```
{"key1":"value1"}
```

Please note, the intersection of client-side and shared device attribute keys is a **bad** practice! However, it is still possible to have same keys for client, shared or even server-side attributes.

Publish attribute update to the server

In order to publish client-side device attributes to ThingsBoard server node, send **PUBLISH** message to the following topic:

```
v1/devices/me/attributes
```

Example

Client library	Shell file	JSON file
Mosquitto	*mosquitto-attributes-publish.sh*	*new-attributes-values.json*
MQTT.js	*mqtt-js-attributes-publish.sh*	

mosquitto-attributes-publish.sh

```
# Publish client-side attributes update
mosquitto_pub -d -h "127.0.0.1" -t "v1/devices/me/attributes" -u "$ACCESS_TOKEN" -f "new-
↪attributes-values.json"
```

mqtt-js-attributes-publish.sh

```
# Publish client-side attributes update
cat new-attributes-values.json | mqtt pub -d -h "127.0.0.1" -t "v1/devices/me/attributes
↪" -u '$ACCESS_TOKEN' -s
```

new-attributes-values.json

```
{
   "stringKey": "value1",
   "booleanKey": true,
   "doubleKey": 42.0,
   "longKey": 73,
   "jsonKey": {
      "someNumber": 42,
      "someArray": [1,2,3],
      "someNestedObject": {"key": "value"}
   }
}
```

Subscribe to attribute updates from the server

In order to subscribe to shared device attribute changes, send **SUBSCRIBE** message to the following topic:

```
v1/devices/me/attributes
```

When a shared attribute is changed by one of the server-side components (such as the REST API or the Rule Chain), the client will **receive** the following update:

```
{"key1":"value1"}
```

Example

Client library	Shell file
Mosquitto	*mosquitto-attributes-subscribe.sh*
MQTT.js	*mqtt-js-attributes-subscribe.sh*

mosquitto-attributes-subscribe.sh

```
# Subscribes to attribute updates
mosquitto_sub -d -h "127.0.0.1" -t "v1/devices/me/attributes" -u "$ACCESS_TOKEN"
```

mqtt-js-attributes-subscribe.sh

```
# Subscribes to attribute updates
mqtt sub -v "127.0.0.1" -t "v1/devices/me/attributes" -u '$ACCESS_TOKEN'
```

2.8.6 PRC API

Server-side RPC

In order to subscribe to RPC commands from the server, send **SUBSCRIBE** message to the following topic:

```
v1/devices/me/rpc/request/+
```

Once subscribed, the client will receive individual commands as a **PUBLISH** message to the corresponding topic:

```
v1/devices/me/rpc/request/$request_id
```

where **$request_id** is an integer request identifier.

The client should publish the response to the following topic:

```
v1/devices/me/rpc/response/$request_id
```

Example

The following example is written in javascript and is based on mqtt.js. Pure command-line examples are not available because subscribe and publish need to happen in the same mqtt session.

Client library	Shell file	JavaScript file
MQTT.js	*mqtt-js-rpc-from-server.sh*	*mqtt-js-rpc-from-server.js*

mqtt-js-rpc-from-server.sh

```
export TOKEN=$ACCESS_TOKEN
node mqtt-js-rpc-from-server.js
```

mqtt-js-rpc-from-server.js

```
var mqtt = require('mqtt');
var client  = mqtt.connect('mqtt://127.0.0.1',{
   username: process.env.TOKEN
});

client.on('connect', function () {
   console.log('connected');
   client.subscribe('v1/devices/me/rpc/request/+')
});

client.on('message', function (topic, message) {
   console.log('request.topic: ' + topic);
   console.log('request.body: ' + message.toString());
   var requestId = topic.slice('v1/devices/me/rpc/request/'.length);
   //client acts as an echo service
   client.publish('v1/devices/me/rpc/response/' + requestId, message);
});
```

Client-side RPC

In order to subscribe to client-side RPC response from the server, send **SUBSCRIBE** message to the following topic:

```
v1/devices/me/rpc/response/+
```

Once subscribed, the client may send **PUBLISH** message to the following topic:

```
v1/devices/me/rpc/request/$request_id
```

where **$request_id** is an integer request identifier. The response from server will be published to the following topic:

```
v1/devices/me/rpc/response/$request_id
```

Example

The following example is written in javascript and is based on mqtt.js. Pure command-line examples are not available because subscribe and publish need to happen in the same mqtt session.

Client library	Shell file	JavaScript file
MQTT.js	*mqtt-js-rpc-from-client.sh*	*mqtt-js-rpc-from-client.js*

mqtt-js-rpc-from-client.sh

```
export TOKEN=$ACCESS_TOKEN
node mqtt-js-rpc-from-client.js
```

mqtt-js-rpc-from-client.js

```
var mqtt = require('mqtt');
var client = mqtt.connect('mqtt://127.0.0.1', {
   username: process.env.TOKEN
});

client.on('connect', function () {
   console.log('connected');
   client.subscribe('v1/devices/me/rpc/response/+');
   var requestId = 1;
   var request = {
      "method": "getTime",
      "params": {}
   };
   client.publish('v1/devices/me/rpc/request/' + requestId, JSON.stringify(request));
});

client.on('message', function (topic, message) {
   console.log('response.topic: ' + topic);
   console.log('response.body: ' + message.toString());
});
```

2.8.7 Claiming API

Please see the corresponding article to get more information about the Claiming devices feature.

In order to initiate claiming device, send PUBLISH message to the following topic:

```
v1/devices/me/claim
```

The supported data format is:

```
{"secretKey":"value", "durationMs":60000}
```

Please note that the above fields are optional. In case the **secretKey** is not specified, the empty string as a default value is used. In case the **durationMs** is not specified, the system parameter **device.claim.duration** is used (in the file **/etc/thingsboard/conf/thingsboard.yml**).

2.8.8 Firmware API

Replace 8192 with your chunk size.

When ThingsBoard initiates an MQTT device firmware update, it sets the `fw_title`, `fw_version`, `fw_checksum`, `fw_checksum_algorithm` shared attributes. To receive the shared attribute updates, the device has to subscribe to:

```
v1/devices/me/attributes/response/+
```

Where

+ is the Wildcard character.

When the MQTT device receives updates for fw_title and fw_version shared attributes, it has to send PUBLISH message to:

```
v2/fw/request/${requestId}/chunk/${chunkIndex}
```

Where

${requestId} - number corresponding to the number of firmware updates. The ${requestId} has to be different for each firmware update.

${chunkIndex} - number corresponding to the index of firmware chunks. The ${chunkID} are counted from 0. The device must increment the chunk index for each request until the received chunk size is zero. And the MQTT payload should be the size of the firmware chunk in bytes.

For each new firmware update, you need to change the request ID and subscribe to:

```
v2/fw/response/+/chunk/+
```

Where

+ is the Wildcard character.

2.8.9 Device MQTT Topic

Table 2: Device MQTT Topic

Function Topic	Subscribe	Tx	Rx
Telemetry		v1/devices/me/telemetry	
Request attributes	v1/devices/me/attributes	v1/devices/me/attributes/request/	v1/devices/me/attributes/response/${requestId}
Publish attributes		v1/devices/me/attributes	
Subscribe attributes update	v1/devices/me/attributes		v1/devices/me/attributes
Server-Side RPC	v1/devices/me/rpc/reque	v1/devices/me/rpc/response/${re	v1/devices/me/rpc/request/${requestId}
Client-Side RPC	v1/devices/me/rpc/respo	v1/devices/me/rpc/request/${requ	v1/devices/me/rpc/response/${requestId}
Claiming device		v1/devices/me/claim	
Firmware updates*	v2/fw/response/+/chunk	v2/fw/request/${requestId}/chunl	v2/fw/response/${requestId}/chunk/${chunkIndex}

Note:

- The order in which topics are performed.
- **Firmware updates** needs the support of *Telemetry*, *Request attributes* and *Subscribe attributes update*.

CHAPTER

THREE

AVANTEC EXTENSION

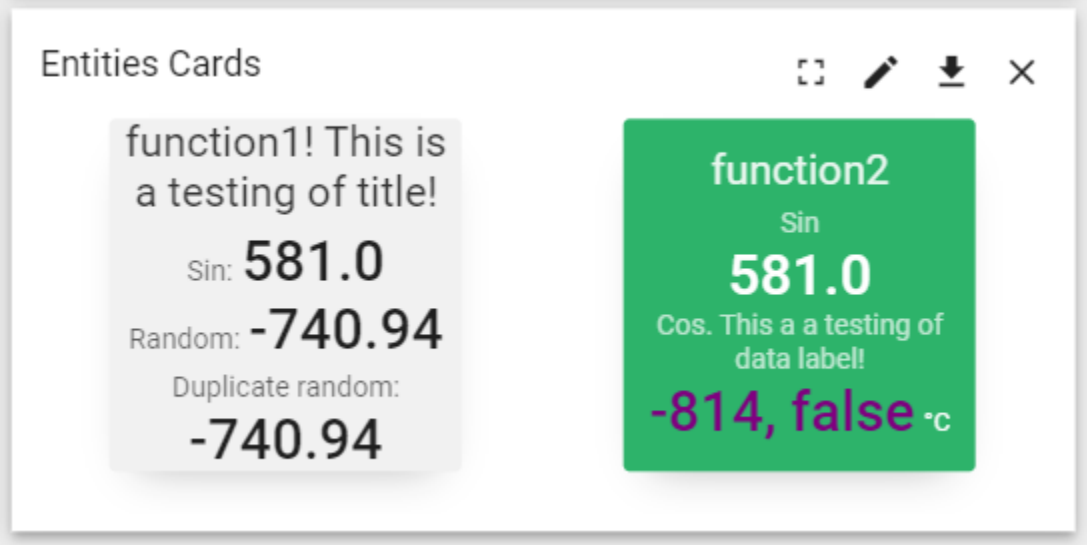
Here is an overview about Avantec Customization.

3.1 Avantec widgets

3.1.1 Widget list

Entities cards

Latest values widget.



Configuration:

1. Add all **datasources** and **data keys** in `Data` page.
2. Add some **card templates** in `Advanced` page. A card template per entity alias used in the datasources.
   - **Alias Name**: Entity alias name.
   - **Card HTML pattern**: HTML template. You can use **${dsName}**, **${entityName}**, **${deviceName}**, **${entityLabel}**, **${aliasName}**, **${entityDescription}**, or *${your_datakey_label}* in it.

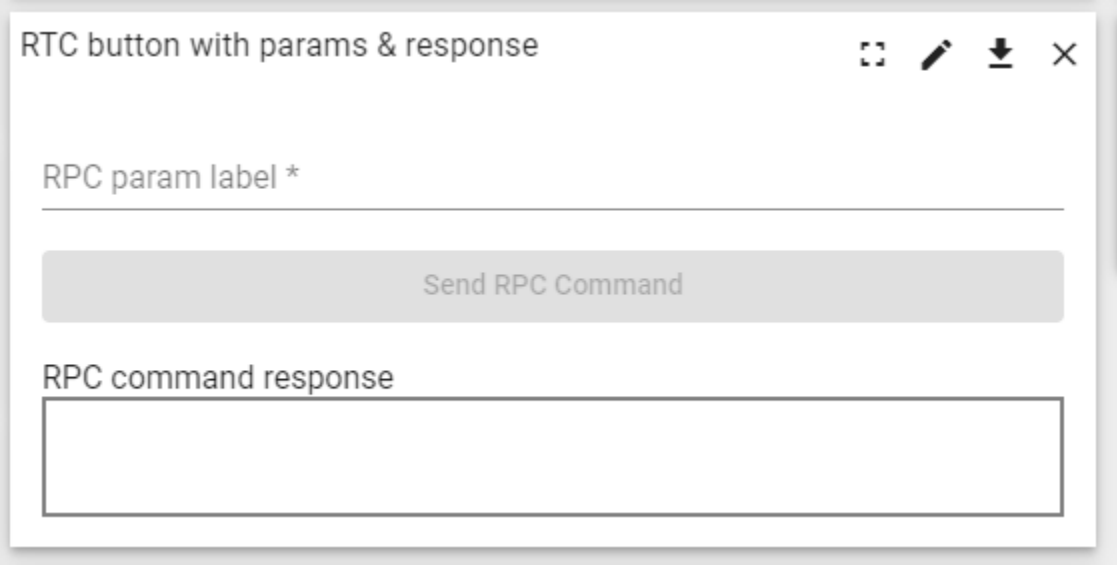
- **Card style function: f(datasource, ctx)**: CSS.

3. Optionally, configure some data keys used in **Card HTML pattern**: `Data` page –> Pen icon –> `Advanced` page.
   - **Cell content function: f(value, datasource, ctx)**: text or HTML
   - **Cell style function: f(value, datasource, ctx)**: CSS.
4. Add some action in `Action` page. A action of element click per entity alias used in the datasources.
   - **Action source**: On HTML element click
   - **Name**: Entity alias name.
5. Optionally, if you want to hide the border of the widget, you should do this in `Settings` page:
   - Disable `Display widget title`.
   - `Background color` of the widget should be the same as `background color` of Dashboard.

RPC button with params & response

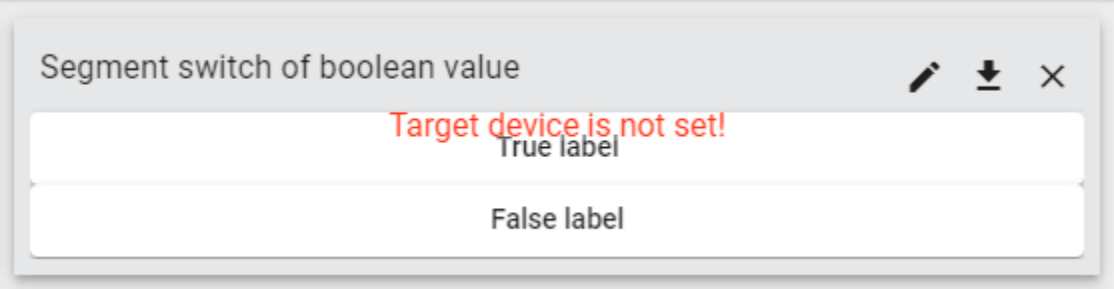
Control widget.

For Server-side RPC.



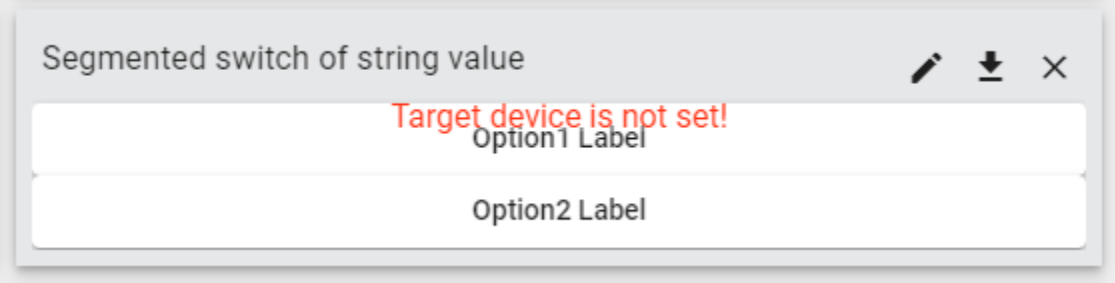
Segmented switch of boolean value

Control widget.



Segmented switch of string value

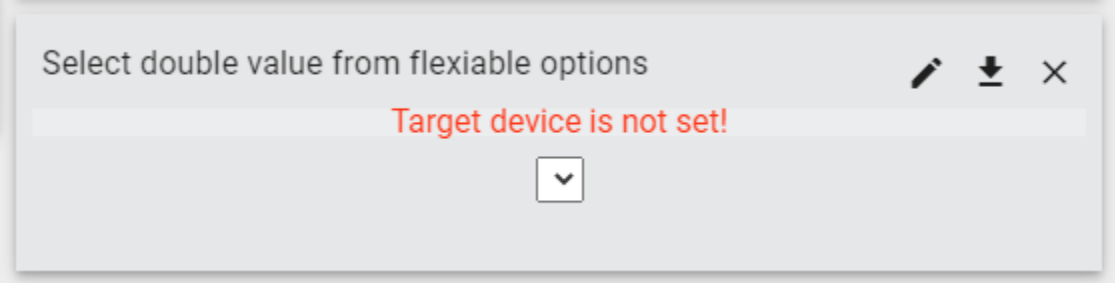
Control widget.



Select double value from flexible options

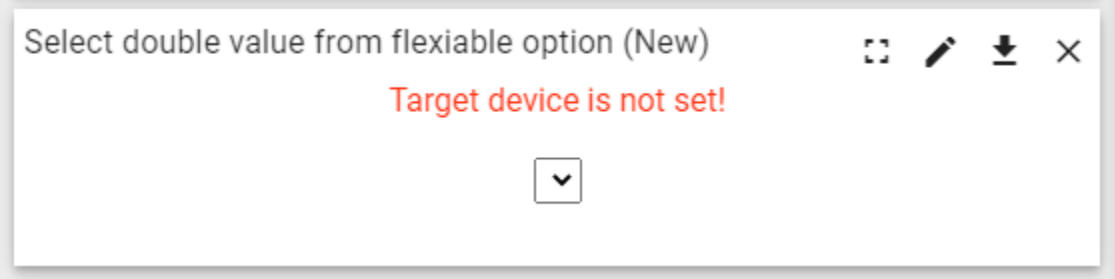
Control widget.

Deprecated!



Select double value from flexible options (New)

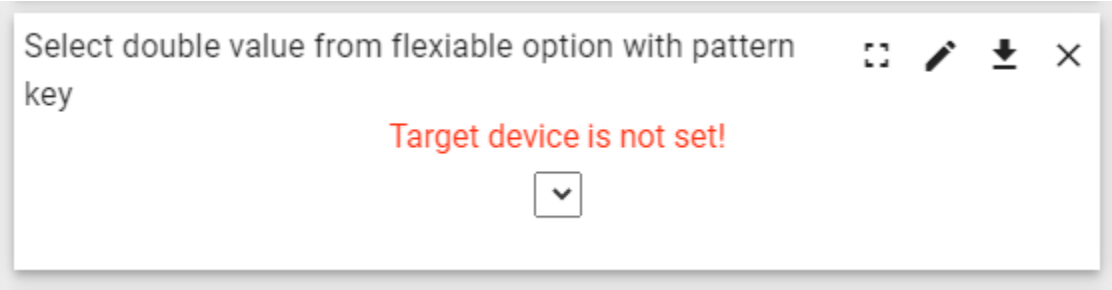
Control widget.



Select double value from flexible options with pattern key

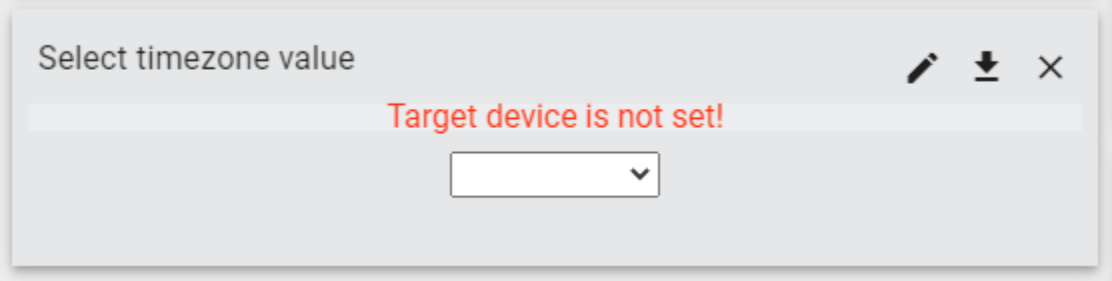
Control widget.

Some parameters of this widget can be appended with a suffix for programming time.



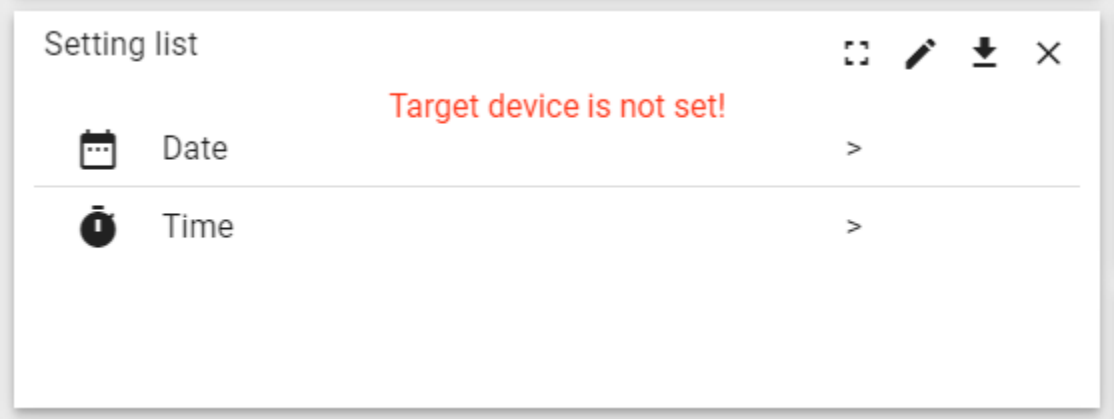
Select time zone value

Control widget.



Setting list

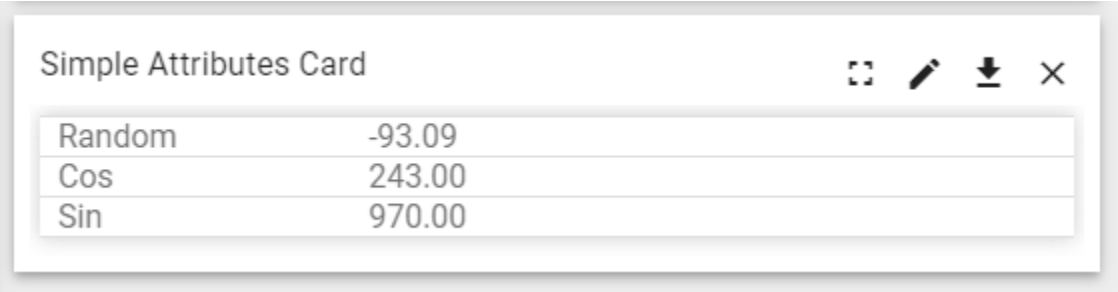
Control widget.



Simple Attributes Card

Latest values widget.

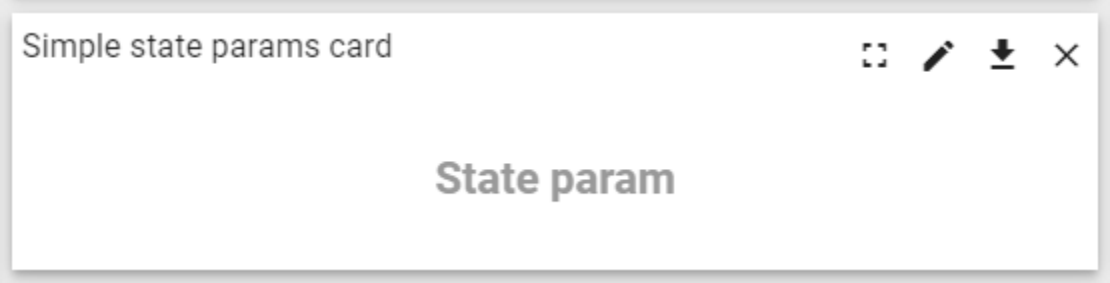
This widget can display the attributes of devices.



Simple state params card

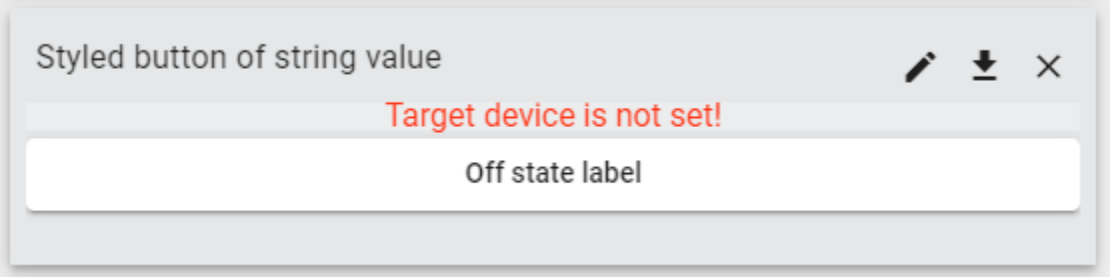
Control widget.

This widget can display the state parameters of the Dashboard.



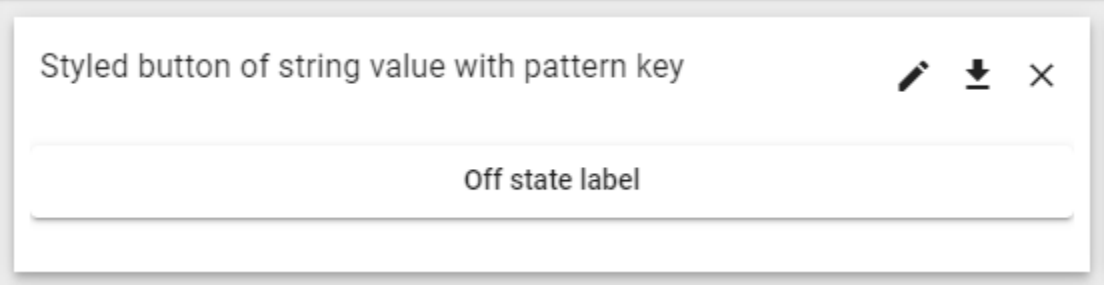
Styled button of string value

Control widget.



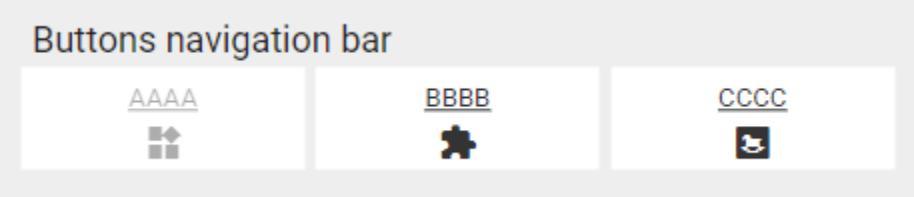
Styled button of string value with pattern key

Control widget.



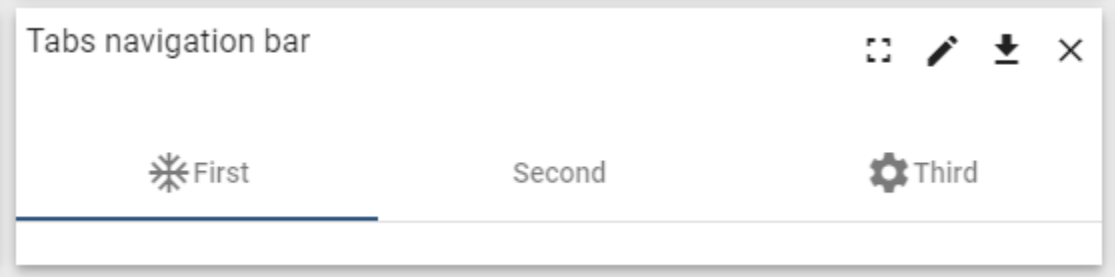
Buttons navigation bar

Control widget.



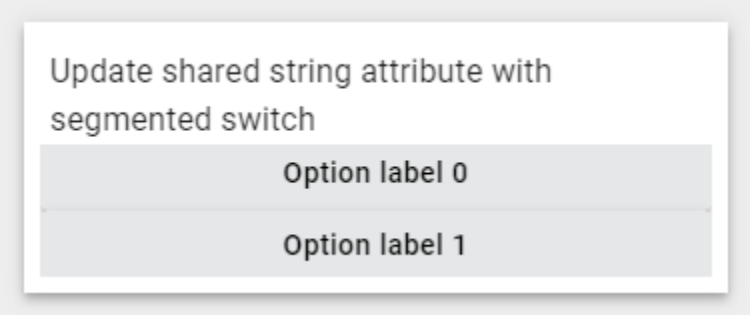
Tabs navigation bar

Control widget.



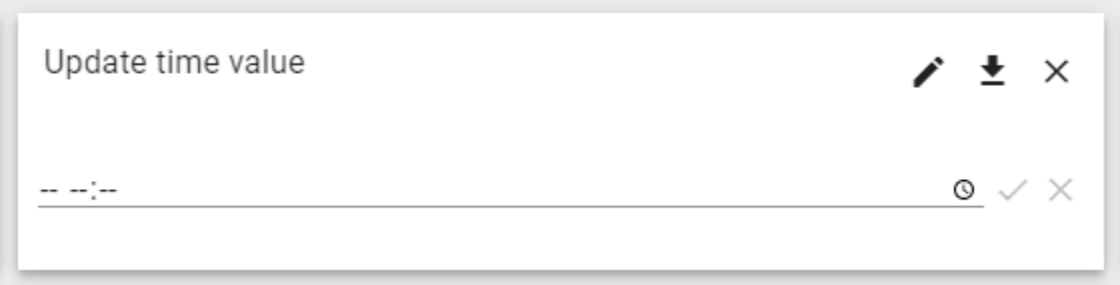
Update shared string attribute with segmented switch

Latest values widget.



Update time value

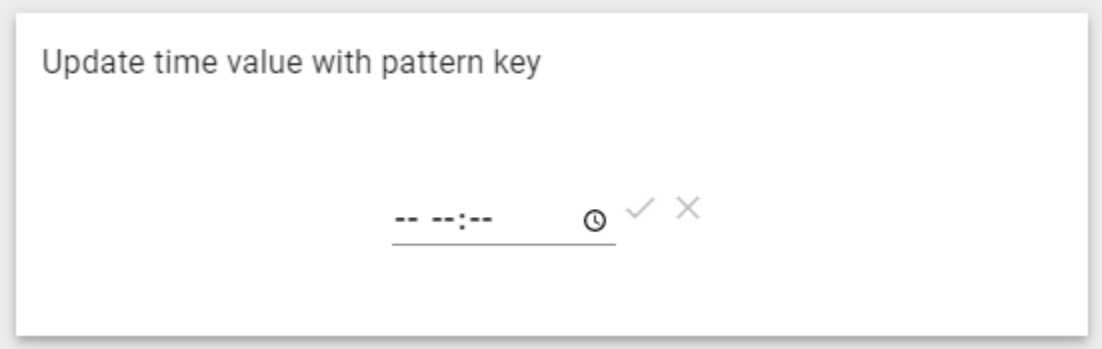
Control widget.



Update time value with pattern key

Control widget.

Some parameters of this widget can be appended with a suffix for programming time.

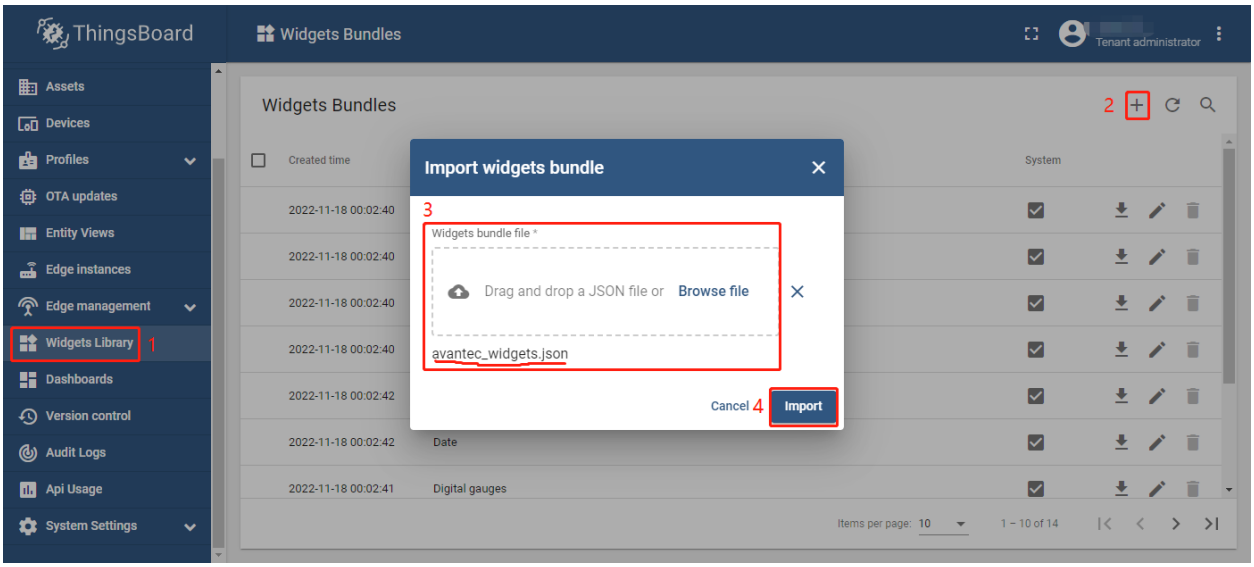


3.1.2 Import Avantec Widgets

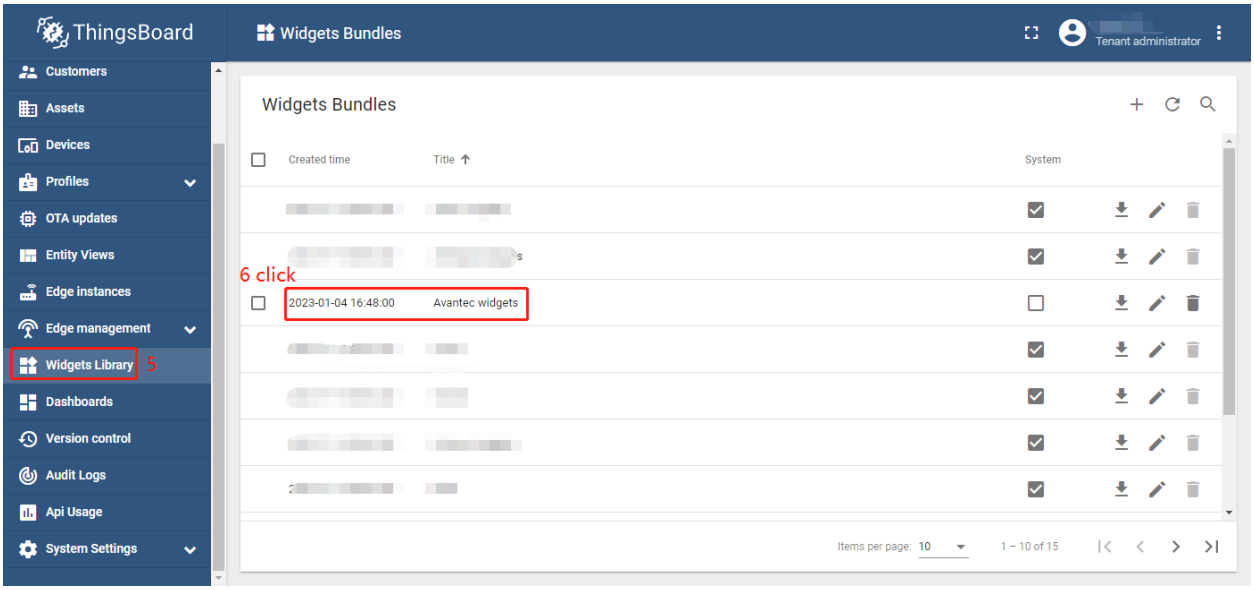
Tip: Avantec_widgets.json can only be imported once. If you have already imported it, you do not need and cannot repeat the import.

If you have already imported it, you can skip this step or *Update Avantec Widgets*.

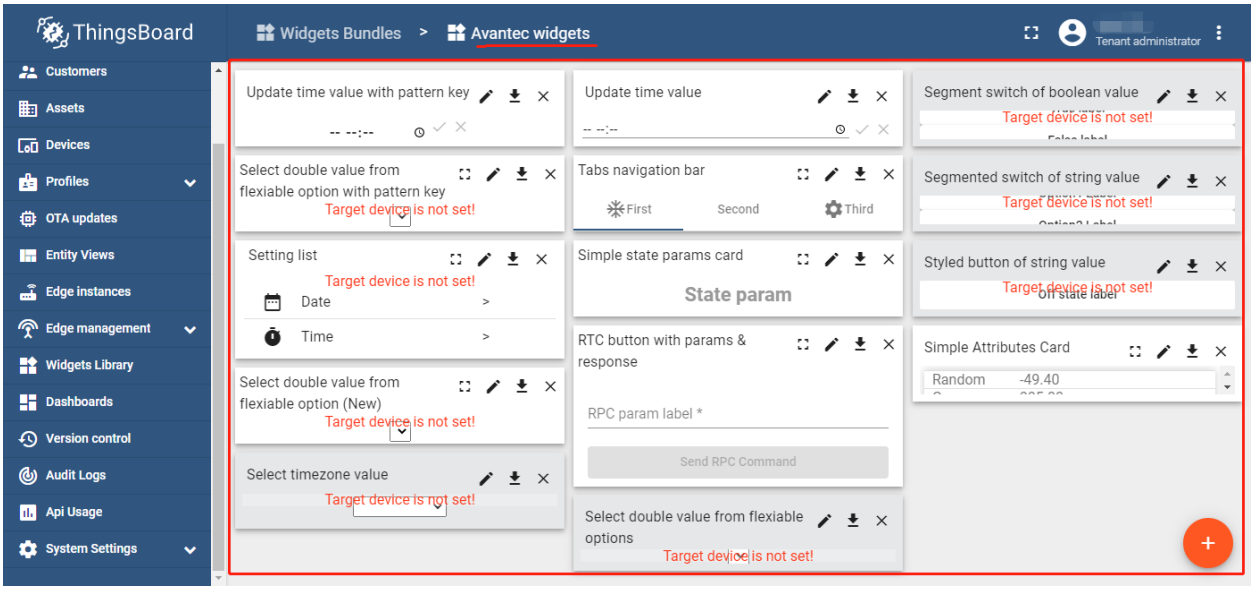
- Download `avantec_widgets.json`.
- **Widgets Library** –> **+** –> **Import widgets bundle** –> **Popup dialog: Import widgets bundle** –> Drag and drop **avantec_widgets.json** –> **Import**.



- **Widgets Library** –> click **Avantec widgets**

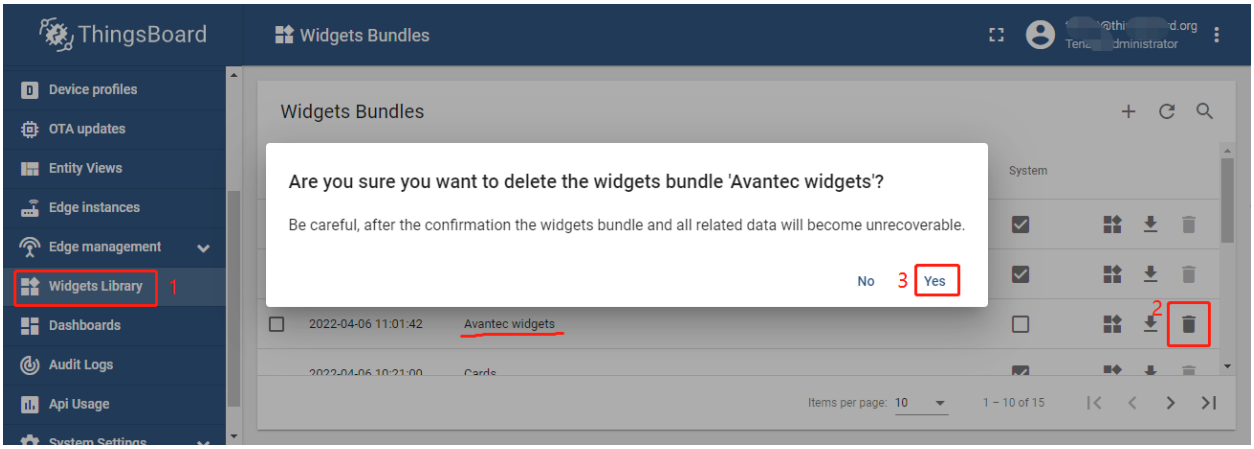


- All Avantec widgets



3.1.3 Update Avantec Widgets

- First, Delete Avantec Widgets: **Widgets Library** –> Click in the row of *Avantec widgets* –> **Popup dialog: Are you sure you want to delete . . . ? –> Yes**.



- Next, *Import Avantec Widgets*.

3.2 Demo Dashboards

3.2.1 TA652FC-W

- *TA652FC-W Thermostat List* - device list.
- *TA652FC-W Thermostat (For Mobile App)* - device detail.

3.2.2 TA652FH-W

- *TA652FH-W Thermostat List* - device list.
- *TA652FH-W Thermostat (For Mobile App)* - device detail.
- *Office center - TA652FH-W Thermostats* - multiple TA652FH-W thermostats in an office center.

3.2.3 TA692FC-L-5

- *TA692FC-L-5 Thermostat List* - device list.
- *TA692FC-L-5 Thermostat (For Mobile App)* - device detail.

3.2.4 Other Dashboards

- Thermostats - All Avantec Thermostas.
  - After import it, Entit aliases must be updated!
  - After import it, some action's targe dashboard must be update in Thermostats Cards - a widget of Entities Cards!

  TODO:…
- Firmware - firmware update.

  Some versions of ThingsBoard have already installed this Dashboard, which can be used without importing. See *here*.
- *Manage device claiming - …*

  TODO:…
- *Claiming - …*

  TODO:…

CHAPTER

FOUR

TA652FC-W WI-FI THERMOSTAT

These references will help you learn more about TA652FC-W Wi-Fi Thermostat, operate it, and even realize your personalized Dashboard.

Specification

Add to ThingsBoard | *Connect to ThingsBoard* | *Demo Dashboards*

MQTT Device API

4.1 TA652FC-W – 2 pipe Fan Coil Wi-Fi Thermostat

Caution:

1. Turn off all electrical devices (e.g. heater, cooler) that are connected to the unit before installation and maintenance.
2. The installer must be a trained service personnel.
3. Disconnect the power supply before maintenance.
4. It must be mounted on a dry clean indoor place.
5. Do not expose this unit to moisture.
6. Do not expose this unit to dipping or splashing.

4.1.1 Introduction

TA652FC-W is a controller that controls fan coil system to maintain room temperature at a desired level.

Changeover sensor is required to install when auto changeover is used.

4.1.2 Feature List

- Voltage supply: 230Vac
- Temperature display in °C or °F
- Temperature measurable range : 0 - 50 °C
- 2-pipe system
- Manual changeover or Auto changeover can be selected
- Selection of Heat/Cool
- 7days/5+1+1days, 1day program, no program.
- EEPROM stores all settings
- Adjustable control span

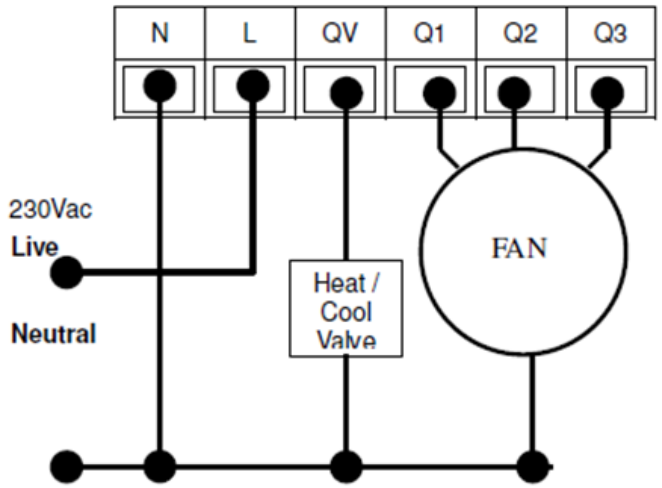
4.1.3 Wiring

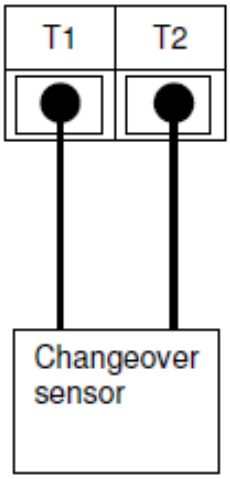
NOTE: Power supply of TA652FC-W is 230Vac.

Terminals	Device
L	230Vac Live
N	230Vac Neutral
Qv	Changeover valve
Q1	Fan Low
Q2	Fan Med
Q3	Fan High
T1	Floor Sensor
T2	Floor Sensor

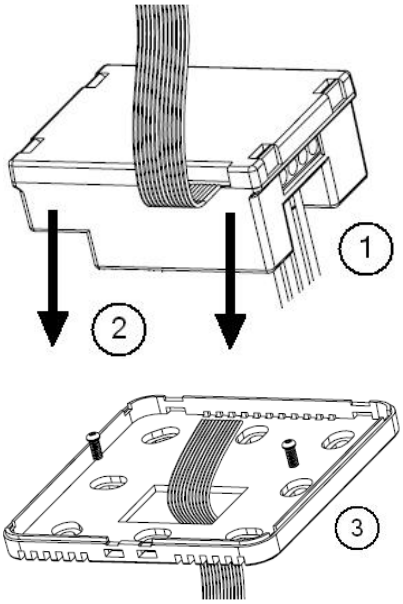
Pull all cables back into the wall beforehand to avoid trapping of wires. Do not use any metal conduits or cables provided with metal sheaths.

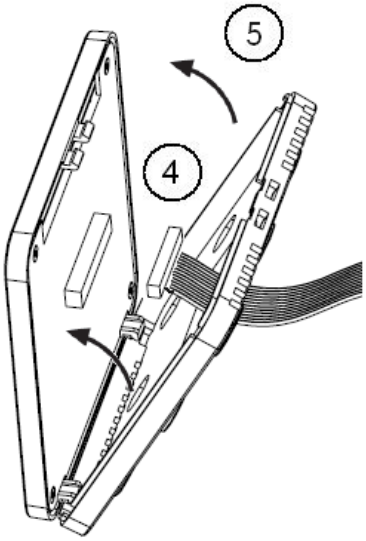
Recommend adding fuse or protective device in the live circuit.





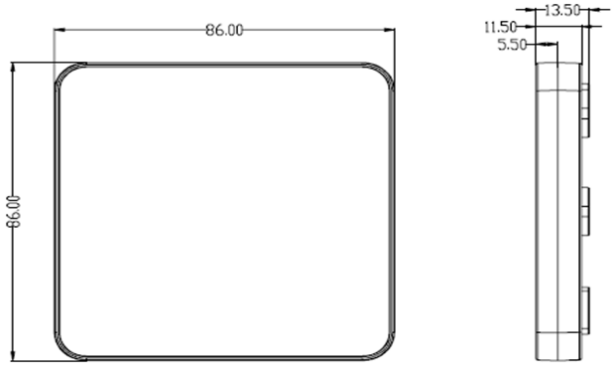
4.1.4 Mounting

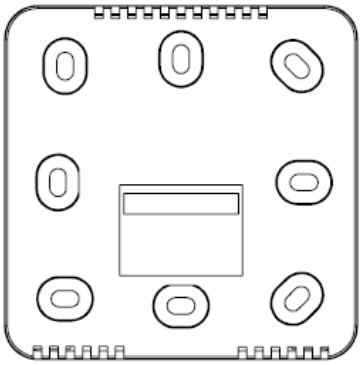




1. Wiring the terminals.
2. Put into junction box.
3. Mount the bottom plate of LCD board into junction box.
4. Connect the wire to the LCD board.
5. Assemble the Top and bottom plate of LCD Board.

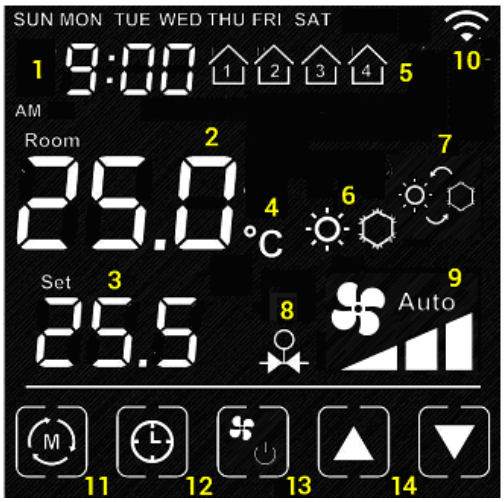
4.1.5 Dimension in mm:





4.1.6 LCD Interface

LCD Indication



sn	item
1	Time
2	Room Temperature
3	Current Set Point
4	Temperature Unit
5	Current Program
6	Heat / Cool Mode
7	Auto Changeover
8	Output is On (when appear)
9	Fan Low/Med/High/Auto
10	Wi-Fi (appear when connected to router)
11	Mode Key: Press to **internal setting 1**. Long hold to **internal setting 2**.
12	Clock Key: Press to **set clock**. Hold to **Program** the Schedule
13	Short Press: Fan Key, Long Hold: On/Off Key
14	Up/Down key: Adjust Set point or Value of setting.
15	Blank: the area outside of the previous five keys

Turn On/Off the thermostat

Hold  to turn On / Off the thermostat. When the thermostat is Off. No Output will be activated.

Clock setting

Normally the clock is automatically set once Wi-Fi is connected and synchronize for each day. So manual set is not necessary when it is online.

- Press  to start the setting
- Press  /  to change the day of week
- Press  again to confirm day of week setting and start to adjust hour
- Press  /  to change the hour
- Press  again to confirm hour setting and start to adjust minutes
- Press  /  to change the minutes
- Press  again to confirm minutes setting and start to adjust day of week
- Press **[blank]** to confirm or leave the clock setting. Or return after no key pressed for 20 seconds.

Clock synchronization

When Wi-Fi is connected and time synchronization is need. Please use the App for time synchronization.

Schedule Programming

When **1 day / 5+1+1 day / 7day program** is selected in internal setting.

- Hold  to start the setting.
- Press  /  to adjust the day of week
- Press  to confirm.
- Press  /  to adjust the time of schedule
- Press  to confirm.
- Press  /  to adjust the setpoint
- Press  to confirm.

- Press **[blank]** to confirm return.

Override Temperature

The Set point can be adjusted by  /  .

When it is in program mode, the set point will be overwritten until the next time slot.

 can be pressed to release the override status.

Internal parameter setting 1

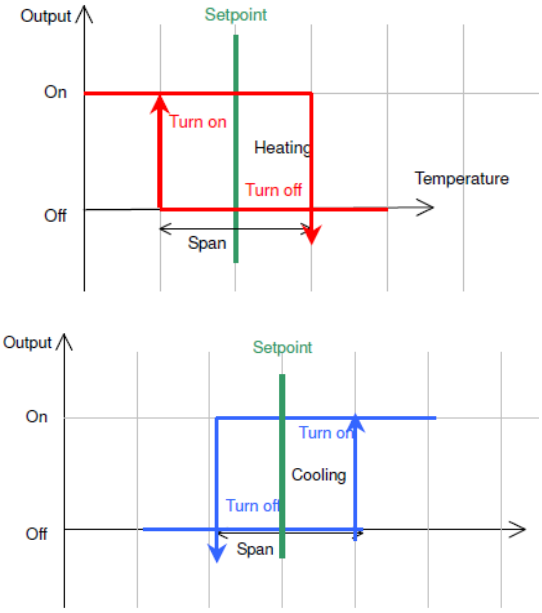
- **Operation:**
  - Press  key to start the setting
  - Press  /  to adjust the value
  - Press **[blank]** to confirm and move to next setting

ID	Items	Value	Default Value
P00	User Interface Screen Saver	0-3	0
P01	Screen Saver Count down	0-120	20
P02	Display unit	°C / °F	°C
P03	Time Display unit	12/24	12
P04	Temperature Offset	-5°C - 5°C, -10°F-10°F	0°C
P05	Switching Differential Heat	2 - 4°C, 4 - 8°F	2°C
P06	Switching Differential Cool	2 - 4°C, 4 - 8°F	2°C
P07	Program mode	No program (0) / 1day program (1) / 5+1+1 program (2) / 7day program (3)	3
P12	Force Ventilation	Disable, Enable	Disable
P13	Changeover Mode	Heat, Cool, Auto	Heat
P14	Changeover temperature Heat	27 - 40°C	27°C
P15	Changeover temperature Cool	10-25°C	10°C

- **User Interface Screen Saver:**
  The thermostat will go to screen saver mode after no key for certain period.
  - **Mode 0**: Nothing will be displayed in screen saver mode.
  - **Mode 1**: Only room temperature will be displayed in screen saver mode.

  - **Mode 2**: Room temperature and Time will be displayed in screen saver mode.
  - **Mode 3**: Display all in screen saver mode.

- **Screen Saver Count Down:**
  The count down time (in seconds) to screen saver mode.
- **Display Unit:**
  Temperature unit in Celsius or Fahrenheit.
- **Time Display Unit:**
  12/24.
- **Temperature offset:**
  The temperature of internal sensor can be calibrated from -5°C - +5°C in case there is temperature difference between actual value and thermostat.
- **Switching Differential:**
  The difference between switching the heating or controller on and off



- **Program Mode:**
  - 0: **No Program** Mode, the thermostat control the temperature simply according to single setpoint.
  - 1: **1 day** program, the thermostat control the temperature according to single schedule.
  - 2: **5+1+1 day** program, the thermostat control the temperature according to 5 +1+1 schedule (Mon to Fri, Sat, Sun).
  - 3: **7 days** program, the thermostat control the temperature according to 7day program (individual program for each day).
- **Forced Ventilation:**
  - **Disable**: Fan will turn on only when heat/cool is on.
  - **Enable**: Fan keeps on (low) even heat / cool is off.
- **Changeover mode:**
  - 0: **Heat mode**

  - 1: **Cool mode**
  - **2: Auto Changeover: When changeover sensor detect the temperature above changeover heat set point. Heat mode will be activated.**
    When changeover sensor detect the temperature below changeover cool set point. Cool mode will be activated.

- **Changeover heating setpoint:**
  Parameter for Auto Changeover mode.
- **Changeover cooling setpoint:**
  Parameter for Auto Changeover mode.

Internal parameter setting 2

- **Operation:**
  - Hold  key to start the setting
  - Press  /  to adjust the value
  - Press **[blank]** to confirm and move to next setting

ID	Items	Value	Default Value
P19	Clear Wi-Fi Configuration	Yes or No	No
P20	Clear Parameter setting (restore default)	Yes or No	No
Adr	Address	…	Read only, eg: 75C68

- **Clear Wi-Fi Configuration:**
  When set to yes, the SSID and Password stored in the thermostat will be cleared so another SSID and Password can be set again.
- **Clear Parameter setting:**
  When set to yes, all internal parameter setting will be restored to default value in next power on (reset)
- **Address:**
  The last 5 characters of the MAC address

Technical Data

Power supply:	195-250 Vac
Relay Contact Voltage:	230Vac Max. 50/60 Hz
Relay Contact Current:	2A Max. for each
Sensing Element:	103AT
Terminals:	2 sq. mm Cable
Operating Temperature:	32 - 122 °F / 0 - 50 °C
Storage Temperature:	23 - 122 °F / -5 - 50 °C
Operating Humidity:	5-95%RHnon-condensing

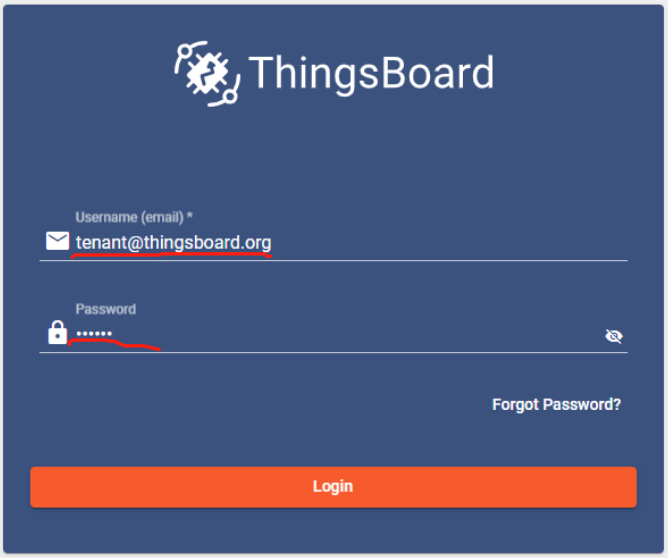
4.2 Add TA652FC-W to ThingsBoard

Tip:

- This section applies to the situation where you add TA652FC-W to ThingsBoard Server.
- If you are adding the first Avantec HVAC device to ThingsBoard Server, please refer to *Get Started*.

4.2.1 Step 1. Tenant Login

- Open ThingsBoard Web UI in browser, e.g. http://localhost:8080
- Tenant Administrator login ThingsBoard.



Tenant default username and password, refer to *Some important parameters*.

4.2.2 Step 2. Import Detail Dashboard of TA652FC-W

See *Import TA652FC-W Detail Dashboard*.

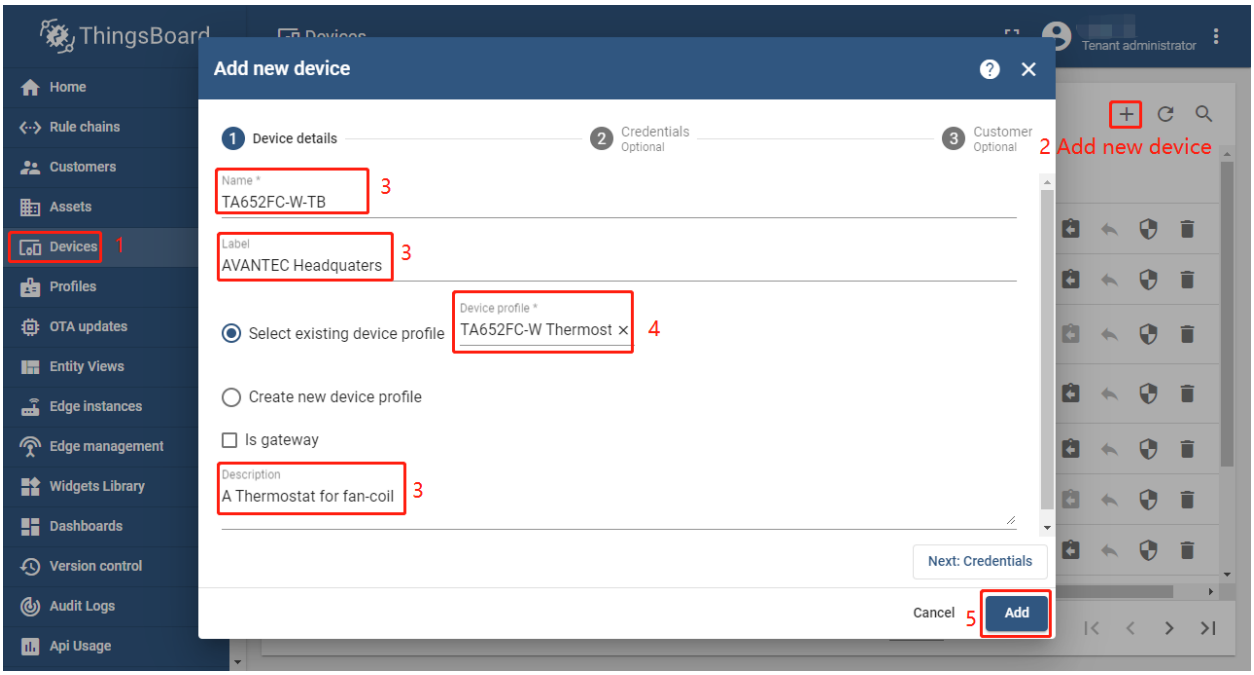
4.2.3 Step 3. Import List Dashboard of TA652FC-W

See *Import TA652FC-W List Dashboard*.

4.2.4 Step 4. Provision TA652FC-W device

Step 4.1 Add device

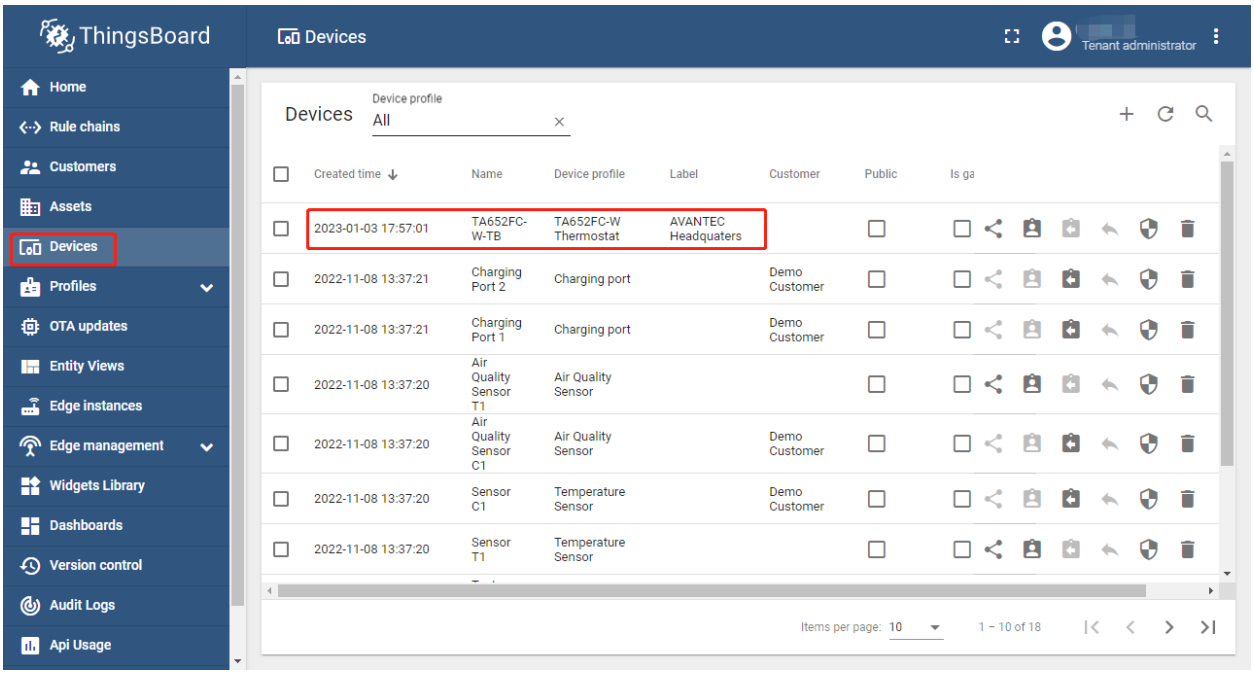
- **Devices** –> **+** –> **Add new device** –> **Popup Dialog** –> Input **Name, Label & Description**, select **device profile** –> **Add**.



Field	Value
Name*	My device name, e.g. TA652FC-W-TB, A8:48:FA:57:60:A4
Device profile*	**TA652FC-W Thermostat**
Label	My device label, e.g. AVANTEC Headquarters
Description	My device description, e.g. A Thermostat for fan-coil

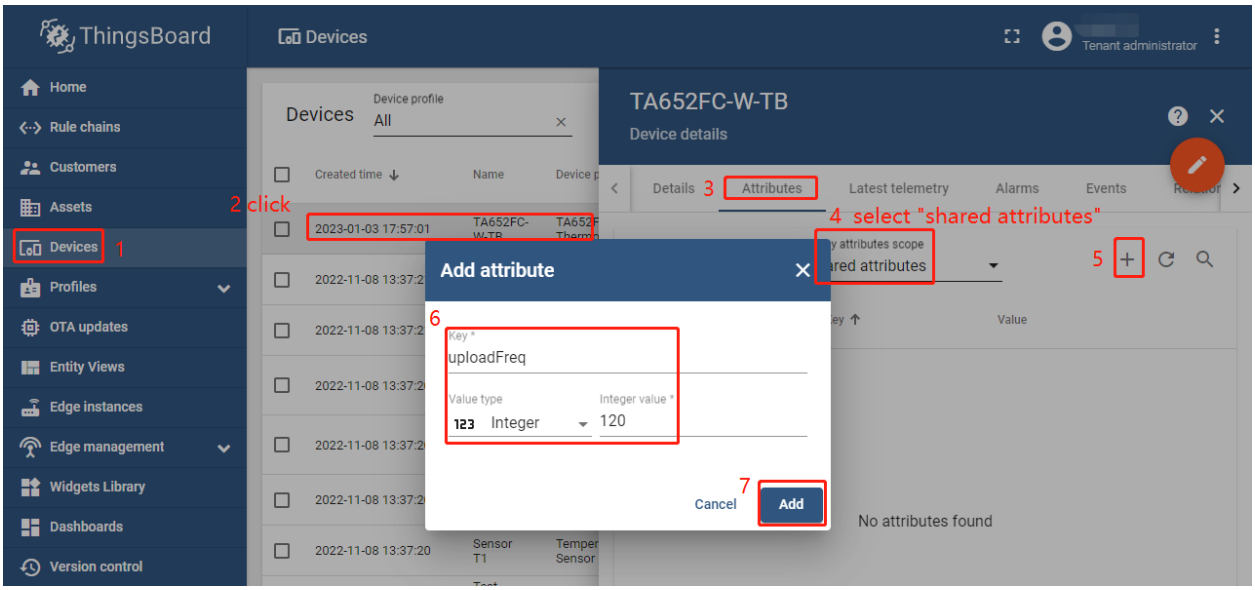
Note: The field with * must be filled in.

- Now my device should be listed first, since the table sort devices using the time of the creation by default.



Step 4.2 Add shared attributes of new device

- **Devices** –> Click *my device* –> **Attributes** –> **Shared attributes** –> **+** –> **Popup Dialog** –> Input Key, Value type & value –> **Add**



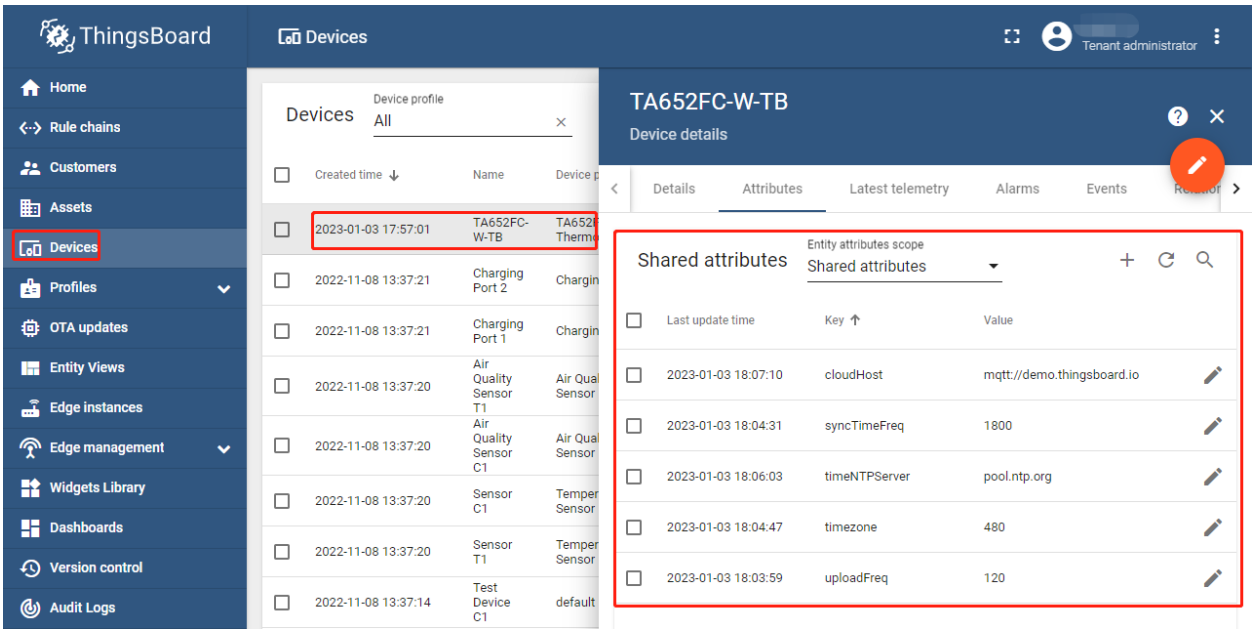
Please add the following Shared attributes of **TA652FC-W**:

Table 1: Add shared attributes of TA652FC-W

Key*	Value Type*	Value*	Memo
uploadFreq	Integer	300	5*60. Telemetry per uploadFreq seconds
uploadThreshold	Double	1.5	1.5°C. If the temprature (Telemetry data) change exceeds it, upload immediately!
syncTimeFreq	Integer	86400	24*3600. Sync time per syncTimeFreq seconds
timezone	Integer	480	**Please replace with your value**. The time offset from UTC, minutes. For example Hongkong is UTC+8:00 time zone, this offset is 480 minutes (8*60)
timeNTPServer	String	pool.ntp.org	SNTP Server URL, e.g. pool.ntp.org, 0.pool.ntp.org, 1.pool.ntp.org, uk.pool.ntp.org, hk.pool.ntp.org, time.nist.gov, ...

Note: The field with * must be filled in.

- Now the shared attributes of my device is like:



You may also use:

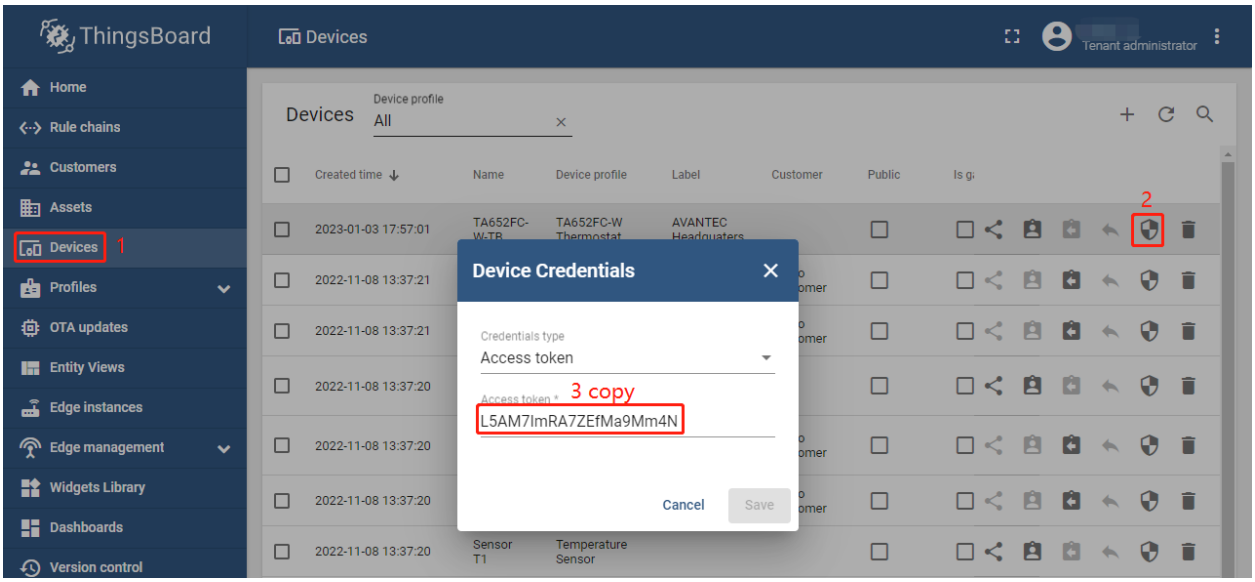
- Bulk provisioning to provision multiple devices from a CSV file using UI.
- Device provisioning to allow device firmware to automatically provision the device, so you don't need to configure each device manually.
- REST API to provision devices and other entities programmatically.

4.2.5 Step 5. Connect TA652FC-W device

Step 5.1 Copy credentials of new device

To connect the device you need to get the device credentials first. ThingsBoard supports various device credentials. We recommend using default auto-generated credentials which is access token for this guide.

- **Devices –> Manage credentials (icon) –> Popup Dialog –> Select Access Token**, `Ctrl + C`.



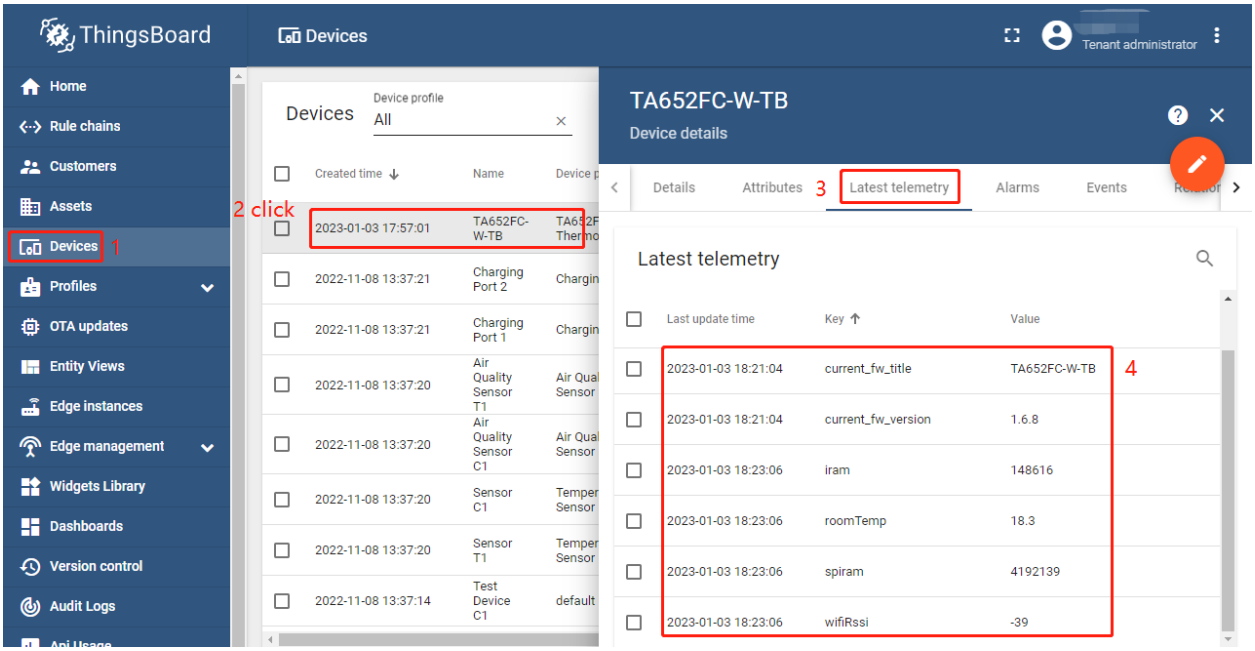
Tip: The Credentials (Access Token), which you need to use when you're configuring your hardware, for example, *j9JiCkID9E7uE1WhKxnc*, *lMTQLZ7VSRQSD7ls*.

Step 5.2 Connect device to ThingsBoard

See *Connect TA652FC-W to ThingsBoard*.

Step 5.3 Publish data to ThingsBoard

Now your device has already published telemetry data to ThingsBoard. You should immediately see them in the Device Telemetry Tab:



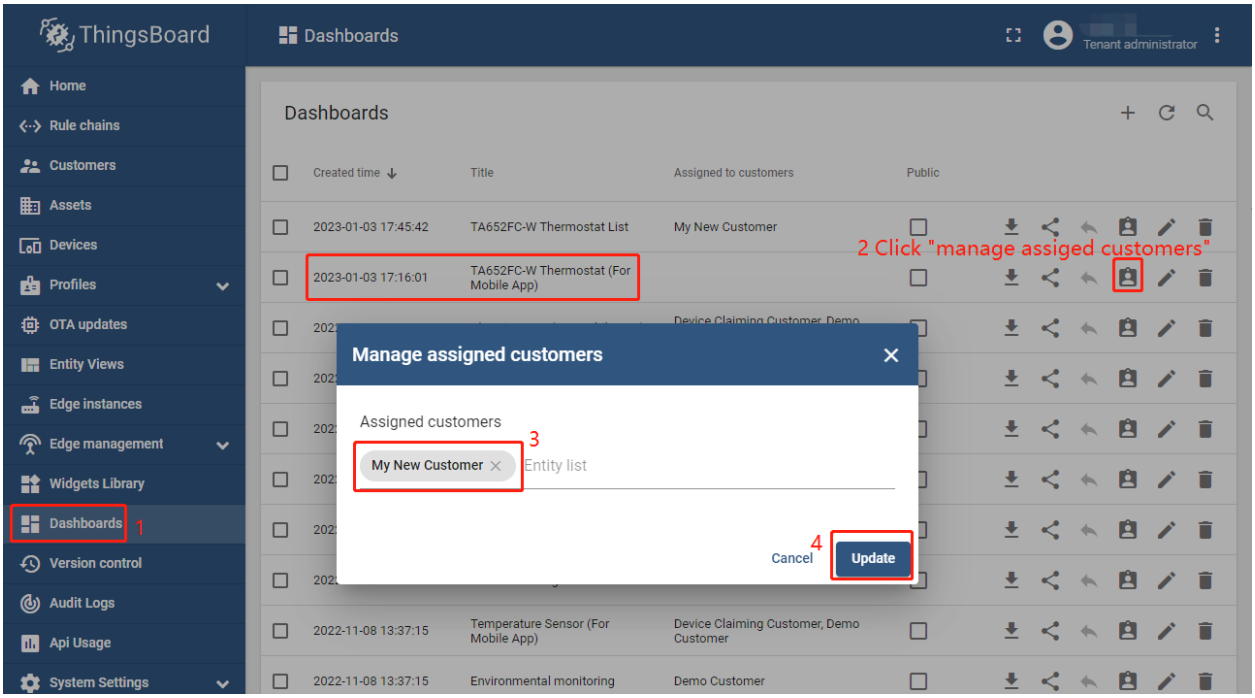
4.2.6 Step 6. Assign Device and Dashboards to Customer

One of the most important ThingsBoard features is the ability to assign Dashboards to Customers. You may assign different devices to different customers. Then, you may create a Dashboard(s) and assign it to multiple customers. Each customer user will see his own devices and will not be able to see devices or any other data that belongs to a different customer.

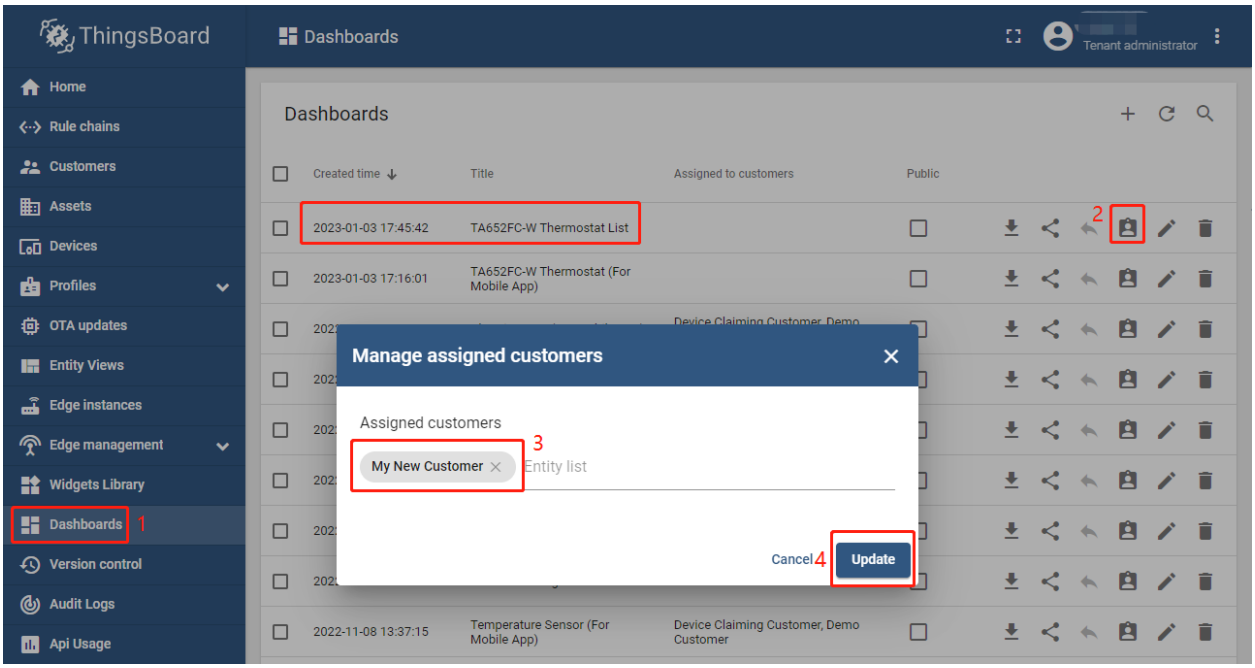
Refer to *Step 7.1 Create customers*, *Step 7.4 Create customer user* & *Step 7.5 Activate customer user*.

Step 6.1 Assign dashboards of TA652FC-W to Customer

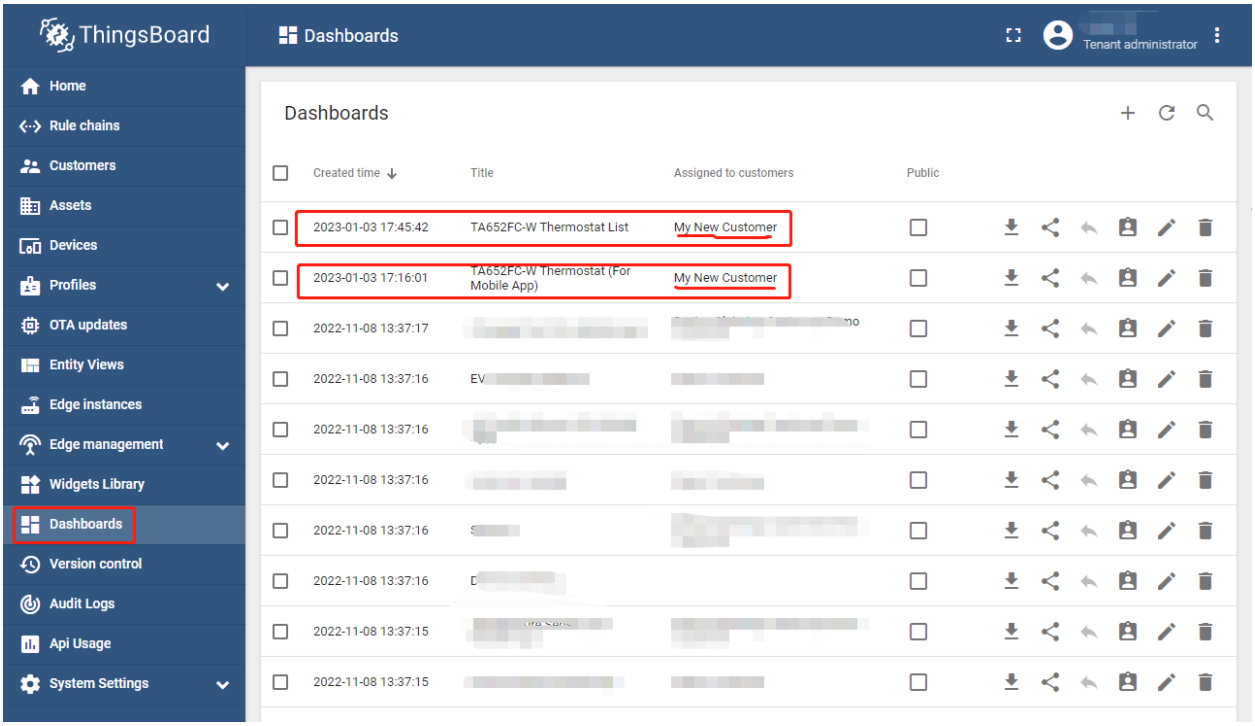
- Assign *Detail dashboard* to Customer: **Dashboards** –> Click **Manage assigned customers** (icon) in *Detail dashboard* line –> **Popup Dialog** –> Select *My New Customer* –> **Update**.



- Assign *List dashboard* to Customer: **Dashboards** –> Click **Manage assigned customers** (icon) in *List dashboard* line –> **Popup Dialog** –> Select *My New Customer* –> **Update**.

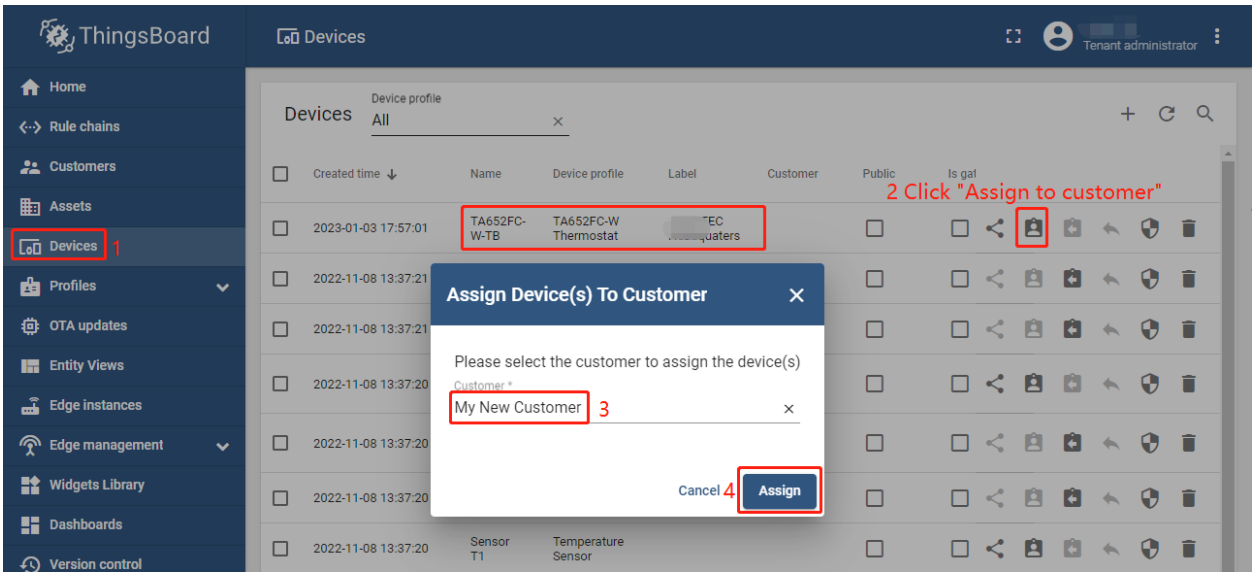


- It's like this now.

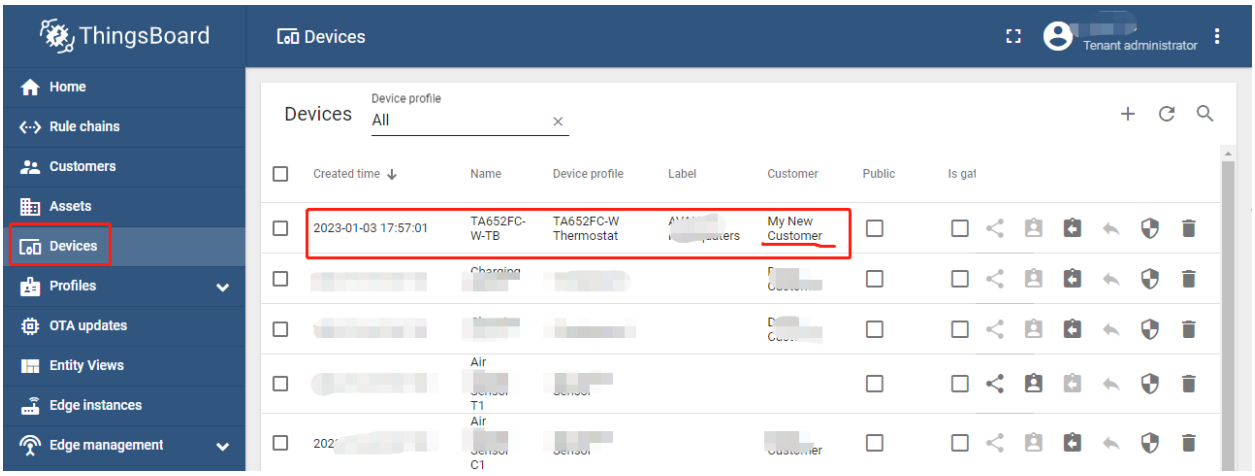


Step 6.2 Assign TA652FC-W device to Customer

- **Devices** –> Click **Assign to customers** (icon) in *My New Device* line –> **Popup Dialog** –> Select *My New Customer* –> **Assign**.

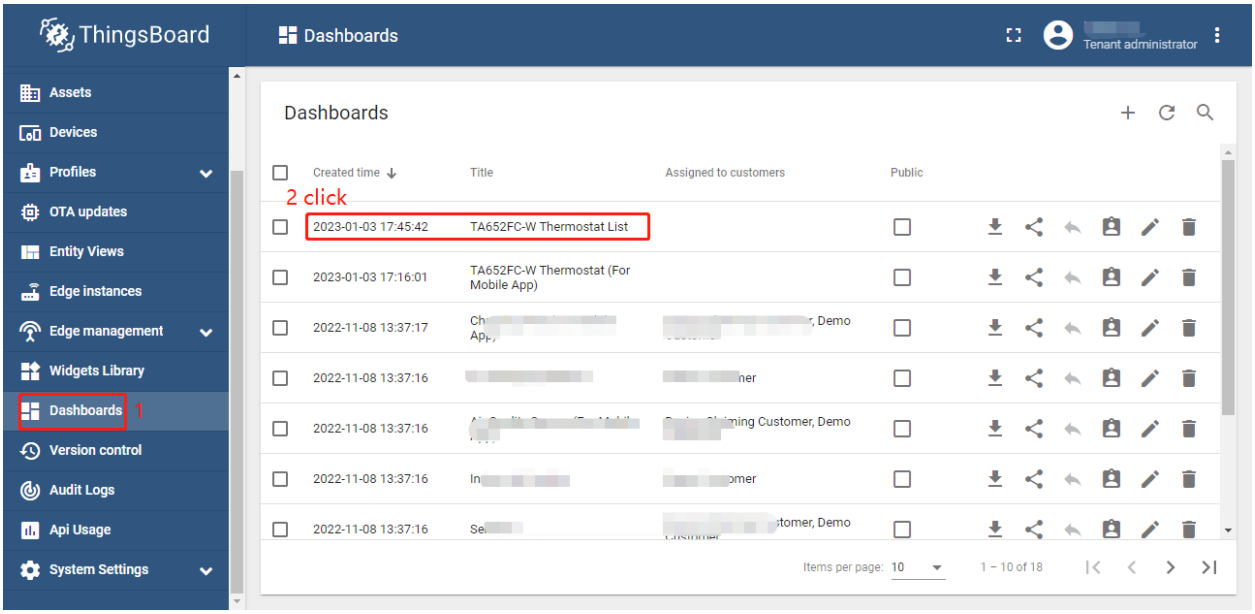


- It's like this now.

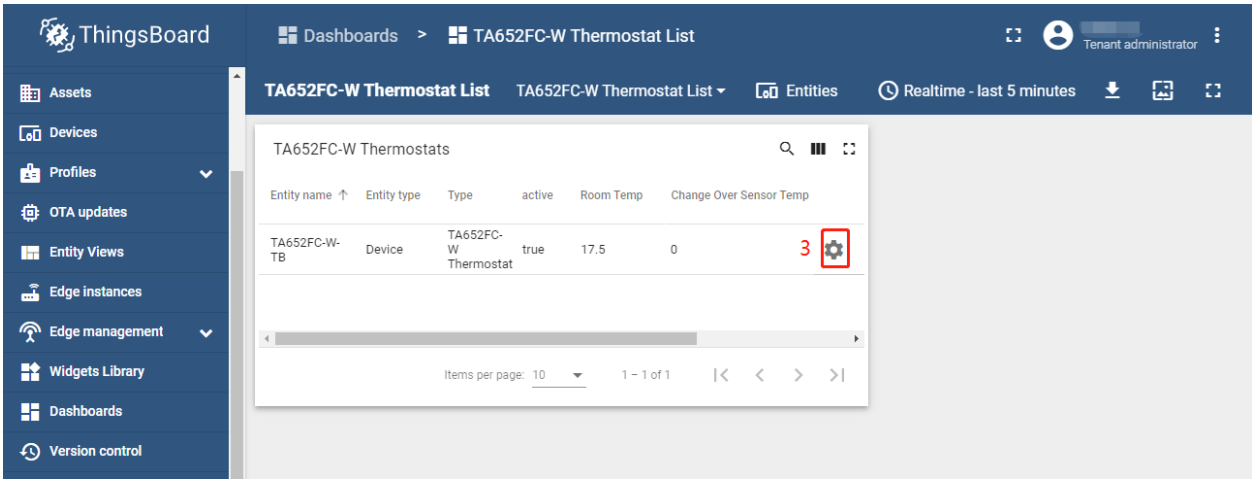


4.2.7 Step 7. Open Dashboards of TA652FC-W

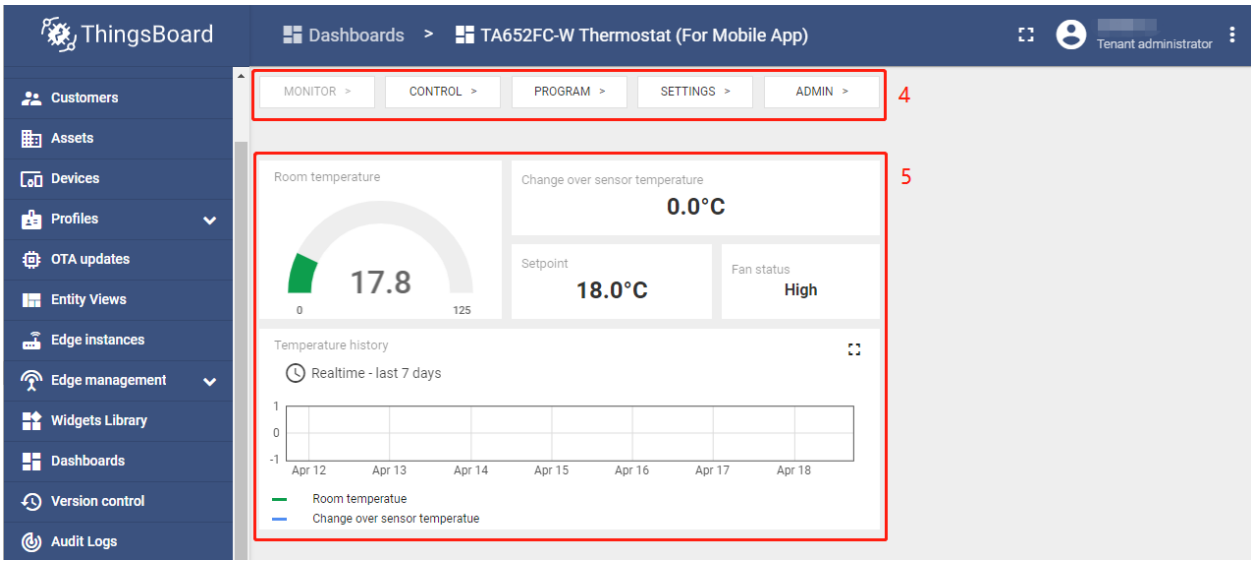
- You are logged in as a Customer User or a Tenant user.
- **Dashboards** –> click *my list dashboard*



- Select my device –> **Settings** (icon)



- Switch page –> Operation



See *TA652FC-W Demo Dashboards Usage*.

4.2.8 Your feedback

Don't hesitate to star Avantec on github to help us spread the word.

4.3 Connect TA652FC-W to ThingsBoard

Tip:

- This section applies to both `TA652FC-W` and `TA652FH-W`.
- Unless otherwise specified, all specifications applicable to TA652FC-W are also applicable to TA652FH-W.

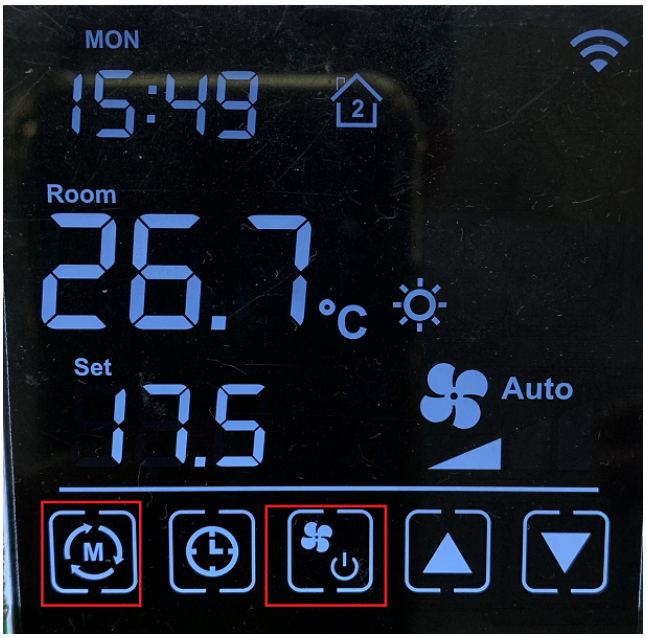
This section describes the process of connecting TA652FC-W to ThingsBoard via Wi-Fi. This process applies to all models of thermostats in this series.

4.3.1 Prerequisites. Clear Wi-Fi Configuration

Tip: If your TA652FC-W is used for the first time, or your TA652FC-W has never been connected to any Wi-Fi router, you can skip this step.

If your TA652FC-W has been connected to a Wi-Fi router before, when you need to connect to a new Wi-Fi router, you need to clear the Wi-Fi configuration of the TA652FC-W first.

- Press and hold  and  simultaneously for 10 seconds on the TA652FC-W.



- Enter Wi-Fi parameter clearing mode P19.

- Press  or  to select *YES*.

- Press  to return to the normal interface, and the Wi-Fi parameters are cleared.

4.3.2 Step 1. Get Access-Token

Get a access-token of TA652FC-W from ThingsBoard. See *Step 5.1 Copy credentials of new device*.

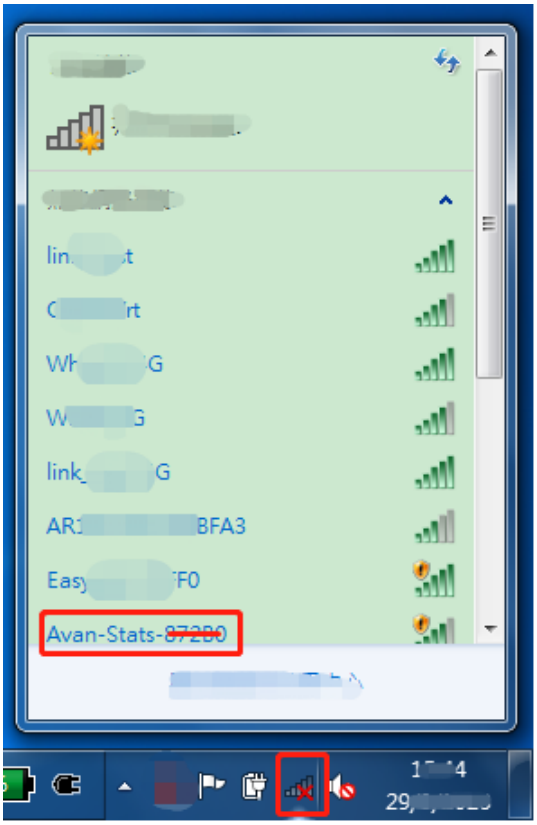
4.3.3 Step 2. Power On

When you first power up, TA652FC-W will enter Wi-Fi AP mode without any Wi-Fi parameters. At this point, you can configure the parameters through the web page.

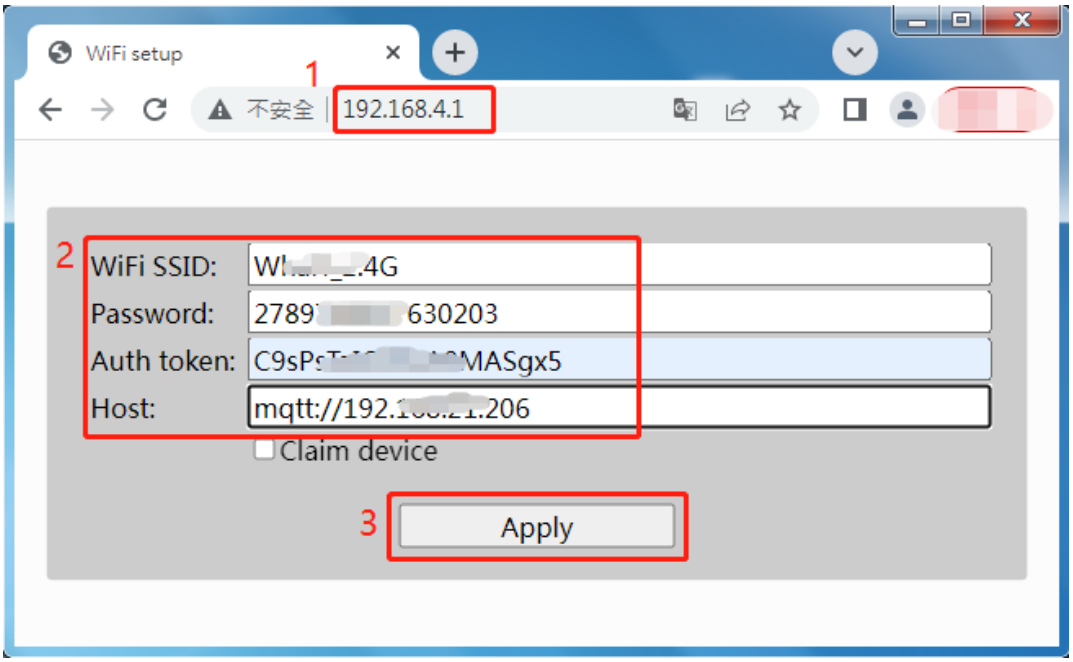
Tip: TA652FC-W has a different Wi-Fi Hotspot name every time it's powered on.

4.3.4 Step 3. Configure

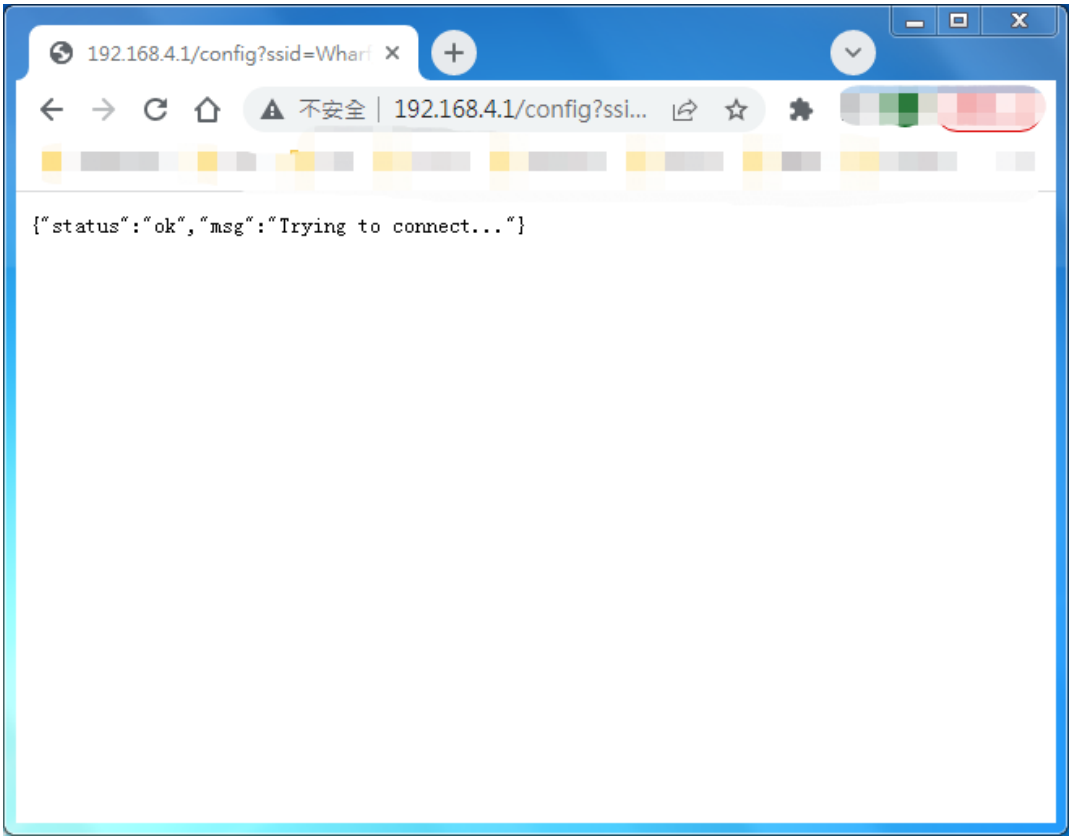
- Connect to TA652FC-W's Wi-Fi hotspot on your computer or smart phone. It's like `Avan-Stats-CEBD8`.



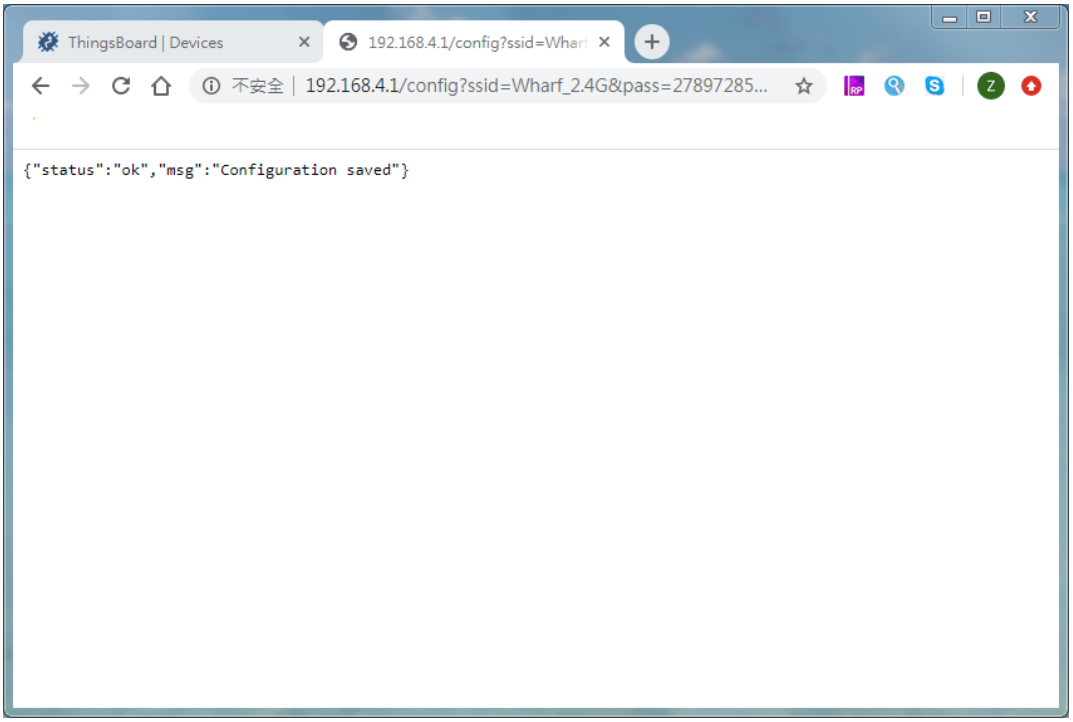
- Open your browser, type `http://192.168.4.1` .
- Input your configuration, then `Apply`.



Field	Description
Wi-Fi SSID	SSID of your Wi-Fi router
Password	password of your Wi-Fi router
Auth Token	Access Token of your TA652FC-W. See *Step 1. Get Access-Token*
Host	This ThingsBoard Server's MQTT URL. It must begin with "mqtt://", such as "mqtt://192.168.21.206" **Please replace 192.168.21.206 with your ThingsBoard IP Address**. See *Step 4.2 Add shared attributes of new device*

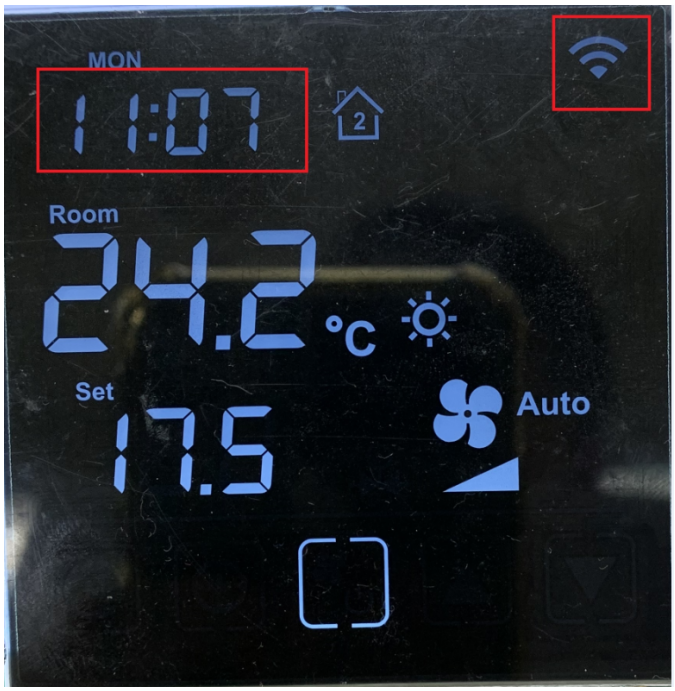


- If the configuration is successful, the following screen *may be* displayed.



4.3.5 Step 4. Check

Check if TA652FC-W is connected to ThingsBoard correctly. If connected correctly, there will be a Wi-Fi icon in the upper right corner of the Thermostat, and the time will no longer be **12:00**. If you do not set the tone zone relationship on ThingsBoard correctly, the time displayed by TA652FC-W may be slightly off.



4.3.6 Troubleshooting

Thermostat TA652FC-W can't connect to Wi-Fi:

- If the Thermostat has never been connected to any Wi-Fi router since leaving the factory, it will enter Soft-AP mode. You can search for Wi-Fi SSID similar to "Avan-Stats-CEBD8" through your mobile phone or computer.
- Make sure the Wi-Fi router supports and turns on the 2.4G signal. Currently, some dual-band (2.4G & 5G) Wi-Fi routers can turn off the 2.4G signal. Please turn it on in your router settings.
- Make sure your Wi-Fi SSID and Password are correct, and they are related parameters of 2.4G Wi-Fi signal.
- Confirm that the Token is normal.
  - Confirm that the Token corresponds to the actual model (the Token of TA652FH-W-TB can only be connected to the Thermostat of TA652FH-W-TB. The same is true for TA652FC-W-TB).
  - Confirm that the Token did not fail during the copying process.
  - Confirm that the Token has no special characters. Token can only contain A-Z, a~z, 0~9. Illegal characters such as "-" will appear in the case of product end. You can edit and get a new Token in *Step 1. Get Access-Token*.
- Confirm that the *Host* parameter is correct. Host must start with "mqtt://", followed by IP address or domain name of ThingsBoard.
- If the above parameters are confirmed to be correct, you can start from *Step 2. Power On* and try several times.

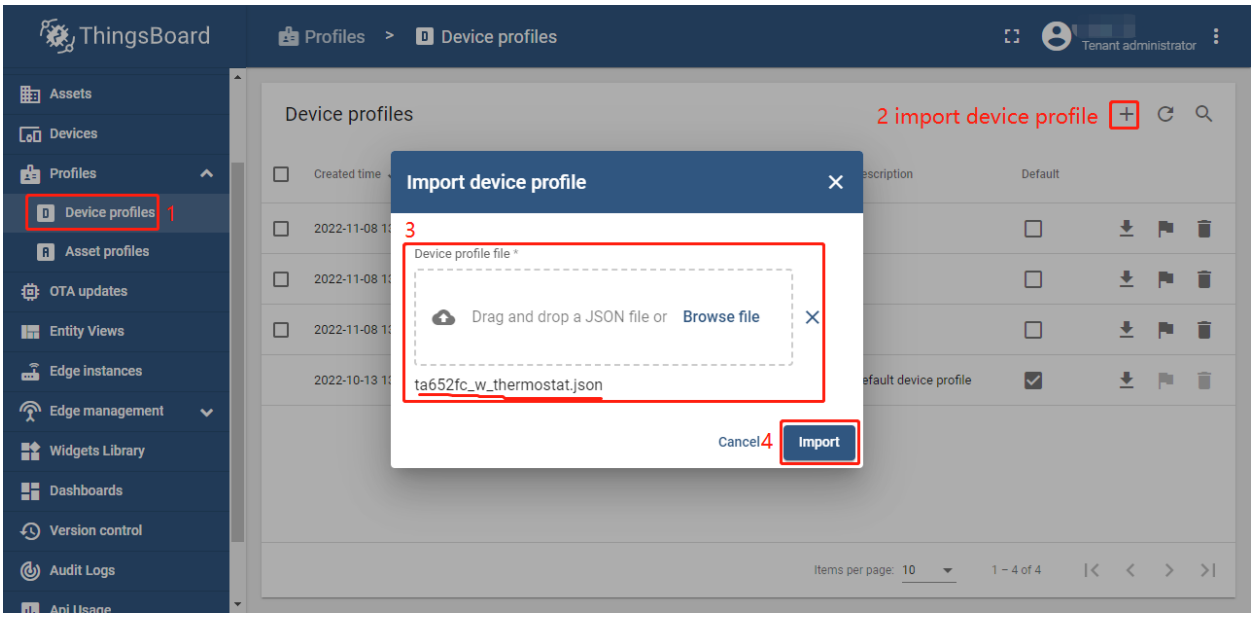
4.4 TA652FC-W Thermostat – Demo device profile usage

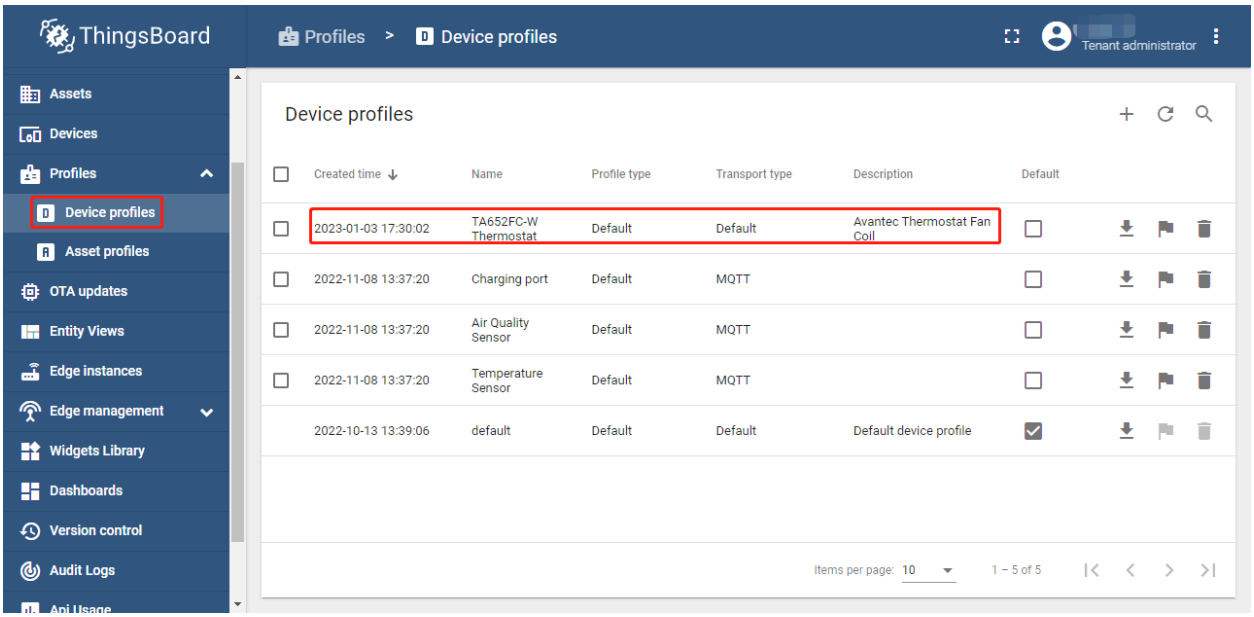
4.4.1 Import device profile

Tip: *A Device Profile file* can only be imported once. If you have already imported it, you do not need and cannot repeat the import.

If you have already imported it, you can skip this step.

- Download `ta652fc_w_thermostat.json`.
- **Profiles** –> **Device profiles** –> **+** –> **Popup dialog: Import device profile** –> Drag and drop *my device profile File* –> **Import**.

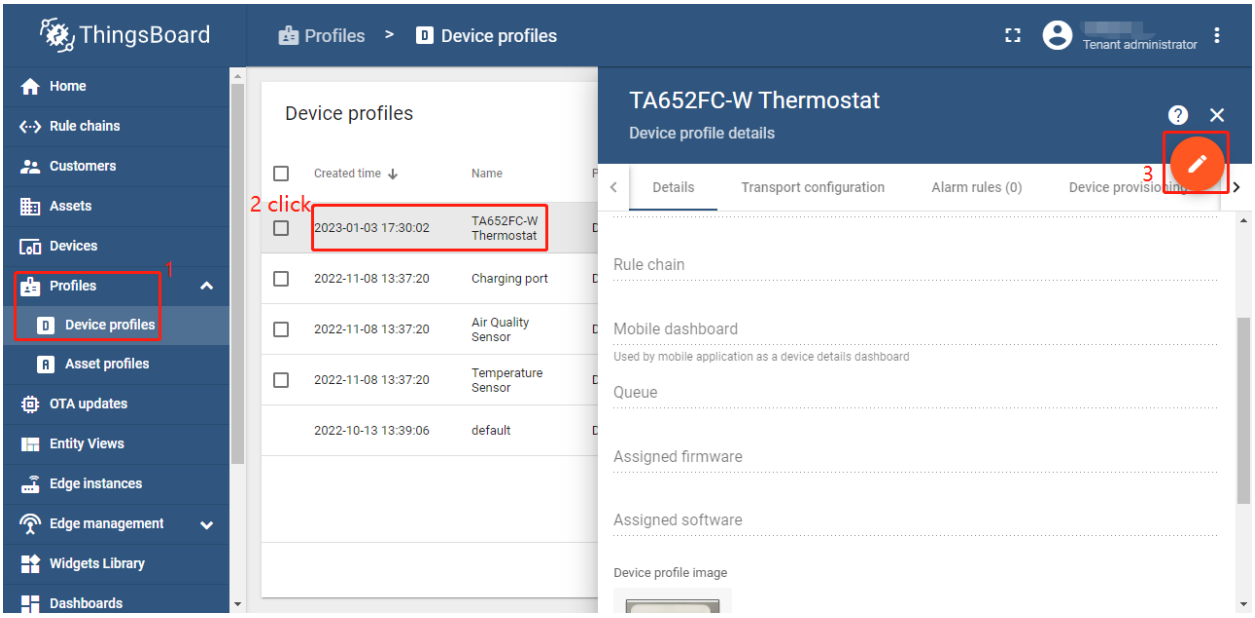




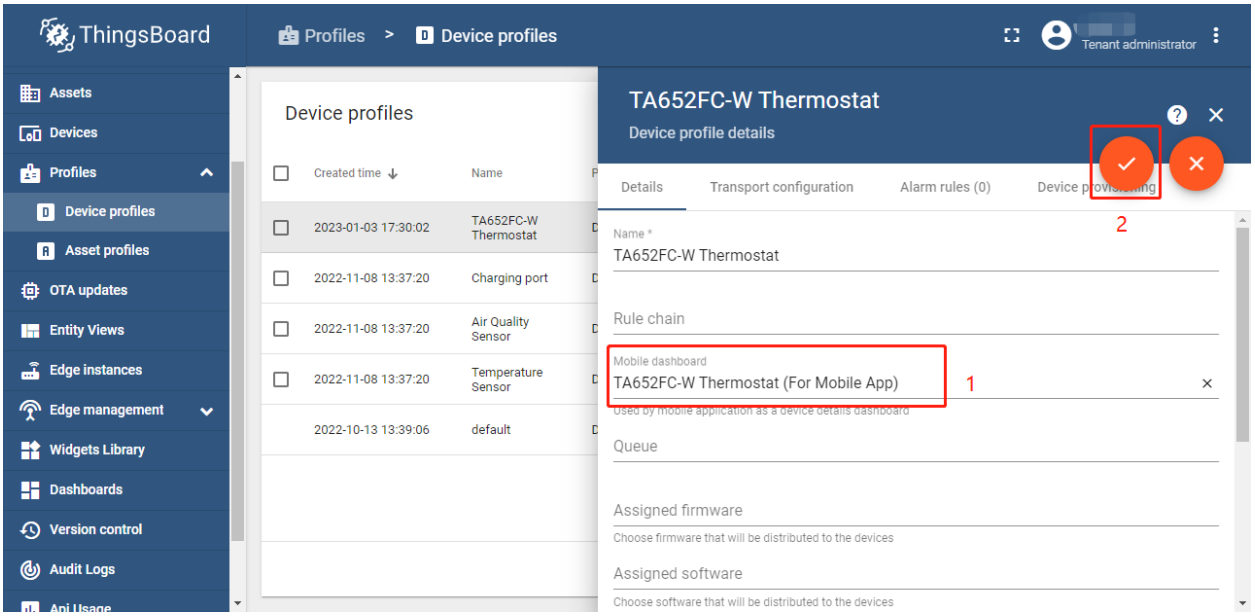
4.4.2 Modify device profile's mobile dashboard

Device profile's mobile dashboard is for `ThingsBoard Mobile Application` or `ThingsBoard PE Mobile Application`.

- **Profiles** –> **Device profiles** –> click *my device profile* –> **Toggle edit mode** (red icon)



- Modify *Mobile dashboard* –> **Apply changes** (red icon)



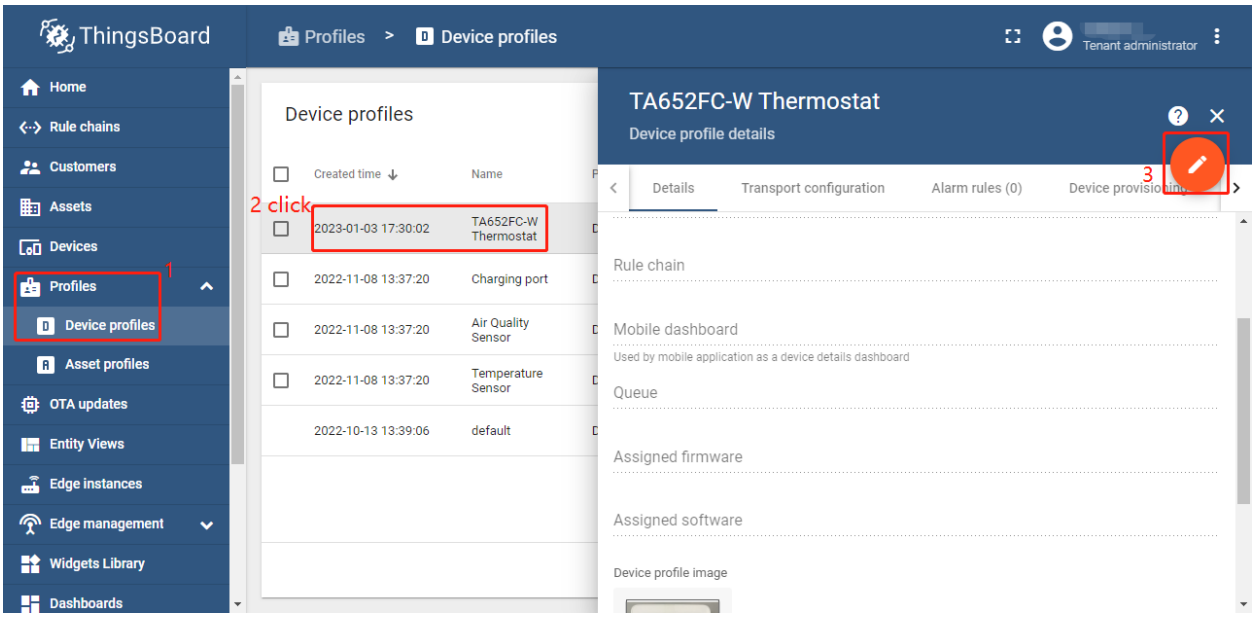
These values are shown in the following table:

Field	Value
Mobile dashboard	TA652FC-W Thermostat (For Mobile App)

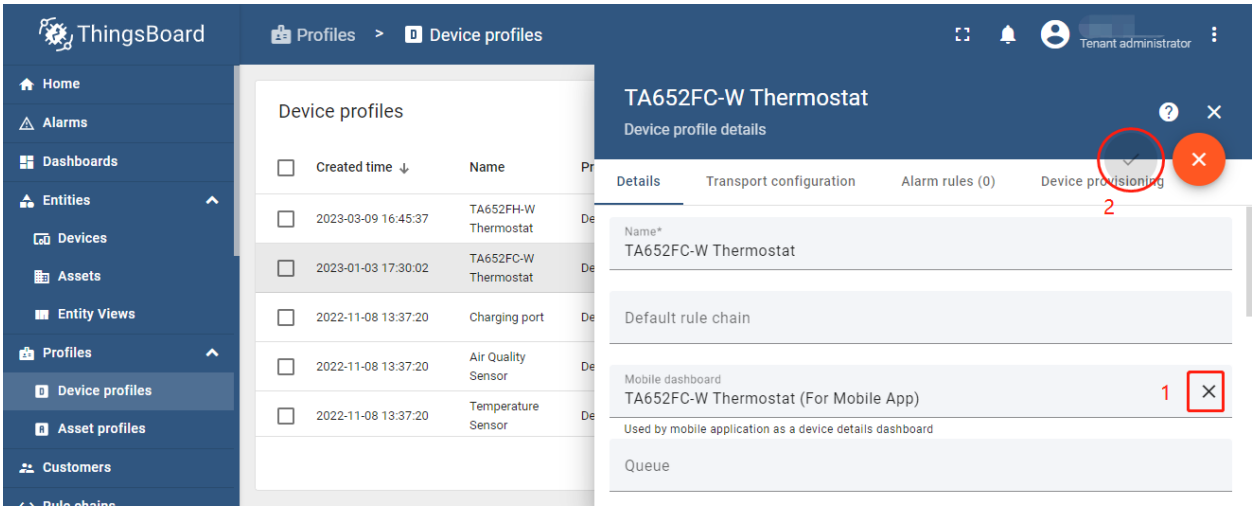
4.4.3 Clear device profile's mobile dashboard

Sometimes if `TA652FC-W Thermostat device profile`'s mobile dashboard is cleared, `TA652FC-W Thermostat (For Mobile App)` can only be deleted.

- **Profiles** –> **Device profiles** –> click *my device profile* –> **Toggle edit mode** (red icon)



- Clear *Mobile dashboard* –> **Apply changes** (red icon)



4.5 TA652FC-W Demo Dashboards Usage

4.5.1 Overview

There are two dashboards related to TA652FC-W, namely `TA652FC-W Thermostat List` and `TA652FC-W Thermostat (For Mobile App)`. We open the former to start operating TA652FC-W.

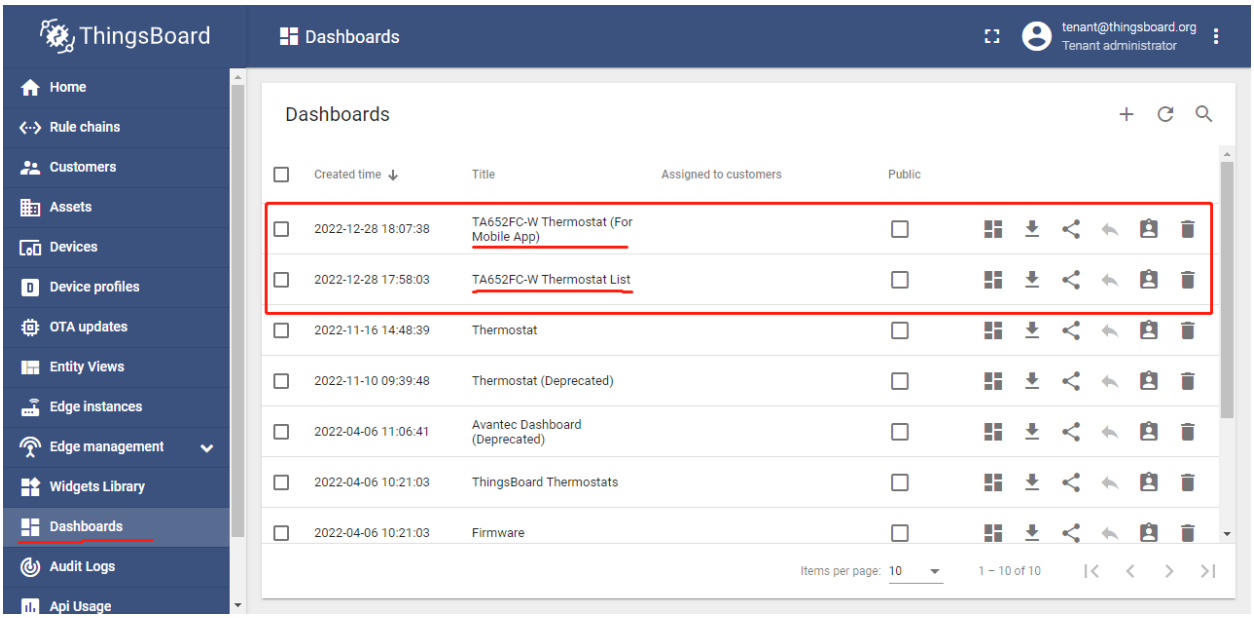


Table 2: TA652FC-W Demo Dashboards

Dashboard	Description	For Web UI	For Mobile App	Entry*
TA652FC-W Thermostat List	list	Yes	No	Yes
TA652FC-W Thermostat (For Mobile App)	details	Yes	Yes	No

Hint:

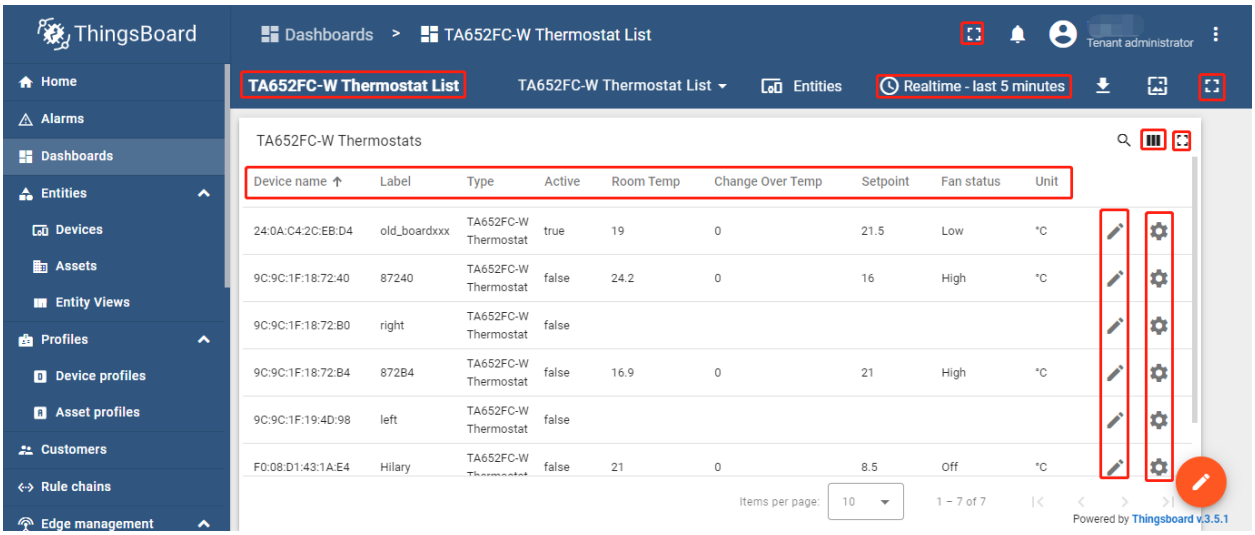
- If *Entry* is *Yes*, then directly enter the Dashboard and there will be data displayed.
- If *Entry* is *No*, there will be no data display when entering this Dashboard directly, and you need to jump to this Dashboard from other Dashboards.

4.5.2 TA652FC-W Thermostat List

Dashboard states

Default state

`Default state` is root state.



- **Dashboard bar:**
  - TA652FC-W Thermostat List : Click here to skip to **root state**. Since **default state** is *root state*, click here and there is no response.
  - : Click the two ICONS in the upper left corner to display the page in full screen.
  - Realtime - last 5 minutes : Edit time window.
- **Thermostats widgets:**
  - **Fields:**
    - Device name, Label, Type, active.
    - Room temperature, Change Over Sensor Temperature, Setpoint, Fan status, Unit: Refer to *Monitor state*.
  - **Actions:**
    - : skip to *TA652FC-W Thermostat (For Mobile App)*.
    - : Popup dialog to editing a device's label.

Import List Dashboard

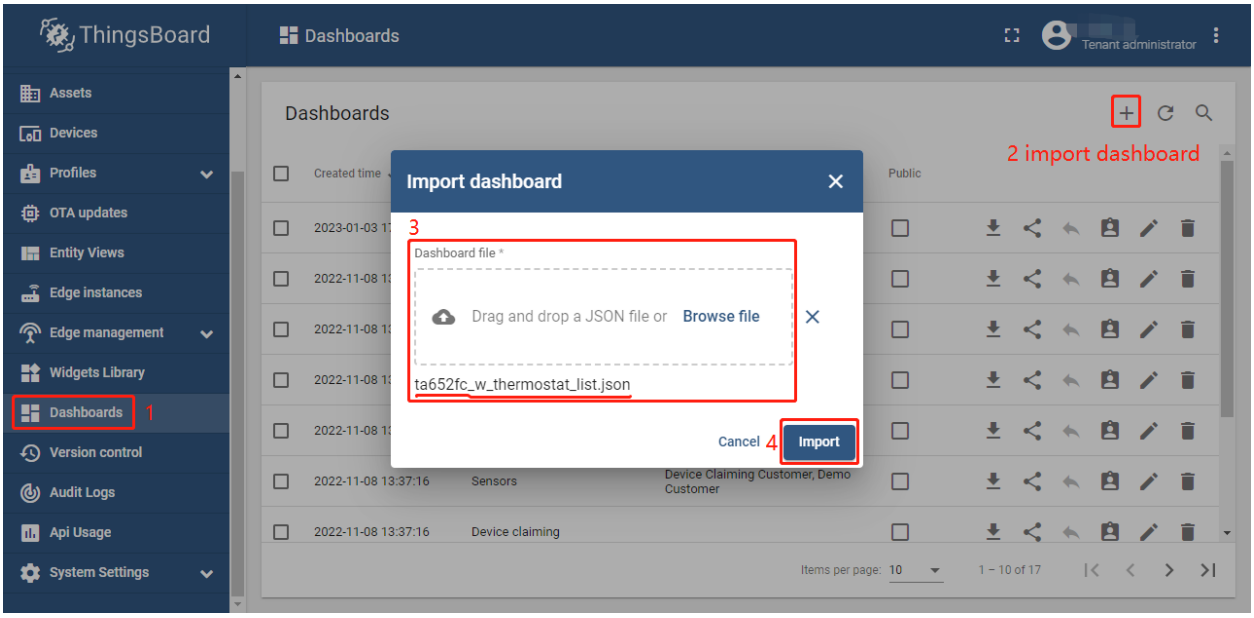
Tip: *A Dashboard file* can only be imported once. If you have already imported it, you do not need and cannot repeat the import.

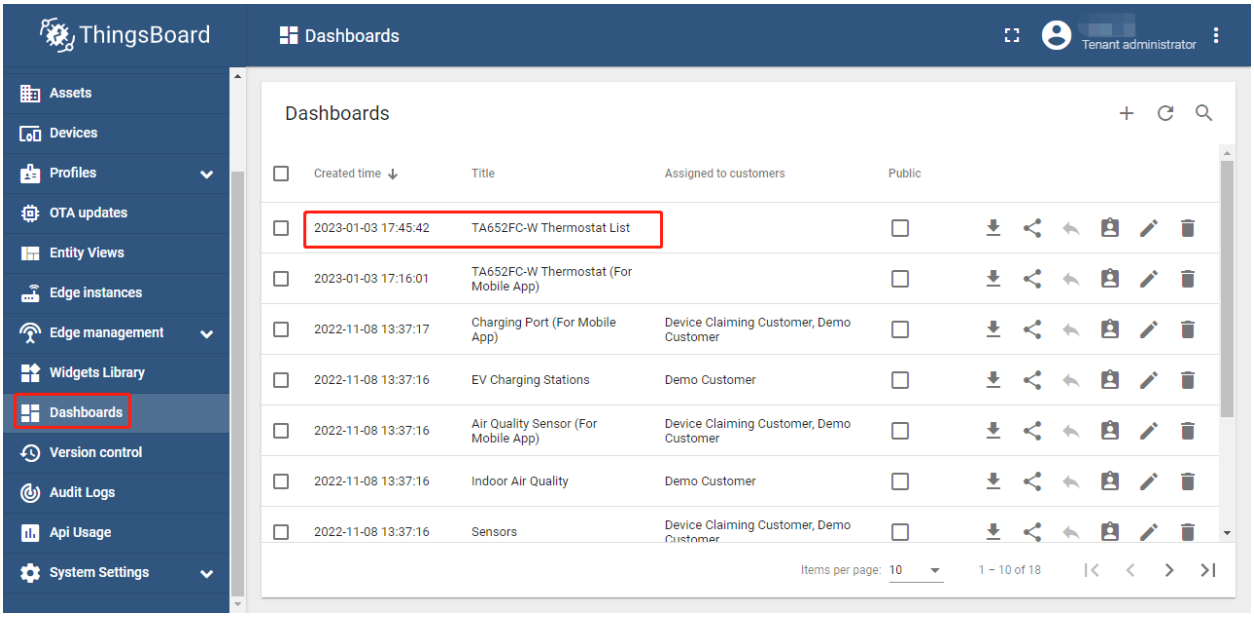
If you have already imported it, you can skip this step.

In order to use this dashboard, you must to create `TA652FC-W Thermostat Device Profile` and `TA652FC-W Thermostat (For Mobile App)`. If they don't exist, you can import them. See *Import Device Profile of TA652FC-W Thermostat* or *Import TA652FC-W Detail Dashboard*.

First, you can import this dashboard.

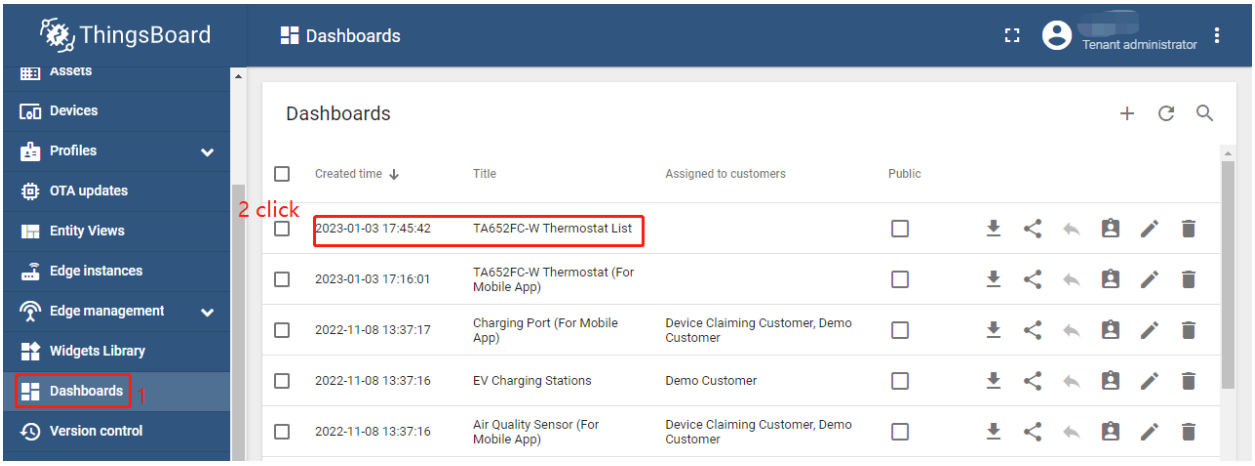
- Download `ta652fc_w_thermostat_list.json`.
- **Dashboards** –> **+** –> **Popup dialog: Import dashboard** –> Drag and drop *list dashboard File* –> **Import**.



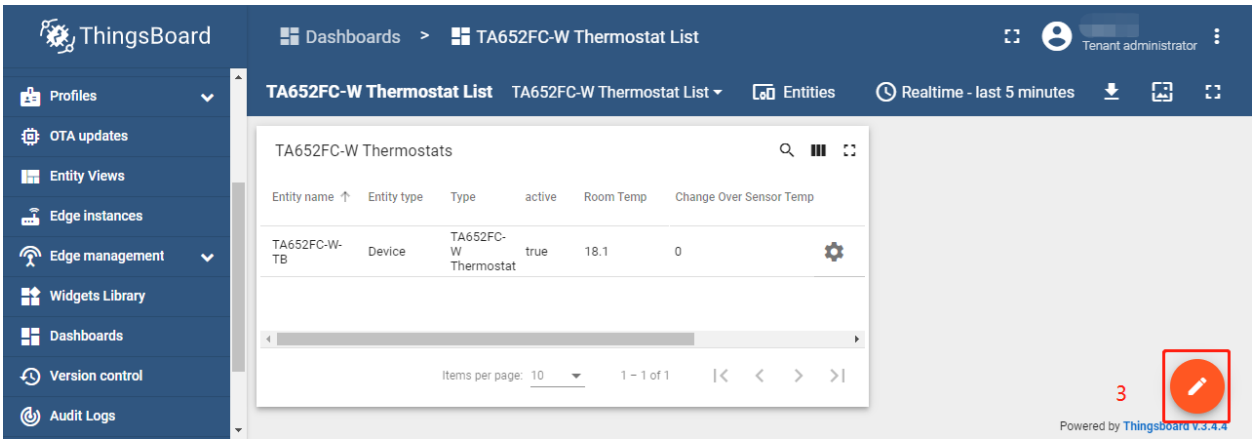


Next, modify a action's target dashboard and target dashboard state.

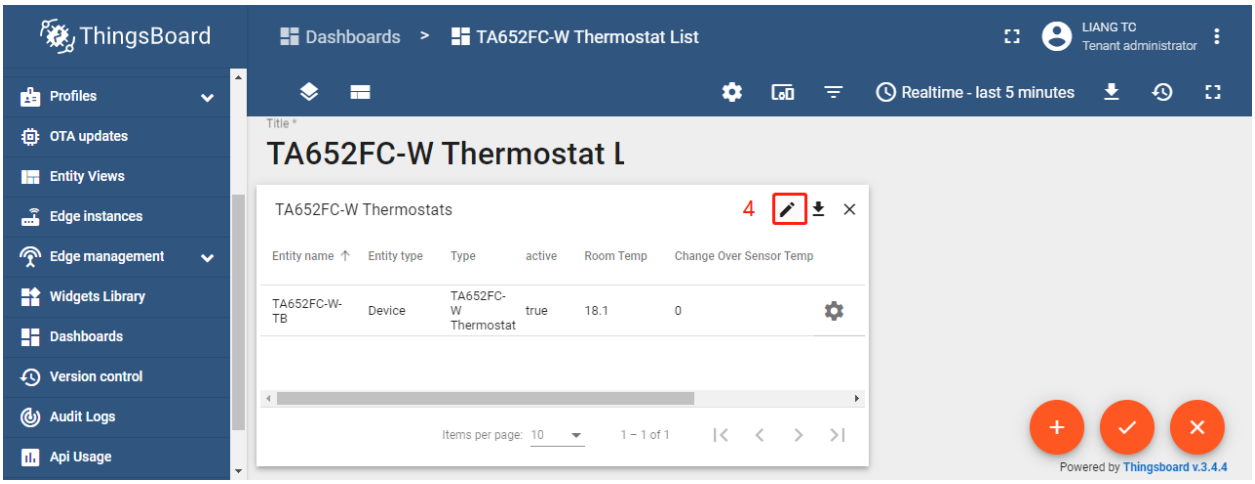
- **Dashboards** –> Click *my list dashboard*



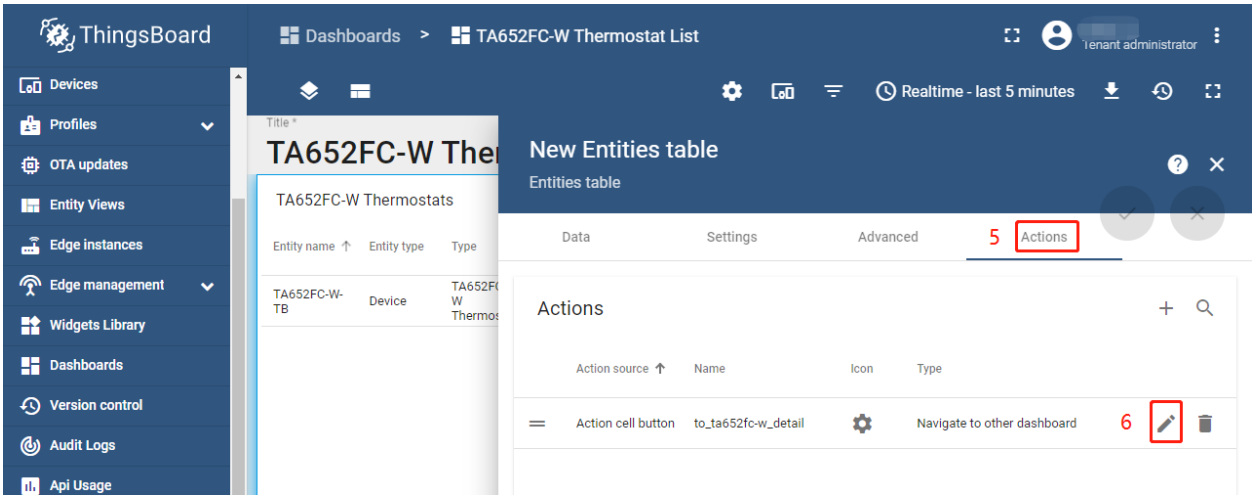
- **Edit** (red icon on the bottom and right)



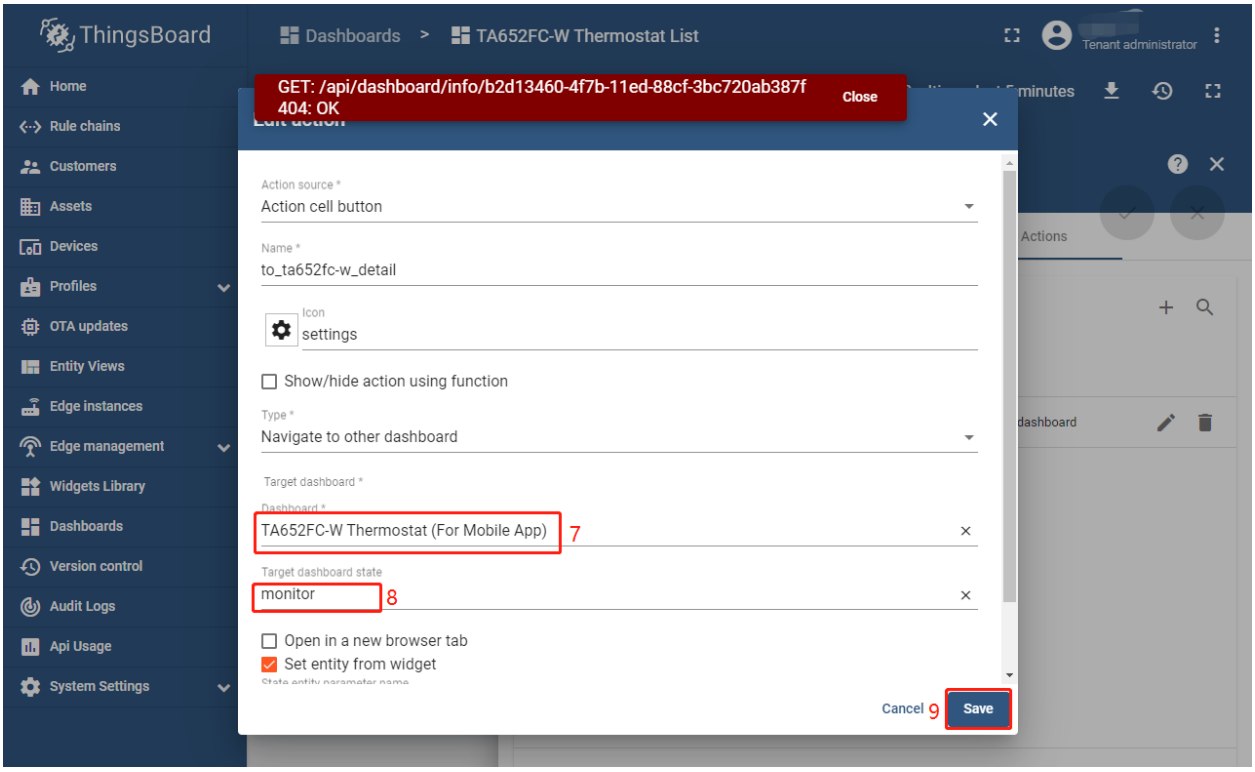
- Enter *Edit Dashboard Mode* –> **Edit Widget** (icon)



- **Action** –> **Edit Action** (icon)



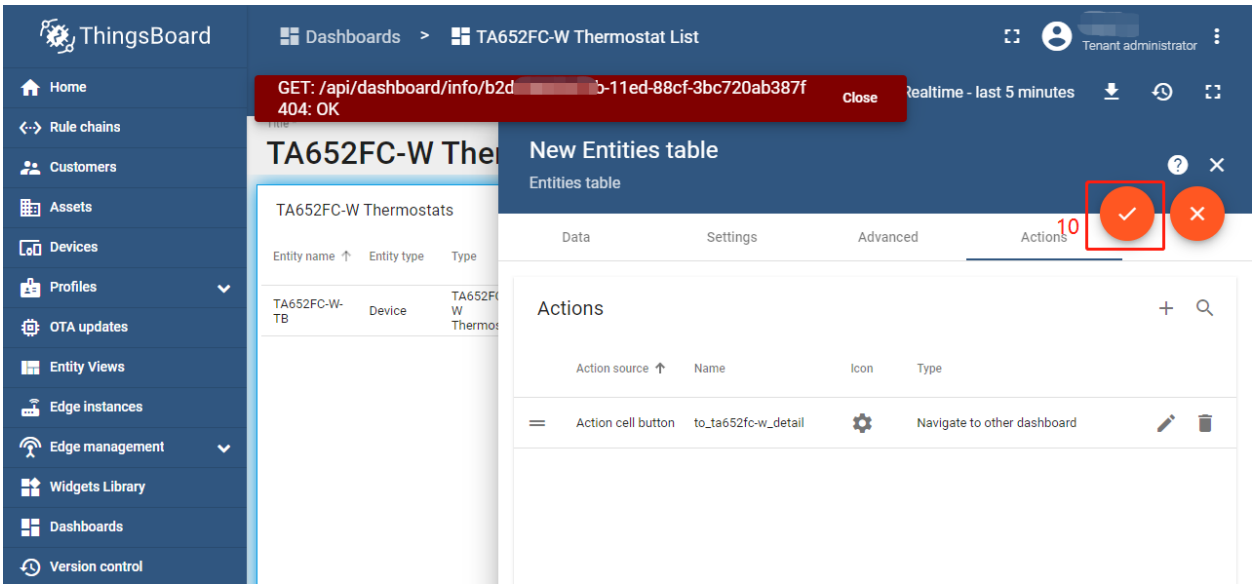
- Modify **Target dashboard** –> modify **Target dashboard state** –> **Save**



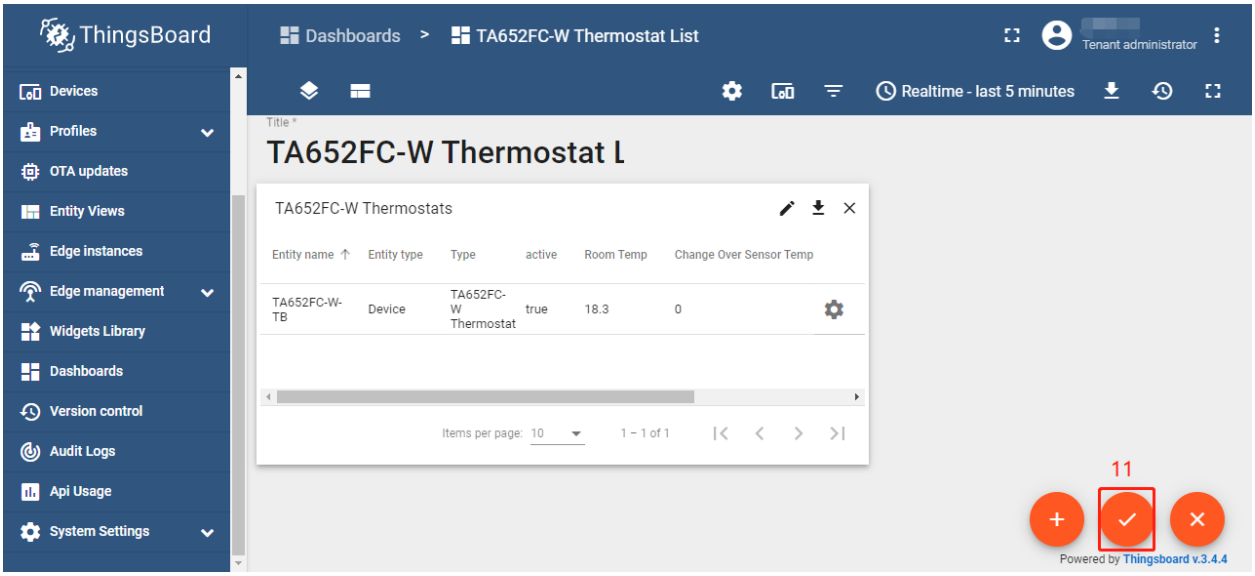
These values are shown in the following table:

Field	Value
Target dashboard	TA652FC-W Thermostat (For Mobile App)
Target dashboard state	monitor

- **Apply changes** (red icon)

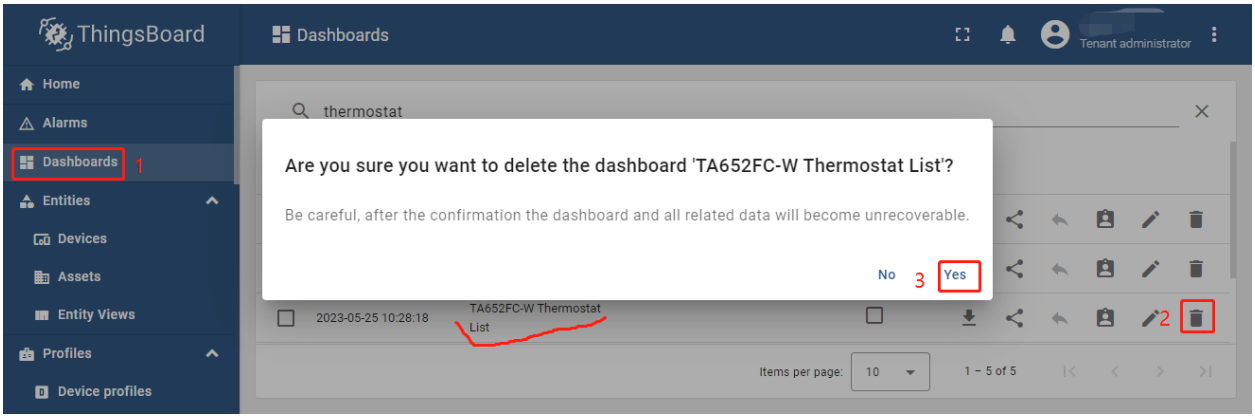


- **Apply changes** (red icon on the bottom and right)



Update List Dashboard

- First, delete this dashboard: **Dashboards** –> Click  in the row of `TA652FC-W Thermostat List` –> **Popup dialog: Are you sure you want to delete . . . ? –> Yes**.



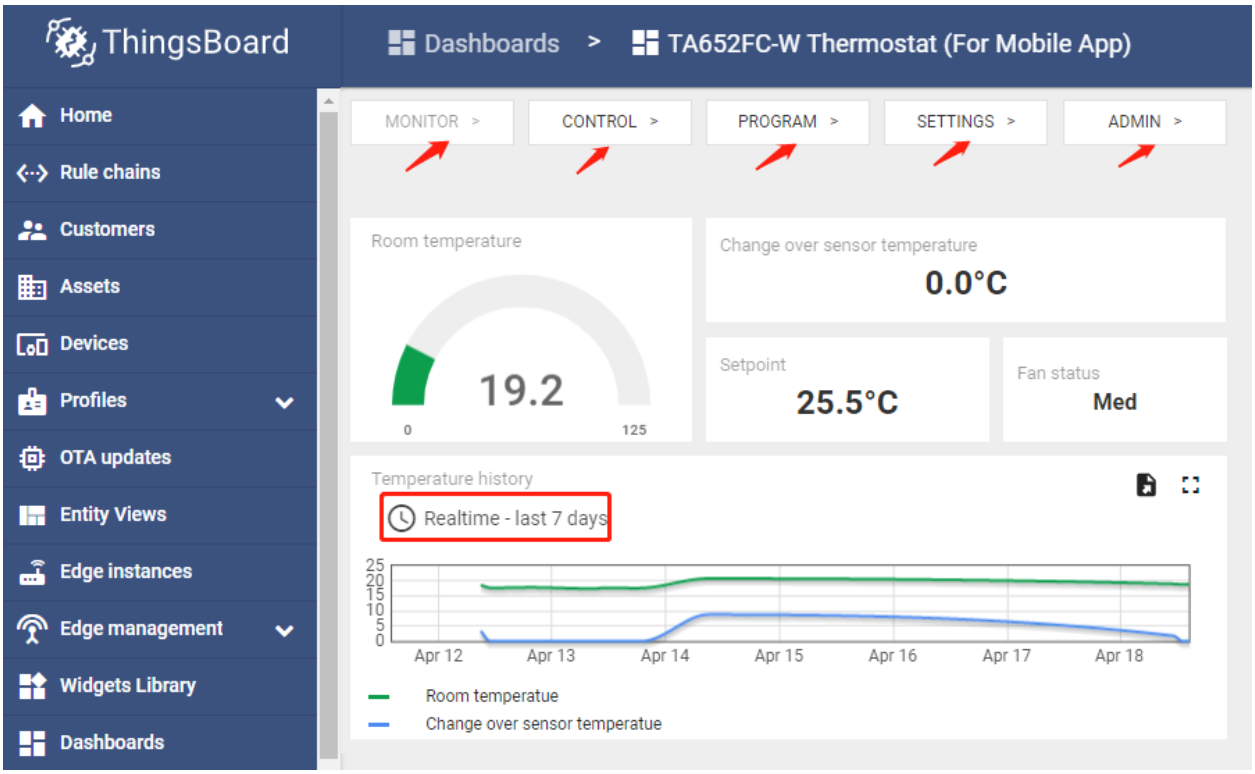
- Next, *import TA652FC-W List Dashboard*.

4.5.3 TA652FC-W Thermostat (For Mobile App)

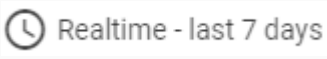
Dashboard states

Monitor state

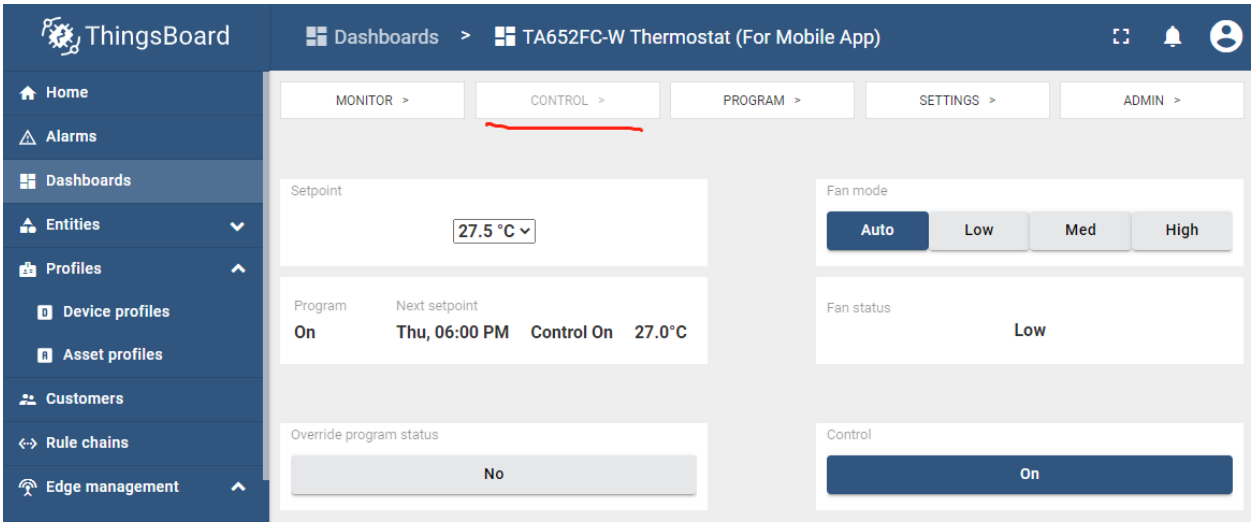
`Monitor state` is root state.



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
MONITOR	skip to *Monitor state*
CONTROL	skip to *Control state*
PROGRAM	skip to *Program state*
SETTINGS	skip to *Settings state*
ADMIN	skip to *Admin state*
Room Temperature	room temperature
Change Over Sensor Temperature	change over sensor temperature
Setpoint	current setpoint value
Fan Status	“Off”, “Low”, “Med” or “High”
Temperature history	Room temperature & Change Over Sensor temperature history. Click  to edit this timewindow. Refer to *Default state*

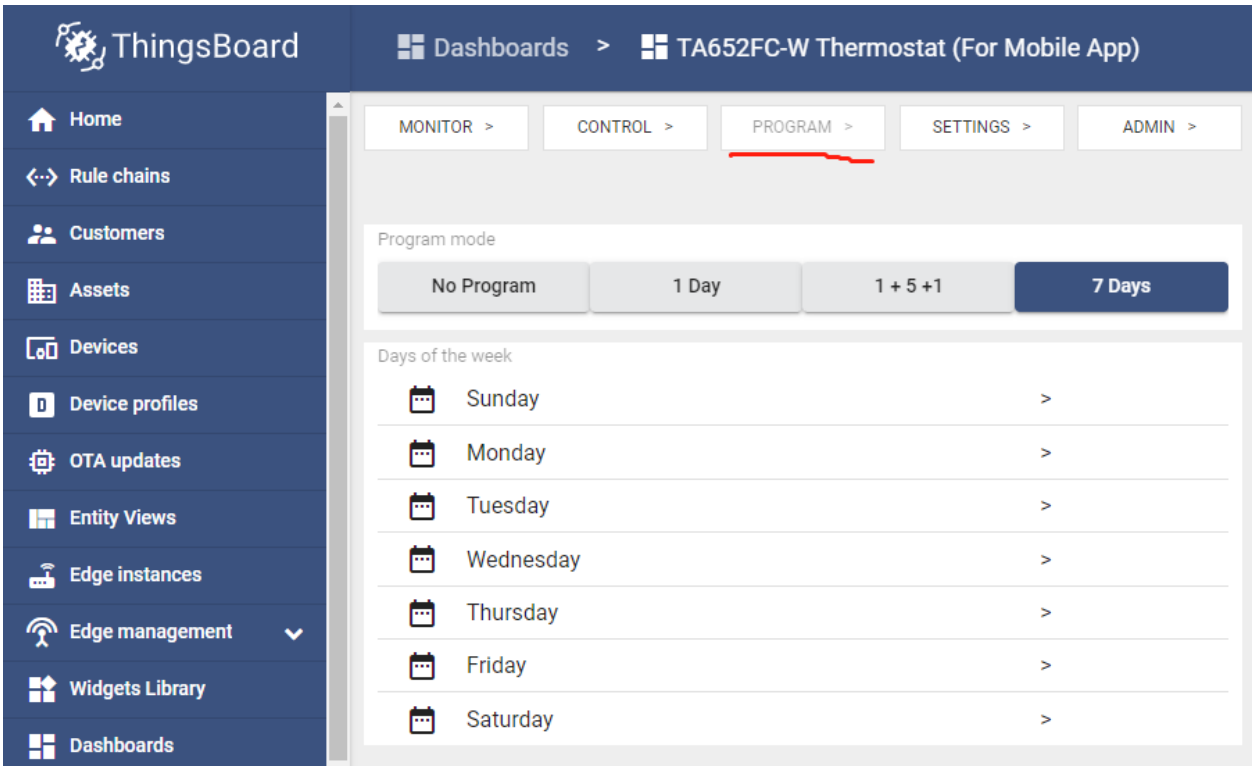
Control state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
Setpoint	If you adjust *setpoint*, *override program status* is YES (true)
Program	program on or off
PRG next setpoint	next program time & setpoint
Override program status	“YES”(true) or “NO”(false)
Fan Mode	“Auto”, “Low”, “Med” or “High”
Fan Status	“Off”, “Low”, “Med” or “High”
Control Mode	“Off” or “On”

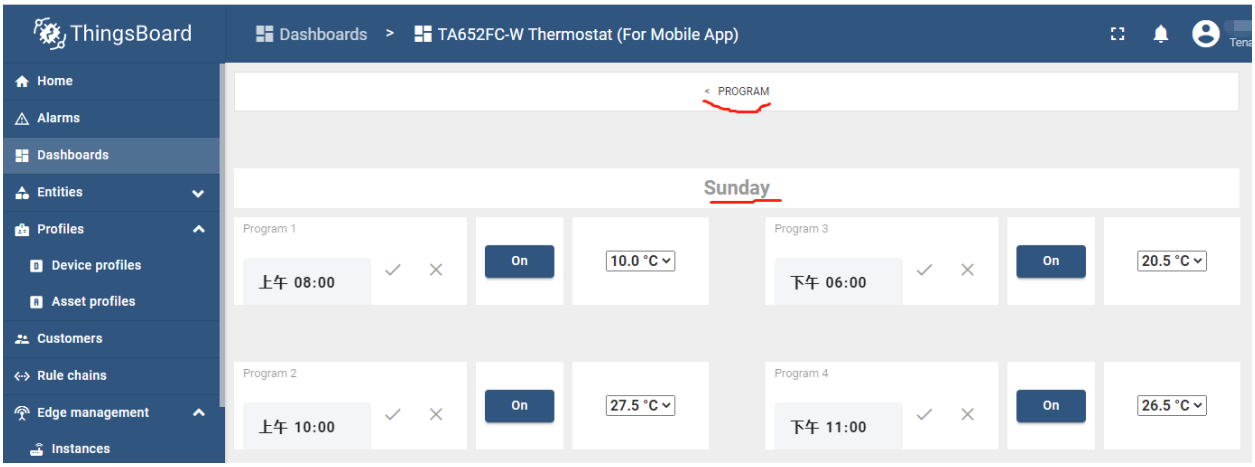
Program state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Program Mode	Description
NO PROGRAM	Program disabled
1 DAY (MON)	Using 4 set points of Monday every day
1+5+1 (SUN+MON+SAT)	Using 4 set points of Monday from Monday to Friday
7 DAYS (SUN~SAT)	Using 4 set points every day
Sunday, . . .	Skip to *Program_setpoints state*

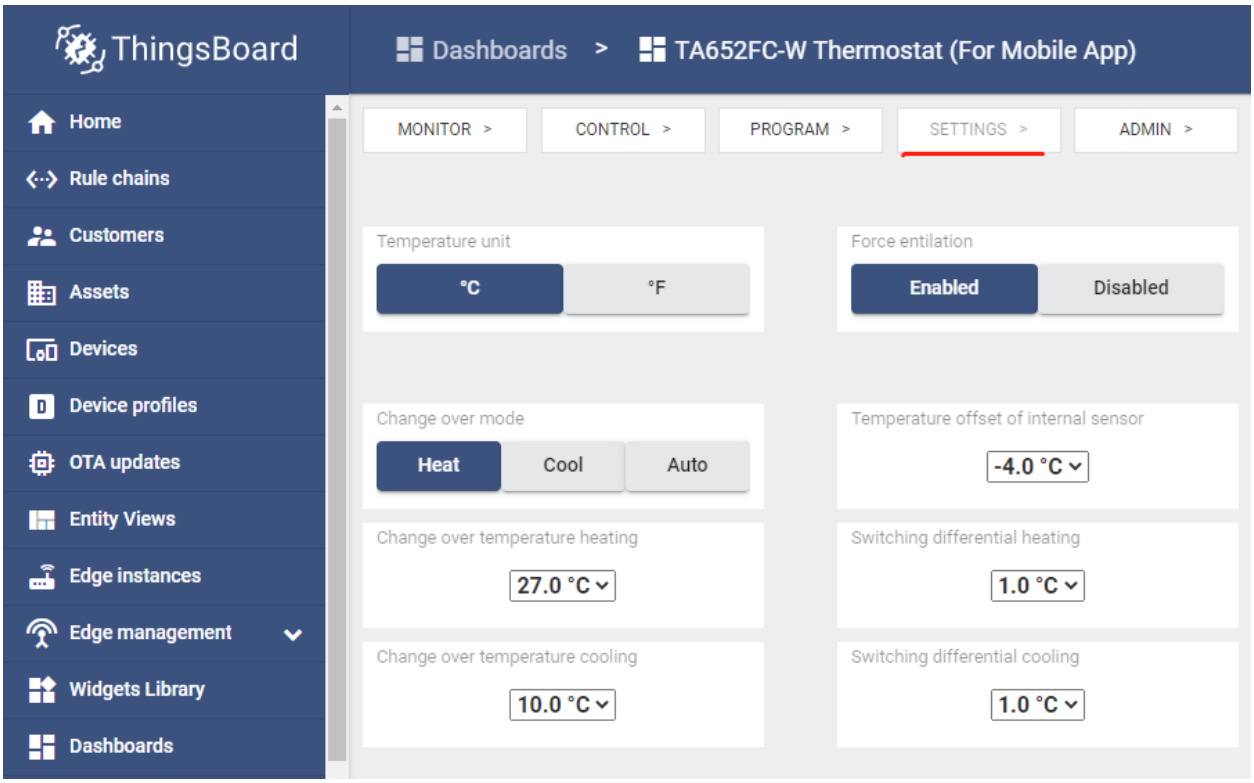
Program_setpoints state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
Program 1 ~ Program 4	time, hour:minute
Control Mode 1 ~ Control Mode 4	On, Off
Setpoint 1 ~ Setpoint 4	setpoint value, temperature

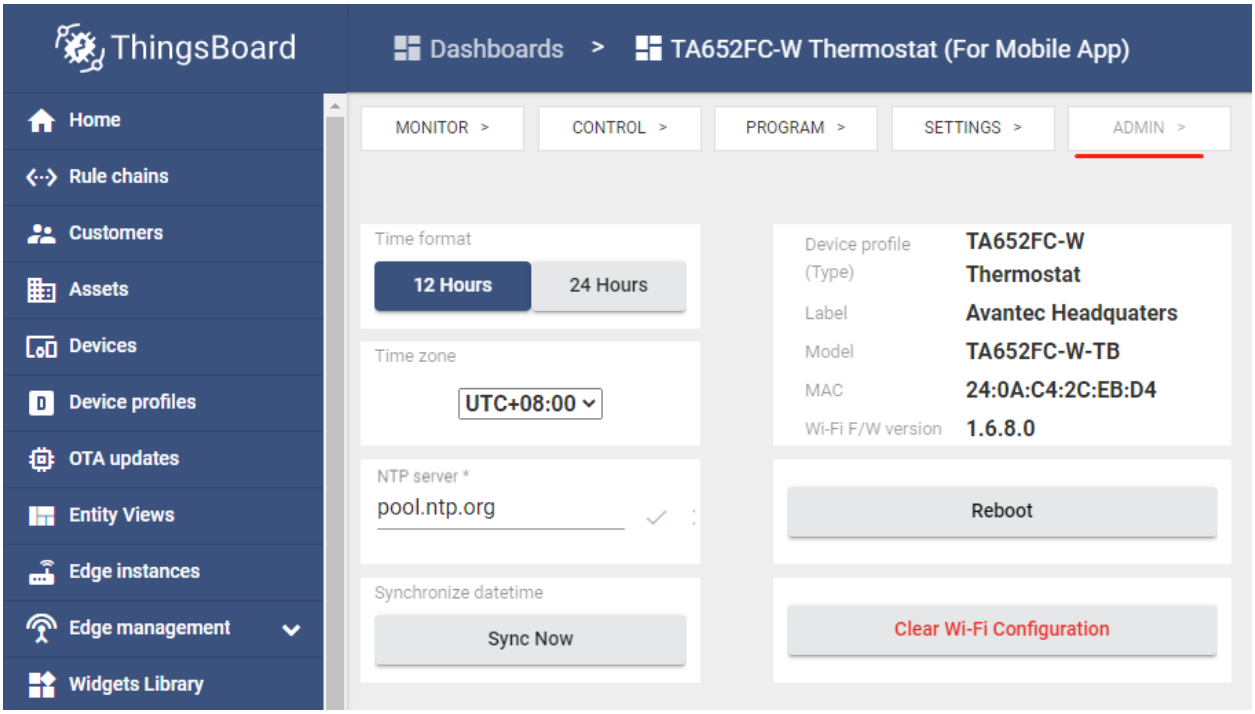
Settings state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
Temp Unit	"°C" or "°F". **Reboot the device to take effect**
Change Over Mode	"Heat", "Cool" or "Auto"
Change Over Temp Heating	Change over temperature heating
Change Over Temp Cooling	Change over temperature cooling
Force Ventilation	Used in automatic *Fan Mode*
Temp Offset(Internal Sensor)	Internal sensor temperature offset
Switching Diff Heating	Switching differential heating
Switching Diff Cooling	Switching differential cooling

Admin state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
Time Format	"12 Hours" or "24 Hours"
Timezone	See *Step 4.2 Add shared attributes of new device*
NTP Server	SNTP protocol server URL, e.g. pool.ntp.org, 0.pool.ntp.org, 1.pool.ntp.org, time.nist.gov, ... see *Step 4.2 Add shared attributes of new device*
Sync Time	Sync time per syncTimeFreq seconds. If you change *Timezone* or *NTP Server*, you have to do it. See *Step 4.2 Add shared attributes of new device*
Device attributes	Device name, device profile (type), device label, model, MAC, device Wi-Fi Module F/W version, device Main MCU F/W version
Reboot	Reboot device
Clear Wi-Fi Config	Clear device's Wi-Fi configuration

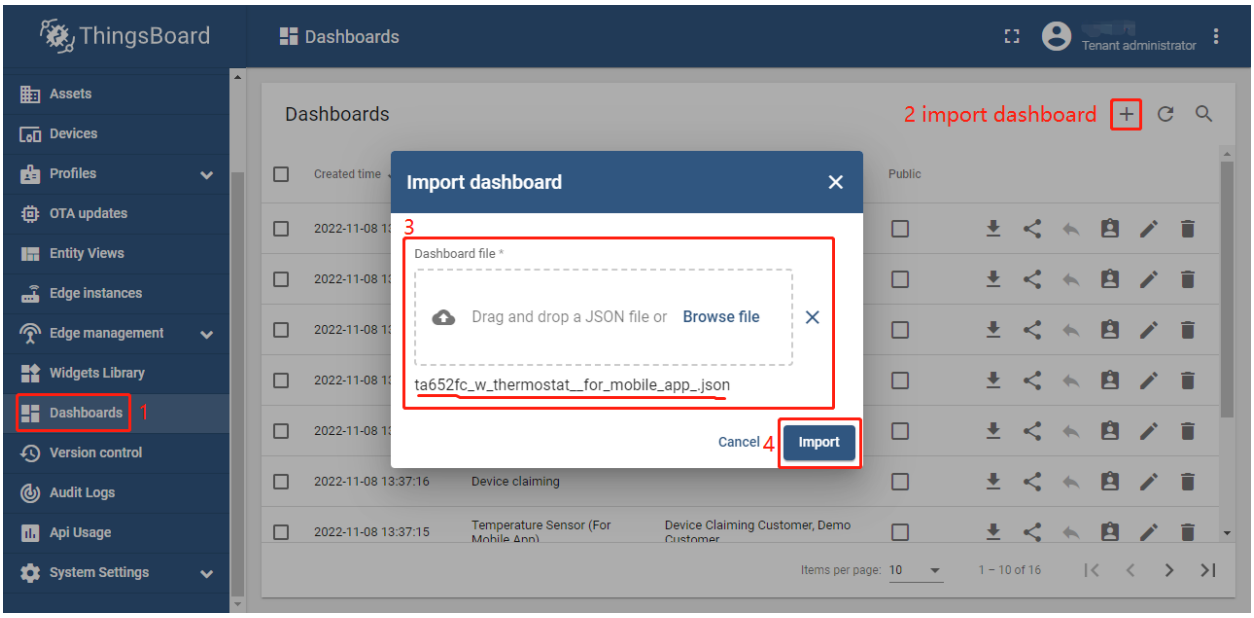
Import Detail Dashboard

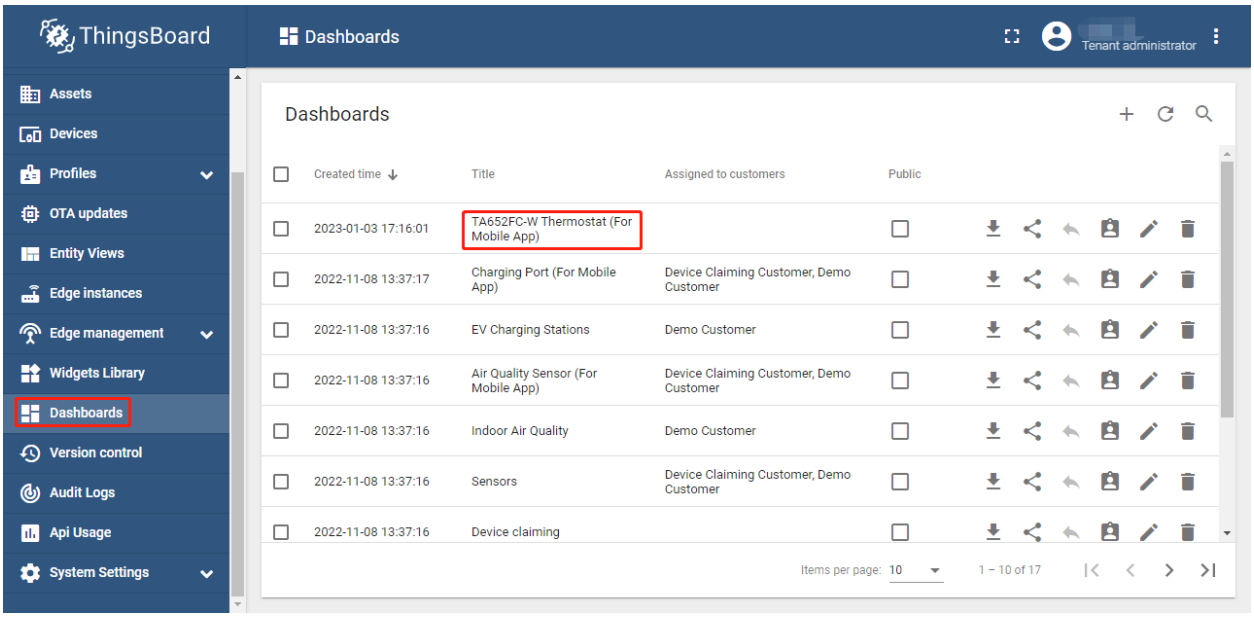
Tip: *A Dashboard file* can only be imported once. If you have already imported it, you don't need and cannot repeat the import.

If you have already imported it, you can skip this step.

In order to use this dashboard, you must to create `TA652FC-W Thermostat Device Profile`. If it doesn't exist, you can import it. See *Import Device Profile of TA652FC-W Thermostat*.

- Download `ta652fc_w_thermostat__for_mobile_app_.json`.
- **Dashboards** –> **+** –> **Popup dialog: Import dashboard** –> Drag and drop *detail dashboard File* –> **Import**.

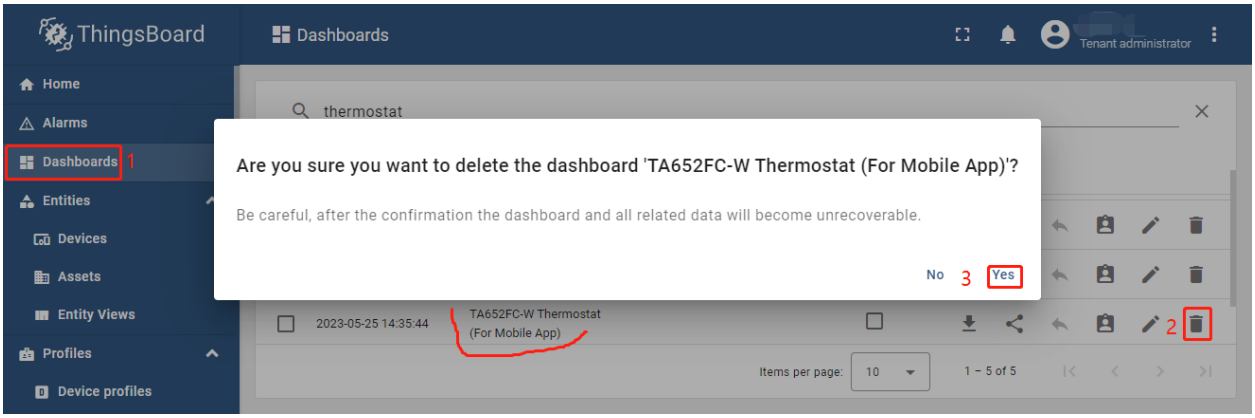




- Optional, This dashboard can be set as `TA652FC-W Thermostat Device Profile`'s mobile dashboard. See *Modify TA652FC-W Thermostat device profile's mobile dashboard*.

Update Detail Dashboard

- First, *clear TA652FC-W Thermostat device profile's mobile dashboard*.
- Next, delete this dashboard: **Dashboards** –> Click in the row of `TA652FC-W Thermostat (For Mobile App)` –> **Popup dialog: Are you sure you want to delete ...? –> Yes**.



- Then *import TA652FC-W Detail Dashboard*.

4.6 TA652FC-W MQTT API

Tip:

- This section applies to both `TA652FC-W` and `TA652FH-W`.
- Unless otherwise specified, all specifications applicable to TA652FC-W are also applicable to TA652FH-W.

4.6.1 Overview

`TA652FC-W & TA652FH-W MQTT API` is an implementation of *ThingsBoard MQTT Device API* (MQTT is a lightweight publish/subscribe messaging protocol).

4.6.2 Features

- MQTT protocol:
  - Support MQTT over TCP
  - **NOT support MQTT over SSL with mbedtls, MQTT over Websocket, MQTT over Websocket Secure**
- Base on *ThingsBoard MQTT Device API*:
  - Support telemetry upload API
  - Support client-side & shared attributes, and attributes API:
    - Request attribute values from the server
    - Publish attribute update to the server
    - Subscribe to attribute updates from the server
  - Support PRC API:
    - Server-side RPC: one-way and two-way
    - Client-side RPC: one-way and two-way

- Support Claiming devices API
- Support Firmware API
- **NOT support Device provisioning API**

4.6.3 MQTT Special

- Currently support `mqtt` schemes
- Currently **NOT** support `mqtts`, `ws`, `wss` schemes
- MQTT over TCP samples:
  - `mqtt://mqtt.eclipse.org` : MQTT over TCP, default port 1883:
  - `mqtt://mqtt.eclipse.org:1884` : MQTT over TCP, port 1884:

4.6.4 Flow Chart

Tip: The range of values for message fields is referred to in the following sections, see *Telemetry (Time-series data)*, *Shared attributes*, *Client-side attributes* and *Server-side RPC*.

TELE.01 Time-series Data Upload

Chart:

Message:

```
// Message Type:  Telemetry upload (MQTT, PUBLISH)
// Topic:         v1/devices/me/telemetry
// Payload - TA652FC-W:
{"roomTemp":26.2,"changeOverTemp":26.3}
// Payload - TA652FH-W:
{"roomTemp":26.2,"floorTemp":26.3}
```

See *roomTemp*, *changeOverTemp* (only for TA652FC-W), *floorTemp* (only for TA652FH-W).

See *uploadFreq*.

See *uploadThreshold*.

CTRL.01 Control Mode

Chart:

Message 1:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
```

(continues on next page)

(continued from previous page)

```
// Payload:
{"controlMode":"On"}
```

Message 2:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSetControlMode","params":"Off"}
```

See *controlMode* and *remoteSetControlMode*.

CTRL.02 Fan Mode & Fan Status (only for TA652FC-W)

Chart:

Message 1:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload - TA652FC-W:
{"fanMode":"Auto"}
```

Message 2:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload - TA652FC-W:
{"fanStatus":"Low"}
```

Message 3:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload - TA652FC-W:
{"method":"remoteSetFanMode","params":"Med"}
```

See *fanMode* (only for TA652FC-W), *fanStatus* (only for TA652FC-W) and *remoteSetFanMode* (only for TA652FC-W).

CTRL.03 Set Point & Override Status

Chart:

Message 1:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"spValue":27.5}
```

Message 2:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"overrideStatus":false}
```

Message 3:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSetSpValue","params":34}
```

Example 4:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSetOverrideStatus","params":{}}
```

See *spValue*, *overrideStatus*, *remoteSetSpValue* and *remoteSetOverrideStatus* .

PRG.01 Program Mode & Program Status

Chart:

Message 1:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"prgMode":"Every-day"}
```

Message 2:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"prgNextEnable":true}
```

Message 3:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"prgNextCtrlMode":"On"} //{"prgNextCtrlMode":"Off"}
```

Message 4:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"prgNextSetpoint":24.5}
```

Message 5:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"prgNextDaysTime":"Wed, 06:00 PM"}
```

Message 6:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSetPrgMode","params":"Sun_mon-fri_sat"}
```

See *prgMode*, *prgNextEnable*, *prgNextCtrlMode*, *prgNextSetpoint*, *prgNextDaysTime* and *remoteSetPrgMode*.

PRG.02 Program Setpoint & Time

Chart:

Message 1:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"prgSpTime00":"10:00"}
```

Message 2:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"prgCtrlMode00":"On"} //{"prgCtrlMode27":"Off"}
```

Message 3:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"prgSpValue00":27.5}
```

Message 4:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSetPrgSpTime27","params":"23:00"}
```

Message 5:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSetPrgCtrlMode27","params":"Off"} //{"method":
↪"remoteSetPrgCtrlMode00","params":"On"}
```

Message 6:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSetPrgSpValue14","params":21.5}
```

See *prgSpTimeXX*, *prgCtrlModeXX*, *prgSpValueXX*, *remoteSetPrgSpTimeXX*, *remoteSetPrgCtrlModeXX* and *remoteSetPrgSpValueXX*.

SET.01 Upload Device Attributes when the device is started

Chart:

Message 1:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"model":"TA652FC-W-TB","mac":"24:0A:C4:2C:EB:C8",
"wifiFWVersion":"1.5.4.0","mcuFWVersion":"1.4.4.1",
"wifiRSSIMin":0,"wifiRssiMax":255,"wifiRssiStep":1,
"uploadFreqMin":2,"uploadFreqMax":2592000,"uploadFreqStep":1,
"syncTimeFreqMin":1800,"syncTimeFreqMax":2592000,"syncTimeFreqStep":1}
```

Message 2:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"supportCtrlModeInSchedule":"Yes",
"currentTempUnit":"°C",
"envirTempMin":0,"envirTempMax":50,"envirTempStep":0.1,
"spValueMin":5,"spValueMax":40,"spValueStep":0.5,
"internalOffsetMin":-5,"internalOffsetMax":5,"internalOffsetStep":0.5,
"uploadThresholdMin":0.2,"uploadThresholdMax":5,"uploadThresholdStep":0.1}
```

Message 3 - TA652FC-W:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload - TA652FC-W:
{"switchingDiffHeatingMin":1,"switchingDiffHeatingMax":4,"switchingDiffHeatingStep
↪":0.5,
"switchingDiffCoolingMin":1,"switchingDiffCoolingMax":4,"switchingDiffCoolingStep
↪":0.5,
"changeOverTempHeatingMin":27,"changeOverTempHeatingMax":40,
↪"changeOverTempHeatingStep":0.5,
"changeOverTempCoolingMin":10,"changeOverTempCoolingMax":25,
↪"changeOverTempCoolingStep":0.5}
```

Message 3 - TA652FH-W:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload - TA652FH-W:
{"floorTempLimitedMin":20,"floorTempLimitedMax":40,"floorTempLimitedStep":0.5,
"switchingDiffHeatingMin":1,"switchingDiffHeatingMax":4,"switchingDiffHeatingStep
↪":0.5,
"switchingDiffCoolingMin":1,"switchingDiffCoolingMax":4,"switchingDiffCoolingStep
↪":0.5}
```

See *model*, *mac*, *wifiFWVersion*, *mcuFWVersion*, *wifiRSSIMin*, *wifiRssiMax*, *wifiRssiStep*, *uploadFreqMin*, *uploadFreqMax*, *uploadFreqStep*, *syncTimeFreqMin*, *syncTimeFreqMax* and *syncTimeFreqStep*.

See *supportCtrlModeInSchedule*, *currentTempUnit*, *envirTempMin*, *envirTempMax*, *envirTempStep*, *spValueMin*, *spValueMax*, *spValueStep*, *internalOffsetMin*, *internalOffsetMax* and *internalOffsetStep*, *uploadThresholdMin*, *uploadThresholdMax* and *uploadThresholdStep*.

See *floorTempLimitedMin* (only for TA652FH-W), *floorTempLimitedMax* (only for TA652FH-W), *floorTempLimitedStep* (only for TA652FH-W), *switchingDiffHeatingMin*, *switchingDiffHeatingMax*, *switchingDiffHeatingStep*, *switchingDiffCoolingMin*, *switchingDiffCoolingMax*, *switchingDiffCoolingStep*, *changeOverTempHeatingMin* (only for TA652FC-W), *changeOverTempHeatingMax* (only for TA652FC-W), *changeOverTempHeatingStep* (only for TA652FC-W), *changeOverTempCoolingMin* (only for TA652FC-W), *changeOverTempCoolingMax* (only for TA652FC-W) and *changeOverTempCoolingStep* (only for TA652FC-W).

SET.02 Settings

Chart:

Message 1a:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"tempUnit":"°C"}
```

Message 1b:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSetTempUnit","params":"°F"}
```

Message 2a:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"timeFormat":"12hours"}
```

Message 2b:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSetTimeFormat","params":"24hours"}
```

Message 3a:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"method":"remoteSetInternalOffset","params":-3.5}
```

Message 3b:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"internalOffset":-3.5}
```

Message 4a:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"switchingDiffHeating":3.5}
```

Message 4b:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSetSwitchingDiffHeating","params":3.5}
```

Message 5a:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
```

(continues on next page)

(continued from previous page)

```
// Topic:         v1/devices/me/attributes
// Payload:
{"switchingDiffCooling":2.5}
```

Message 5b:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSetSwitchingDiffCooling","params":2.5}
```

Message 6a - TA652FH-W:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload - TA652FH-W:
{"systemMode":"Cool"}
```

Message 6b - TA652FH-W:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload - TA652FH-W:
{"method":"remoteSetSystemMode","params":"Heat"}
```

Message 7a - TA652FH-W:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload - TA652FH-W:
{"sensorMode":"Internal"}
```

Message 7b - TA652FH-W:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload - TA652FH-W:
{"method":"remoteSetSensorMode","params":"External"}
```

Message 8a - TA652FH-W:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload - TA652FH-W:
{"floorTempLimited":29.5}
```

Message 8b - TA652FH-W:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
```

(continues on next page)

(continued from previous page)

```
// Payload - TA652FH-W:
{"method":"remoteSetFloorTempLimited","params":29.5}
```

Message 9a - TA652FH-W:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload - TA652FH-W:
{"adaptiveControl":false}
```

Message 9b - TA652FH-W:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload - TA652FH-W:
{"method":"remoteSetAdaptiveControl","params":true}
```

Message 10a - TA652FC-W:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload - TA652FC-W:
{"forceVent":true}
```

Message 10b - TA652FC-W:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload - TA652FC-W:
{"method":"remoteSetForceVent","params":false}
```

Message 11a - TA652FC-W:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload - TA652FC-W:
{"changeOverMode":"Heat"}
```

Message 11b - TA652FC-W:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload - TA652FC-W:
{"method":"remoteSetChangeOverMode","params":"Auto"}
```

Message 12a - TA652FC-W:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
```

(continues on next page)

(continued from previous page)

```
// Payload - TA652FC-W:
{"changeOverTempHeating":27}
```

Message 12b - TA652FC-W:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload - TA652FC-W:
{"method":"remoteSetChangeOverTempHeating","params":27}
```

Message 13a - TA652FC-W:

```
// Message Type:  publish client-side attributes update to the server (MQTT,␣
↪PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload - TA652FC-W:
{"changeOverTempCooling":11.5}
```

Message 13b - TA652FC-W:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload - TA652FC-W:
{"method":"remoteSetChangeOverTempCooling","params":10}
```

See *tempUnit* and *remoteSetTempUnit*, *timeFormat* and *remoteSetTimeFormat*, *internalOffset* and *remoteSetInternalOffset*, *switchingDiffHeating* and *remoteSetSwitchingDiffHeating*, *switchingDiffCooling* and *remoteSetSwitchingDiffCooling*.

See *systemMode* and *remoteSetSystemMode*, *sensorMode* and *remoteSetSensorMode*, *floorTempLimited* and *remoteSetFloorTempLimited*, *adaptiveControl* and *remoteSetAdaptiveControl*.(only for TA652FH-W)

See *forceVent* and *remoteSetForceVent*, *changeOverMode* and *remoteSetChangeOverMode*, *changeOverTempHeating* and *remoteSetChangeOverTempHeating*, *changeOverTempCooling* and *remoteSetChangeOverTempCooling*.(only for TA652FC-W)

ADM.01 Request all remote parameters when the device is started

Chart:

Message 1:

```
// Message Type:  request attribute values from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/attributes/request/$request_id
// Payload:
{"sharedKeys":"uploadFreq,uploadThreshold,syncTimeFreq,timezone,timeNTPServer"}
```

Message 2:

```
// Message Type:  receive response (MQTT, PUBLISH)
// Topic:         v1/devices/me/attributes/response/$request_id
// Payload:
{"shared":{"uploadFreq":300,"uploadThreshold":1.5,"syncTimeFreq":86400,
"timezone":480,"timeNTPServer":"pool.ntp.org"}}
```

See *uploadFreq*, *uploadThreshold*, *syncTimeFreq*, *timezone* and *timeNTPServer*.

ADM.02 Timer Parameters & upload threshold

Chart:

Message 1:

```
// Message Type:  receive attribute update from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"uploadFreq":300}
```

Message 2:

```
// Message Type:  receive attribute update from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"uploadThreshold":1.5}
```

Message 3:

```
// Message Type:  receive attribute update from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"syncTimeFreq":86400}
```

See *uploadFreq*, *uploadThreshold* and *syncTimeFreq*.

ADM.03 Remote Sync Time

Chart:

Message 1:

```
// Message Type:  receive attribute update from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"timezone":480}
```

Message 2:

```
// Message Type:  receive attribute update from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/attributes
// Payload:
{"timeNTPServer":"pool.ntp.org"}
```

Message 3:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteSyncTimeRequest","params":{}}
```

See *timezone*, *timeNTPServer* and *remoteSyncTimeRequest*.

ADM.04 FUOTA (firmware update over the air)

The flow is to download the firmware from your HTTP server. For the flow of downloading firmware from ThingsBoard server, please refer to *Firmware API*.

Chart:

Message 1a:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteWiFiFUOTA",
"params":"http://192.168.1.106/TA652FC-W_WiFi.ino.bin"}
```

Message 1b:

```
// Message Type:  send response (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/response/$request_id
// Payload:
{"method":"remoteWiFiFUOTA","results":{"result":"success"}}
```

Message 2a (NOT implemented):

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
 {"method":"remoteMcuFUOTA",
 "params":"http://192.168.1.106/TA652FC-W_MCU.bin"}
```

Message 2b (NOT implemented):

```
// Message Type:  send response (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/response/$request_id
// Payload:
{"method":"remoteMcuFUOTA","results":{"result":"success"}}
```

See *remoteWiFiFUOTA* and *remoteMcuFUOTA*.

ADM.05 Remote Get Memeory Usage

Chart:

Message 1a:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteGetMemoryUsage"}
```

Message 1b:

```
 // Message Type:  send response (MQTT, PUBLISH)
 // Topic:         v1/devices/me/rpc/response/$request_id
 // Payload:
{"iram":162592,"spiram":4194252}
```

See *remoteGetMemoryUsage*.

ADM.06 Remote Reboot Device

Chart:

Message 1:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteRebootDevice","params":{}}
```

See *remoteRebootDevice*.

ADM.07 Remote Clear Wi-Fi Config

Chart:

Message 1:

```
// Message Type:  receive server-side RPC request from the server (MQTT, PUBLISH)
// Topic:         v1/devices/me/rpc/request/$request_id
// Payload:
{"method":"remoteClearWiFiConfig","params":{}}
```

See *remoteClearWiFiConfig*.

Claiming

Refer to *Claiming API*.

Firmware update with ThingsBoard Server

Refer to *Firmware API*.

4.6.5 Telemetry (Time-series data)

Tip:

- All of these telemetry (timeseries data) is uploaded every *uploadFreq* seconds.
- If these telemetry (timeseries data) change exceeds *uploadThreshold*, upload immediately.

roomTemp

changeOverTemp

floorTemp

wifiRssi

Table 3: Telemetry (Time-series data)

Time-series	Type	Unit	Min	Max	Step/Pre	Valu	TA652 FC-W	TA652 FH-W	Memo
roomTemp	float	*current-TempUnit*	*envirTemp-Min*	*envirTemp-Max*	*envirTemp-Step*				Room temperature
changeOverT	float	*current-TempUnit*	*envirTemp-Min*	*envirTemp-Max*	*envirTemp-Step*				Change Over Temperatue
floorTemp	float	*current-TempUnit*	*envirTemp-Min*	*envirTemp-Max*	*envirTemp-Step*				Floor Temperatue
wifiRssi (deprecated)*	int		*wifiRssiM*	*wifiRssi-Max*	*wifiRssiStep*				Received Signal Strength Indicator

Tip: In order to reduce the load on ThingsBoard server, *wifiRssi* is no longer sent.

4.6.6 Shared attributes

Tip: All of these shared attributes may be obtained from your ThingsBoard server.

uploadFreq

uploadThreshold

syncTimeFreq

timezone

timeNTPServer

Table 4: Shared attributes

Sharec attribute	Type	Unit	Min	Max	Step/Pr	Value	TA65 FC-W	TA65 FH-W	Memo
upload-Freq	int	second	*uploadFreqMin*	*uploadFreqMax*	*uploadFreqStep*	Default: 300			Time-series (Telemetry) upload Frequency. see *Step 4.2 Add shared attributes of new device*.
upload-Threshold	double	temperature	*uploadThresholdMin*	*uploadThresholdMax*	*uploadThresholdStep*	Default: 1.5			Time-series (Telemetry) upload Threshold. see *Step 4.2 Add shared attributes of new device*.
syncTimeFreq	int	second	*syncTimeFreqMin*	*syncTimeFreqMax*	*syncTimeFreqStep*	Default: 86400 (24*3600)			timer period of sync datetime. see *Step 4.2 Add shared attributes of new device*.
timezone	int	minut				Default: 480 (8*60)			offset UTC. see *Step 4.2 Add shared attributes of new device*.
timeNTF	string					Default: pool.ntp.org (127 char+'0')			SNTP server, eg: pool.ntp.org . see *Step 4.2 Add shared attributes of new device*.

4.6.7 Client-side attributes

Client-side attribute (static/fixed)

model

mac

wifiFWVersion

mcuFWVersion

Table 5: Client-side attribute (static/fixed)

Client-side attribute (static/fixed)	Type	Unit	Value	TA652 FC-W	TA652 FH-W	Memo
model	string		“TA652FC-W-TB”, “TA652FH-W-TB”			Product Model
mac	string		eg: “34:02:86:5F:23:A9”			Mac Address
wifiFWVersion	string		eg: “1.5.5”			WiFi Module F/W version
mcuFWVersion	string		eg: “1.5.4”			Main MCU F/W version

Client-side attribute (static/fixed, metadata)

wifiRssiMin

wifiRssiMax

wifiRssiStep

uploadFreqMin

uploadFreqMax

uploadFreqStep

syncTimeFreqMin

syncTimeFreqMax

syncTimeFreqStep

Table 6: Client-side attribute (static/fixed, metadata)

Client-side attribute (static/fixed, metadata)	Type	Unit	Value	TA652 FC-W	TA652 FH-W	Memo
wifiRssiMin	int		0			the minimum value of *wifiRssi*
wifiRssiMax	int		255			the maximum value of *wifiRssi*
wifiRssiStep	int		1			the step value of *wifiRssi*
uploadFreqMin	int	second	2			the minimum value of *uploadFreq*
uploadFreqMax	int	second	30*24*3600 (2592000)			the maximum value of *uploadFreq*
uploadFreqStep	int	second	1			the step value of *uploadFreq*
syncTimeFreqMin	int	second	30*60			the minimum value of *syncTimeFreq*
syncTimeFreqMax	int	second	30*24*3600			the maximum value of *syncTimeFreq*
syncTimeFreqStep	int	second	1			the step value of *syncTimeFreq*

Client-side attribute (semi-static)

supportCtrlModeInSchedule

currentTempUnit

tempResolution

envirTempMin

envirTempMax

envirTempStep

spValueMin

spValueMax

spValueStep

internalOffsetMin

internalOffsetMax

internalOffsetStep

uploadThresholdMin

uploadThresholdMax

uploadThresholdStep

floorTempLimitedMin

floorTempLimitedMax

floorTempLimitedStep

switchingDiffHeatingMin

switchingDiffHeatingMax

switchingDiffHeatingStep

switchingDiffCoolingMin

switchingDiffCoolingMax

switchingDiffCoolingStep

changeOverTempHeatingMin

changeOverTempHeatingMax

changeOverTempHeatingStep

changeOverTempCoolingMin

changeOverTempCoolingMax

changeOverTempCoolingStep

Table 7: Client-side attribute (semi-static)

Client-side attribute (semi-static)	Type	Unit	Value	TA652 FC-W	TA652 FH-W	Memo
supportCtrlModeInSchedule	string		"Yes" / "No"			Control On/Off in schedule
currentTempUnit	string		"°C" / "°F"			Centigrade, Fahrenheit
envirTempMin	float	*currentTempUnit*	0.0 (°C) / 32 (°F)			the minimum value of *roomTemp changeOverTemp*, *floorTemp*
envirTempMax	float	*currentTempUnit*	50.0 (°C) / 120 (°F)			the maximum value of *roomTemp changeOverTemp*, *floorTemp*
envirTempStep	float	*currentTempUnit*	0.1 (°C) / 0.5 (°F)			the step value of *roomTemp changeOverTemp*, *floorTemp*
spValueMin	float	*currentTempUnit*	5.0 (°C) / 40 (°F)			the minimum value of *spValue prgSpValueXX*
spValueMax	float	*currentTempUnit*	40.0 (°C) / 104 (°F)			the maximum value of *spValue prgSpValueXX*
spValueStep	float	*currentTempUnit*	0.5 (°C) / 1.0 (°F)			the step value of *spValue prgSpValueXX*
internalOffsetMin	float	*currentTempUnit*	-5.0 (°C) / -10 (°F)			the minimum value of *internalOffset*
internalOffsetMax	float	*currentTempUnit*	5.0 (°C) / 10 (°F)			the maximum value of *internalOffset*
internalOffsetStep	float	*currentTempUnit*	0.1 (°C) / 0.5 (°F)			the step value of *internalOffset*
uploadThresholdMin	float	*currentTempUnit*	0.2 (°C) / 32 (°F)			the minimum value of *uploadThreshold*
uploadThresholdMax	float	*currentTempUnit*	5.0 (°C) / 41 (°F)			the maximum value of *uploadThreshold*
uploadThresholdtep	float	*currentTempUnit*	0.1 (°C) / 0.5 (°F)			the step value of *uploadThreshold*
floorTempLimitedMin	float	*currentTempUnit*	20.0 (°C) / 68 (°F)			the minimum value of *floorTempLimited*
floorTempLimitedMax	float	*currentTempUnit*	5.0 (°C) / 10 (°F)			the maximum value of *floorTempLimited*
floorTempLimitedStep	float	*currentTempUnit*	40.0 (°C) / 104 (°F)			the step value of *floorTempLimited*
switchingDiffHeatingMin	float	*currentTempUnit*	0.5 (°C) / 1 (°F)			the minimum value of *switchingDiffHeating*
switchingDiffHeat-	float	*current-*	4.0 (°C) / 8			the maximum value of *switch-*

Client-side attribute (application state)

fanStatus

overrideStatus

prgNextEnable

prgNextCtrlMode

prgNextDaysTime

prgNextSetpoint

Table 8: Client-side attribute (application state)

Client-side attribute (application state)	Type	Unit	Value	TA652 FC-W	TA652 FH-W	Memo
fanStatus	string		"Off", "Low", "Med", "High"			
overrideStatus	bool		true, false			see *spValue*
prgNextEnable	bool		true, false			Next program enabled
prgNextCtrlMode	string		"On", "Off"			Next program control On/Off
prgNextDaysTime	float					Next program weekday & time
prgNextSetpoint	float	*currentTempUnit*				Next program set point

Client-side attribute (change by server-side RPC, settings)

tempUnit

timeFormat

systemMode

sensorMode

internalOffset

floorTempLimited

switchingDiffHeating

switchingDiffCooling

adaptiveControl

forceVent

changeOverMode

changeOverTempHeating

changeOverTempCooling

Table 9: Client-side attribute (change by server-side RPC, settings)

Client-side attribute	Type	Unit	Min	Max	Step/ Precision	Value	TA65 FC-W	TA65 FH-W	Memo
tempUnit	string					"°C" / "°F"			Centigrade, Fahrenheit, see *remoteSetTempUnit*
timeFormat	string					"12hours", "24hours"			see *remoteSetTimeFormat*
systemMode	string					"Heat", "Cool"			see *remoteSetSystemMode*
sensorMode	string					"Internal", "External", "Combined"			see *remoteSetSensorMode*
internalOffset	float	*currentTempUnit*	*internalOffsetMin*	*internalOffsetMax*	*internalOffsetStep*				Internal Sensor Temperture Offset, see *remoteSetInternalOffset*
floorTempLimited	float	*currentTempUnit*	*floorTempLimitedMin*	*floorTempLimitedMax*	*floorTempLimitedStep*				floor temperature limited (combined mode), see *remoteSetFloorTempLimited*
switchingDiffHeating	float	*currentTempUnit*	*switchingDiffHeatingMin*	*switchingDiffHeatingMax*	*switchingDiffHeatingStep*				Switching Differential Heating, see *remoteSetSwitchingDiffHeating*
switchingDiffCooling	float	*currentTempUnit*	*switchingDiffCoolingMin*	*switchingDiffCoolingMax*	*switchingDiffCoolingStep*				Switching Differential Cooling, see *remoteSetSwitchingDiffCooling*
adaptiveControl	bool					true, false			see *remoteSetAdaptiveControl*
forceVent	bool					true, false			Force Ventialation, see *remoteSetForceVent*
changeOverMode	string					"Heat", "Cool", "Auto"			see *remoteSetChangeOverMode*
changeOverTempHeating	float	*currentTempUnit*	*changeOverTempHeatingMin*	*changeOverTempHeatingMax*	*changeOverTempHeatingStep*				Change Over Temp Heating, see *remoteSetChangeOverTempHeating*
changeOverTempCooling	float	*currentTempUnit*	*changeOverTempCoolingMin*	*changeOverTempCoolingMax*	*changeOverTempCoolingStep*				Change Over Temp Cooling, see *remoteSetChangeOverTempCooling*

Client-side attribute (change by server-side RPC, control & program)

controlMode

fanMode

spValue

prgMode

prgSpTimeXX

0 <= XX <= 27, prgSpTime00 ~ prgSpTime27

prgCtrlModeXX

0 <= XX <= 27, prgCtrlMode00 ~ prgCtrlMode27

prgSpValueXX

0 <= XX <= 27, prgSpValue00 ~ prgSpValue27

Table 10: Client-side attribute (change by server-side RPC, control & program)

Client-side attribute	Type	Unit	Min	Max	Step/ Precision	Value	TA652FC-W	TA652FH-W	Memo
controlMode	string					"Off", "On"			see *remoteSetControlMode*
fanMode	string					"Auto", "Low", "Med", "High"			see *remoteSetFanMode*
spValue	float	*currentTempUnit*	*spValueMin*	*spValueMax*	*spValueStep*				see *remoteSetSpValue*, see *overrideStatus*
prgMode	string					"No-program", "One-day", "Sun_mon-fri_sat", "Every-day"			see *remoteSetPrgMode*
prgSpTimeXX	string					"hh:mm", eg: "23:50"			see *remoteSetPrgSpTimeXX*
prgCtrlModeXX	string					"On", "Off"			see *remoteSetPrgCtrlModeXX*
prgSpValueXX	float	*currentTempUnit*	*spValueMin*	*spValueMax*	*spValueStep*				see *remoteSetPrgSpValueXX*

4.6.8 Server-side RPC

Server-side RPC (remote change client-side attribute)

Tip:

- All of these server-side RPC are **one-way**, no response
- Request format of these server-side RPC: {"**method**":"remoteSetTempUnit", "**params**":"°F"}
- **params** value see *Client-side attribute (change by server-side RPC, settings)* & *Client-side attribute (change by server-side RPC, control & program)*

---

remoteSetTempUnit

remoteSetTimeFormat

remoteSetSystemMode

remoteSetSensorMode

remoteSetInternalOffset

remoteSetFloorTempLimited

remoteSetSwitchingDiffHeating

remoteSetSwitchingDiffCooling

remoteSetAdaptiveControl

remoteSetForceVent

remoteSetChangeOverMode

remoteSetChangeOverTempHeating

remoteSetChangeOverTempCooling

remoteSetControlMode

remoteSetFanMode

remoteSetSpValue

remoteSetPrgMode

remoteSetPrgSpTimeXX

0 <= XX <= 27, remoteSetPrgSpTime00 ~ remoteSetPrgSpTime27

remoteSetPrgCtrlModeXX

0 <= XX <= 27, remoteSetPrgCtrlMode00 ~ remoteSetPrgCtrlMode27

remoteSetPrgSpValueXX

0 <= XX <= 27, remoteSetPrgSpValue00 ~ remoteSetPrgSpValue27

Table 11: Server-side RPC (remote change client-side attribute)

Server-side RPC (remote change client-side attribute)	params value type	params value	TA652 FC-W	TA652 FH-W	Memo
remoteSetTempUnit	string	"°C" / "°F"			*tempUnit*
remoteSetTimeFormat	string	"12hours" "24hours"			*timeFormat*
remoteSetSystemMode	string	"Heat" "Cool"			*systemMode*
remoteSetSensorMode	string	"Internal" "External" "Combined"			*sensorMode*
remoteSetInternalOffset	float				*internalOffset*
remoteSetFloorTempLimited	float				*floorTempLimited*
remoteSetSwitchingDiffHeating	float				*switchingDiffHeating*
remoteSetSwitchingDiffCooling	float				*switchingDiffCooling*
remoteSetAdaptiveControl	bool	true false			*adaptiveControl*
remoteSetForceVent	bool	true false			*forceVent*
remoteSetChangeOverMode	string	"Heat" "Cool" "Auto"			*changeOverMode*
remoteSetChangeOverTempHeating	float				*changeOverTempHeating*
remoteSetChangeOverTempCooling	float				*changeOverTempCooling*
remoteSetControlMode	string	"Off" "On"			*controlMode*
remoteSetFanMode	string	"Auto" "Low" "Med" "High"			*fanMode*
remoteSetSpValue	float				*spValue*
remoteSetPrgMode	string	"No-program" "One-day" "Sun_mon-fri_sat" "Every-day"			*prgMode*
remoteSetPrgSpTimeXX	string	"hh:mm", eg: "23:50"			remoteSetPrgSpTime00 ~ remoteSetPrgSpTime27, see *prgSpTimeXX*
remoteSetPrgCtrlModeXX	string	"On" "Off"			remoteSetPrgCtrlMode00 ~ remoteSetPrgCtrlMode27, see *prgCtrlModeXX*
remoteSetPrgSpValueXX	float				remoteSetPrgSpValue00 ~ remoteSetPrgSpValue27, see *prgSpValueXX*

Server-side RPC (remote control)

remoteSetOverrideStatus

remoteSyncTimeRequest

remoteClearWiFiConfig

remoteRebootDevice

remoteWiFiFUOTA

remoteMcuFUOTA

remoteGetMemoryUsage

Table 12: Server-side RPC (remote control)

Server-side RPC	one-way | two-way	Request	Response	TA65 FC-W	TA65 FH-W	Memo
remoteSetOverrideStatus	one-way	{"method":"remoteS "params":{}}				Assign a *prgSpValueXX* to *spValue*, 0 <= XX <= 27
remoteSyncTimeReques	one-way	{"method":"remoteS "params":{}}				
remoteClearWiFiConfig	one-way	{"method":"remoteC "params":{}}				
remoteRebootDevice	one-way	{"method":"remoteR "params":{}}				
remoteWiFiFUOTA	two-way	{"method":"remoteW "params":"http://192.168.1.2/x.img"}	{"method":"remoteWiFiFUOTA", "results":{"result":"success"}}, or {"method":"remoteWiFiFUOTA", "results":{"result":"failure", "description":"xxx"}}			
remoteMcuFUOTA *(NOT implemented)*	two-way	{"method":"remoteM "params":"http://192.168.1.1/y.img"}	{"method":"remoteMcuFUOTA", "results":{"result":"success"}}, or {"method":"remoteMcuFUOTA", "results":{"result":"failure", "description":"xxx"}}			
remoteGetMemoryUsage	two-way	{"method":"remoteG "params":{}}	{"method":"remoteGetMemoryUsage", "results":{"iram":123123, "spiram":2345678}}			

CHAPTER

FIVE

TA652FH-W WI-FI THERMOSTAT

These references will help you learn more about TA652FH-W Wi-Fi Thermostat, operate it, and even realize your personalized Dashboard.

Specification

Add to ThingsBoard | *Connect to ThingsBoard* | *Demo Dashboards*

MQTT Device API

5.1 TA652FH-W — Floor Heating Wi-Fi Thermostat

Caution:

1. Turn off all electrical devices (e.g. heater, cooler) that are connected to the unit before installation and maintenance.
2. The installer must be a trained service personnel
3. Disconnect the power supply before maintenance.
4. It must be mounted on a dry clean indoor place.
5. Do not expose this unit to moisture.
6. Do not expose this unit to dipping or splashing.

5.1.1 Introduction

T65 is a controller that controls heater/cooler on or off to maintain room temperature at a desired level.

When **Heat mode** is used, **Internal sensor**, **Floor sensor** and **combined sensor** can be selected for different application.

When **Cool mode** is selected, Only **Internal sensor** will be used.

5.1.2 Feature List

- Voltage supply: 230Vac
- Temperature display in °C or °F
- Temperature measurable range : 0 - 50 °C
- Selection of Heat/Cool
- Adaptive control
- 7days / 5+1+1days, 1day program, no program.
- EEPROM stores all settings
- Adjustable control span
- Short cycle protection for compressor

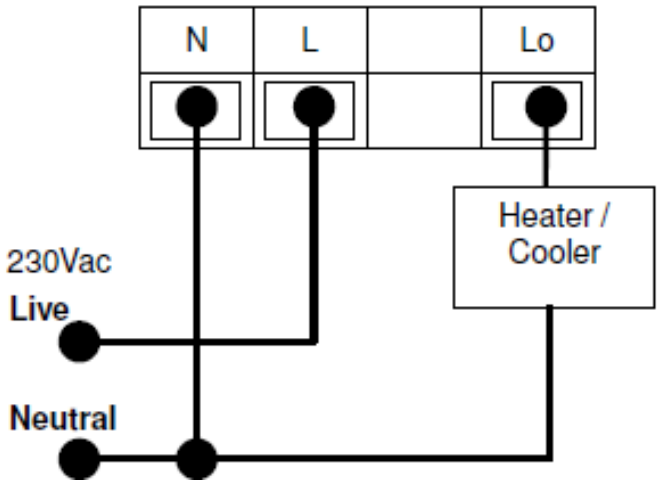
5.1.3 Wiring

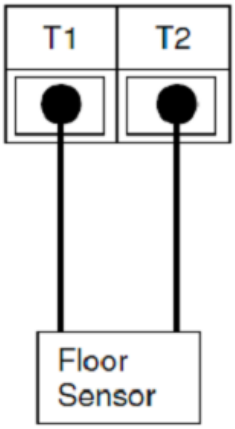
NOTE: Power supply of TA652FH-W is 230Vac.

Terminals	Device
L	230Vac Live
N	230Vac Neutral
LO	Heater / Cooler
T1	Floor Sensor 1
T2	Floor Sensor 2

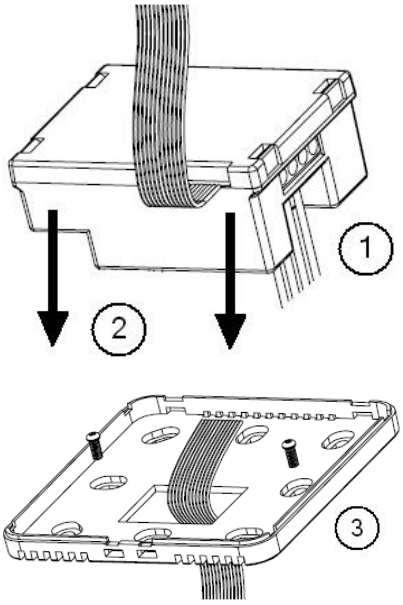
Pull all cables back into the wall beforehand to avoid trapping of wires. Do not use any metal conduits or cables provided with metal sheaths.

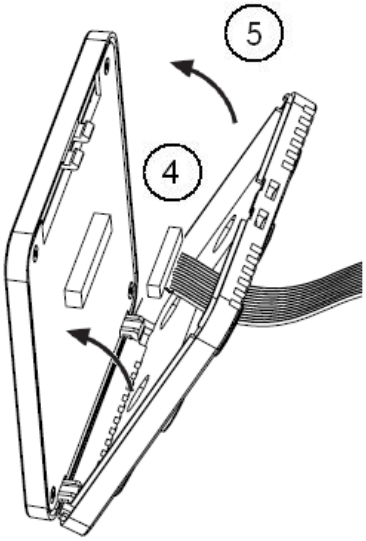
Recommend adding fuse or protective device in the live circuit.





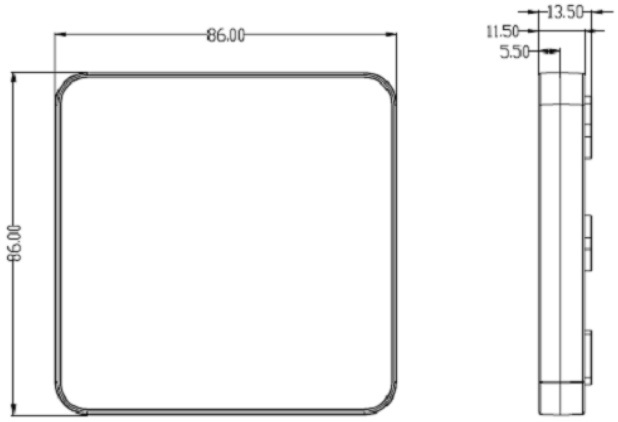
5.1.4 Mounting

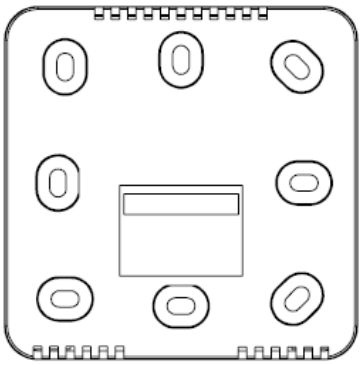




1. Wiring the terminals.
2. Put into junction box.
3. Mount the bottom plate of LCD board into junction box.
4. Connect the wire to the LCD board.
5. Assemble the Top and bottom plate of LCD Board.

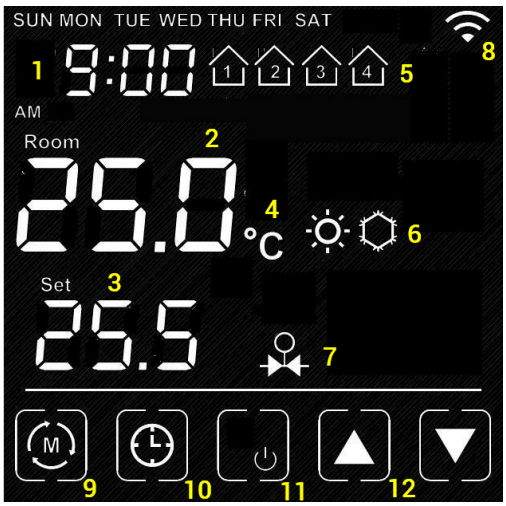
5.1.5 Dimension in mm:





5.1.6 LCD Interface

LCD Indication



sn	item
1	Time
2	Room Temperature
3	Current Set Point
4	Temperature Unit
5	Current Program
6	Heat / Cool Mode
8	Output is On (when appear)
8	Wi-Fi (appear when connected to router)
9	Mode Key: Press to **internal setting 1**. Long hold to **internal setting 2**.
10	Clock Key: Press to **set clock**. Hold to **Program** the Schedule
11	Short Press: Fan Key, Long Hold: On/Off Key
12	Up/Down key: Adjust Set point or Value of setting.
13	Blank: the area outside of the previous five keys

Turn On/Off the thermostat

Hold  to turn On / Off the thermostat. When the thermostat is Off. No Output will be activated.

Clock setting

Normally the clock is automatically set once Wi-Fi is connected and synchronize for each day. So manual set is not necessary when it is online.

- Press  to start the setting
- Press  /  to change the day of week
- Press  again to confirm day of week setting and start to adjust hour
- Press  /  to change the hour
- Press  again to confirm hour setting and start to adjust minutes
- Press  /  to change the minutes
- Press  again to confirm minutes setting and start to adjust day of week
- Press **[blank]** to confirm or leave the clock setting. Or return after no key pressed for 20 seconds.

Clock synchronization

When Wi-Fi is connected and time synchronization is need. Please use the App for time synchronization.

Schedule Programming

When **1 day / 5+1+1 day / 7day program** is selected in internal setting.

- Hold  to start the setting.
- Press  /  to adjust the day of week
- Press  to confirm.
- Press  /  to adjust the time of schedule
- Press  to confirm.
- Press  /  to adjust the setpoint
- Press  to confirm.

- Press **[blank]** to confirm return.

Override Temperature

The Set point can be adjusted by  /  .

When it is in program mode, the set point will be overwritten until the next time slot.

 can be pressed to release the override status.

Internal parameter setting 1

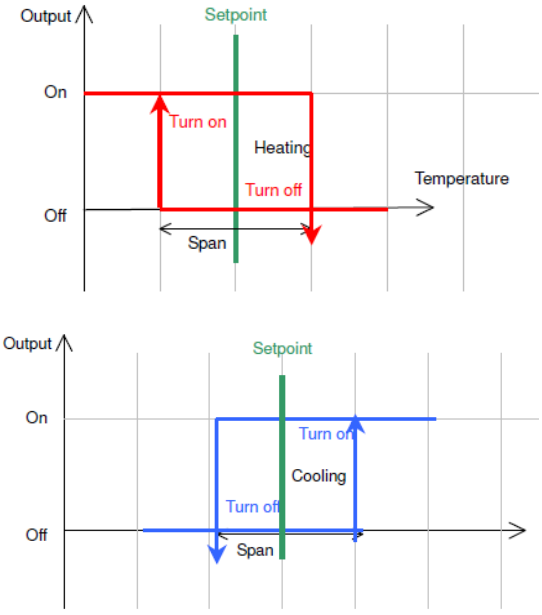
- **Operation:**
  - Press  key to start the setting
  - Press  /  to adjust the value
  - Press **[blank]** to confirm and move to next setting

ID	Items	Value	Default Value
P00	User Interface Screen Saver	0-3	0
P01	Screen Saver Count down	0-120	20
P02	Display unit	°C / °F	°C
P03	Time Display unit	12/24	12
P04	Temperature Offset	-5°C - 5°C, -10°F-10°F	0°C
P05	Switching Differential Heat	2 - 4°C, 4 - 8°F	2°C
P06	Switching Differential Cool	2 - 4°C, 4 - 8°F	2°C
P07	Program mode	No program (0) / 1day program (1) / 5+1+1 program (2) / 7day program (3)	3
P08	Adaptive Control	Enable / Disable	Disable
P09	System Mode	Heat / Cool	Heat
P10	Sensor Mode	Internal Sensor / External Sensor / Combined mode	Internal Sensor
P11	Floor temperature limited	20-40°C, 68-104°F	40°C

- **User Interface Screen Saver:**
  The thermostat will go to screen saver mode after no key for certain period.

  - **Mode 0**: Nothing will be displayed in screen saver mode.
  - **Mode 1**: Only room temperature will be displayed in screen saver mode.
  - **Mode 2**: Room temperature and Time will be displayed in screen saver mode.
  - **Mode 3**: Display all in screen saver mode.

- **Screen Saver Count Down:**
  The count down time (in seconds) to screen saver mode.
- **Display Unit:**
  Temperature unit in Celsius or Fahrenheit.
- **Time Display Unit:**
  12/24.
- **Temperature offset:**
  The temperature of internal sensor can be calibrated from -5°C - +5°C in case there is temperature difference between actual value and thermostat.
- **Switching Differential:**
  The difference between switching the heating or controller on and off



- **Program Mode:**
  - 0: **No Program** Mode, the thermostat control the temperature simply according to single setpoint.
  - 1: **1 day** program, the thermostat control the temperature according to single schedule.
  - 2: **5+1+1 day** program, the thermostat control the temperature according to 5 +1+1 schedule (Mon to Fri, Sat, Sun).
  - 3: **7 days** program, the thermostat control the temperature according to 7day program (individual program for each day).
- **Adaptive control**
  When this function is enable, the thermostat learns the time taken to reach the desired setpoint and turn on the heating / cooling earlier so that the room temperature will reach the setpoint at desired schedule. This is no effect when **No program** is selected.

- **Heat / Cool Mode**
  When **Heat mode** is selected, the thermostat control the room temperature with heating. **Room Sensor**, **Floor Sensor** or **Combined sensor** can be selected.

  When **Cool mode** is selected, the thermostat control the room temperature with cooling. Only **Room Sensor**, will be used.

- **Sensor Mode**
  There are 3 different settings of sensor control for Heat Mode. (For Cool Mode. Only Room sensor will be used)

  - **Room sensor**
    Thermostat control the room temperature based on Room Sensor
  - **Floor sensor**
    Thermostat control the room temperature based on Floor Sensor
  - **Combined Floor-/Room sensor**
    Thermostat control the room temperature based on Room Sensor. And the output will be off if floor temperature above "floor temperature limited" for protection.

- **Floor temperature limited**
  It is the temperature limited for floor sensor. When the **Heat Mode** and **Combined Sensor** are selected. The output will turn off when floor sensor sense the temperature to be higher than **floor temperature limited**.

Internal parameter setting 2

- **Operation:**
  - Hold  key to start the setting
  - Press  /  to adjust the value
  - Press **[blank]** to confirm and move to next setting

ID	Items	Value	Default Value
P19	Clear Wi-Fi Configuration	Yes or No	No
P20	Clear Parameter setting (restore default)	Yes or No	No
Adr	Address	...	Read only, eg: 75C68

- **Clear Wi-Fi Configuration:**
  When set to yes, the SSID and Password stored in the thermostat will be cleared so another SSID and Password can be set again.
- **Clear Parameter setting:**
  When set to yes, all internal parameter setting will be restored to default value in next power on (reset)
- **Address:**
  The last 5 characters of the MAC address

Minimum off time

The minimum off time for Heat mode is 5 seconds and 4 minutes for Cool mode.

Technical Data

Power supply:	195-250 Vac
Relay Contact Voltage:	230Vac Max. 50/60 Hz
Relay Contact Current:	16A Max.
Sensing Element:	103AT
Terminals:	2 sq. mm Cable
Operating Temperature:	32 - 122 °F / 0 - 50 °C
Storage Temperature:	23 - 122 °F / -5 - 50 °C
Operating Humidity:	5-95%RHnon-condensing

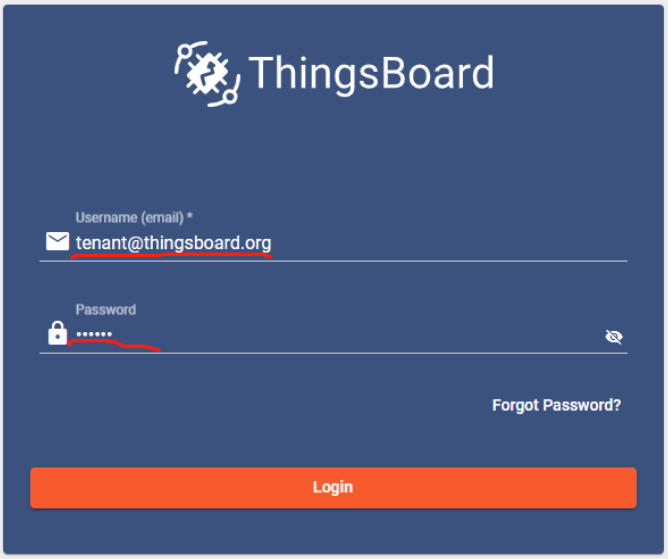
5.2 Add TA652FH-W to ThingsBoard

Tip:

- This section applies to the situation where you add TA652FH-W to ThingsBoard Server.
- If you are adding the first Avantec HVAC device to ThingsBoard Server, please refer to *Get Started*.

5.2.1 Step 1. Tenant Login

- Open ThingsBoard Web UI in browser, e.g. http://localhost:8080
- Tenant Administrator login ThingsBoard.



Tenant default username and password, refer to *Some important parameters*.

5.2.2 Step 2. Import Detail Dashboard of TA652FH-W

See *Import TA652FH-W Detail Dashboard*.

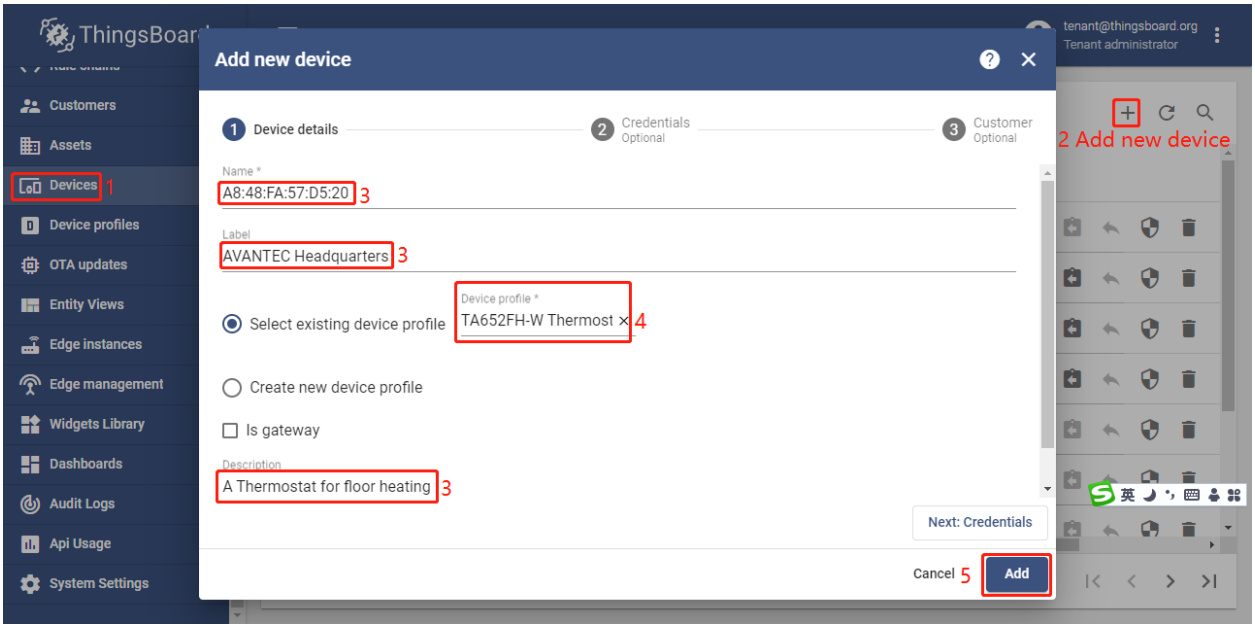
5.2.3 Step 3. Import List Dashboard of TA652FH-W

See *Import TA652FH-W List Dashboard*.

5.2.4 Step 4. Provision TA652FH-W device

Step 4.1 Add device

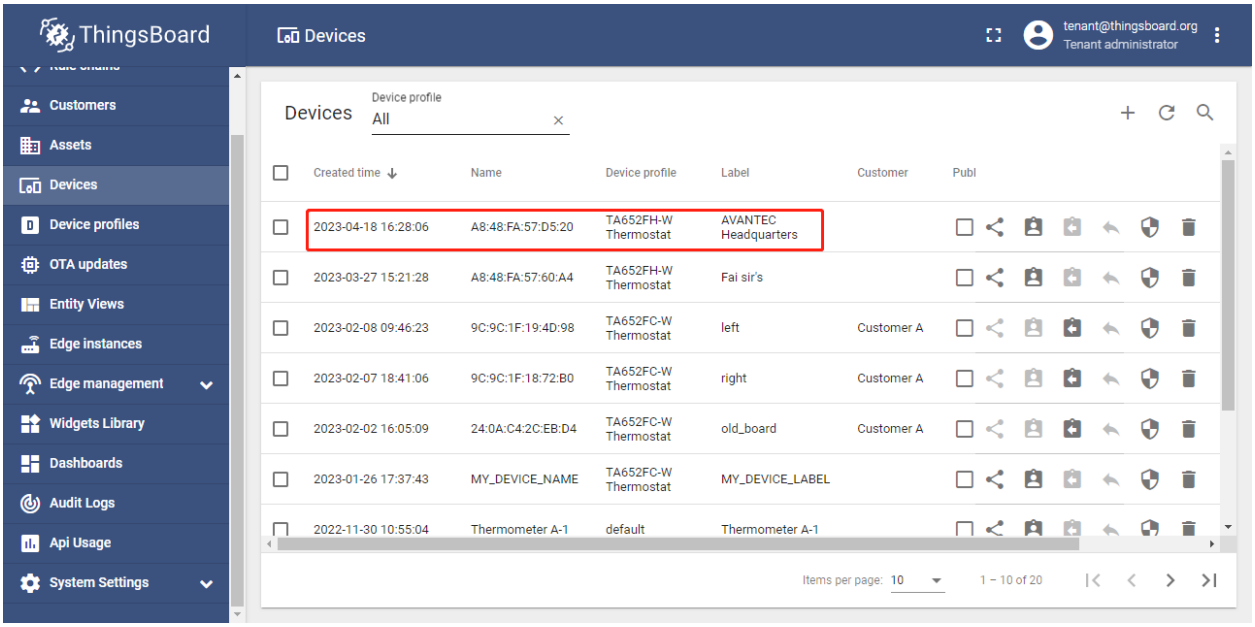
- **Devices** –> **+** –> **Add new device** –> **Popup Dialog** –> Input **Name, Label & Description**, select **device profile** –> **Add**.



Field	Value
Name*	My device name, e.g. TA652FH-W-TB, A8:48:FA:57:D5:20
Device profile*	**TA652FH-W Thermostat**
Label	My device label, e.g. Avantec Manufacturing Plant
Description	My device description, e.g. A Thermostat for floor-heating

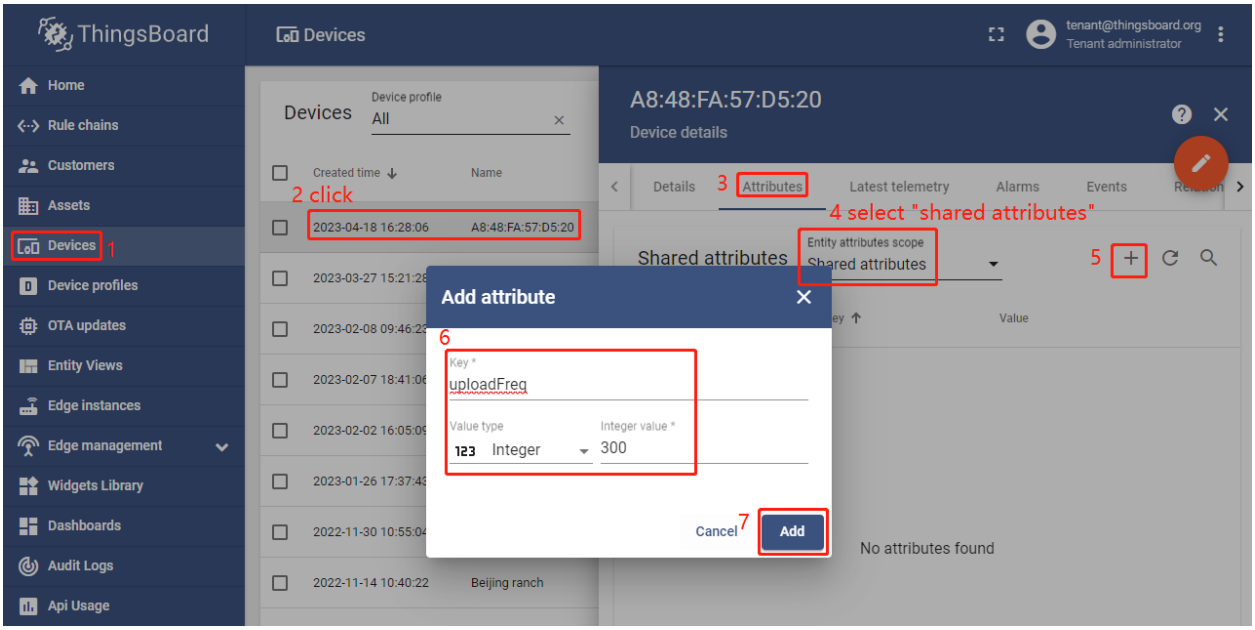
Note: The field with * must be filled in.

- Now my device should be listed first, since the table sort devices using the time of the creation by default.



Step 4.2 Add shared attributes of new device

- **Devices** –> Click *my device* –> **Attributes** –> **Shared attributes** –> **+** –> **Popup Dialog** –> Input Key, Value type & value –> **Add**



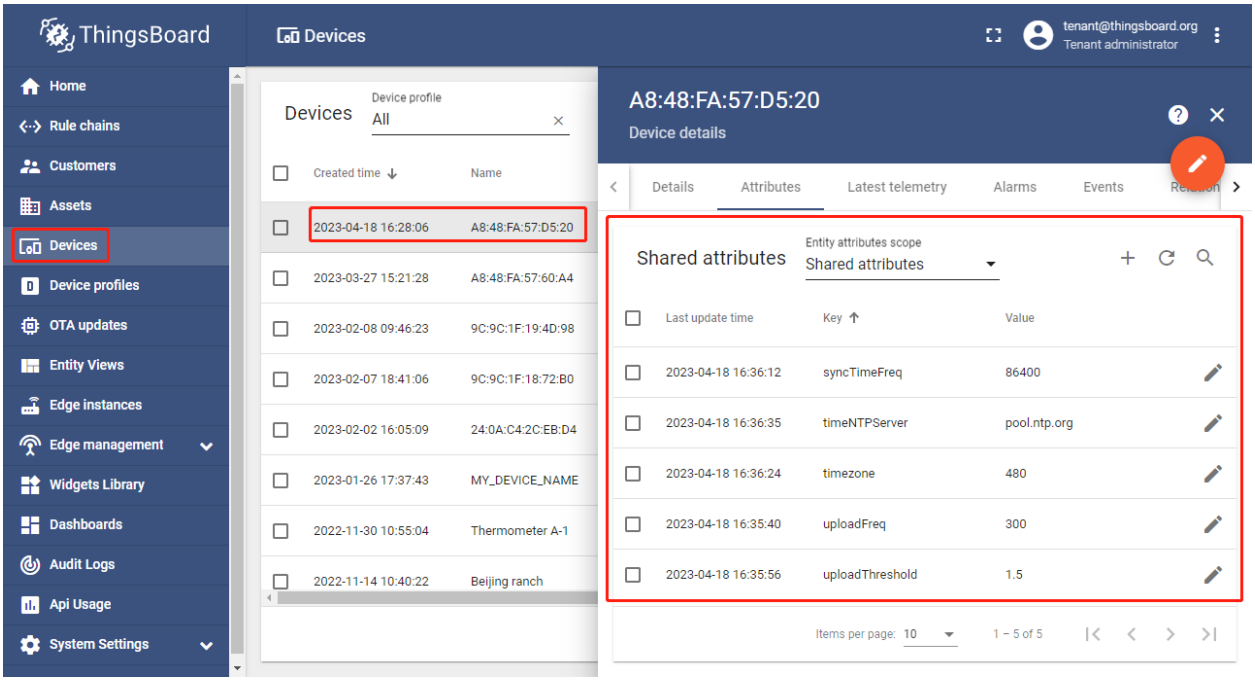
Please add the following Shared attributes of **TA652FH-W**:

Table 1: Add shared attributes of TA652FH-W

Key*	Value Type*	Value*	Memo
uploadFreq	Integer	300	5*60. Telemetry per uploadFreq seconds
uploadThreshold	Double	1.5	1.5°C. If the temprature (Telemetry data) change exceeds it, upload immediately!
syncTimeFreq	Integer	86400	24*3600. Sync time per syncTimeFreq seconds
timezone	Integer	480	**Please replace with your value**. The time offset from UTC, minutes. For example Hongkong is UTC+8:00 time zone, this offset is 480 minutes (8*60)
timeNTPServer	String	pool.ntp.org	SNTP Server URL, e.g. pool.ntp.org, 0.pool.ntp.org, 1.pool.ntp.org, uk.pool.ntp.org, hk.pool.ntp.org, time.nist.gov, ...

Note: The field with * must be filled in.

- Now the shared attributes of my device is like:



You may also use:

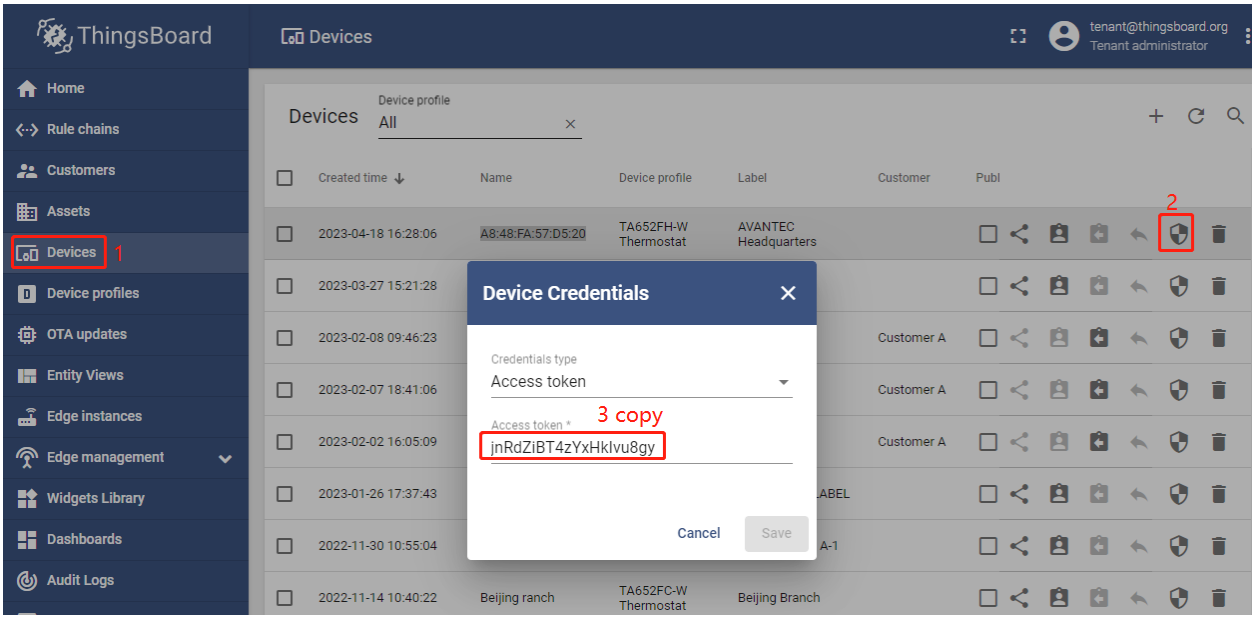
- Bulk provisioning to provision multiple devices from a CSV file using UI.
- Device provisioning to allow device firmware to automatically provision the device, so you don't need to configure each device manually.
- REST API to provision devices and other entities programmatically.

5.2.5 Step 5. Connect TA652FH-W device

Step 5.1 Copy credentials of new device

To connect the device you need to get the device credentials first. ThingsBoard supports various device credentials. We recommend using default auto-generated credentials which is access token for this guide.

- **Devices –> Manage credentials (icon) –> Popup Dialog –> Select Access Token**, `Ctrl + C`.



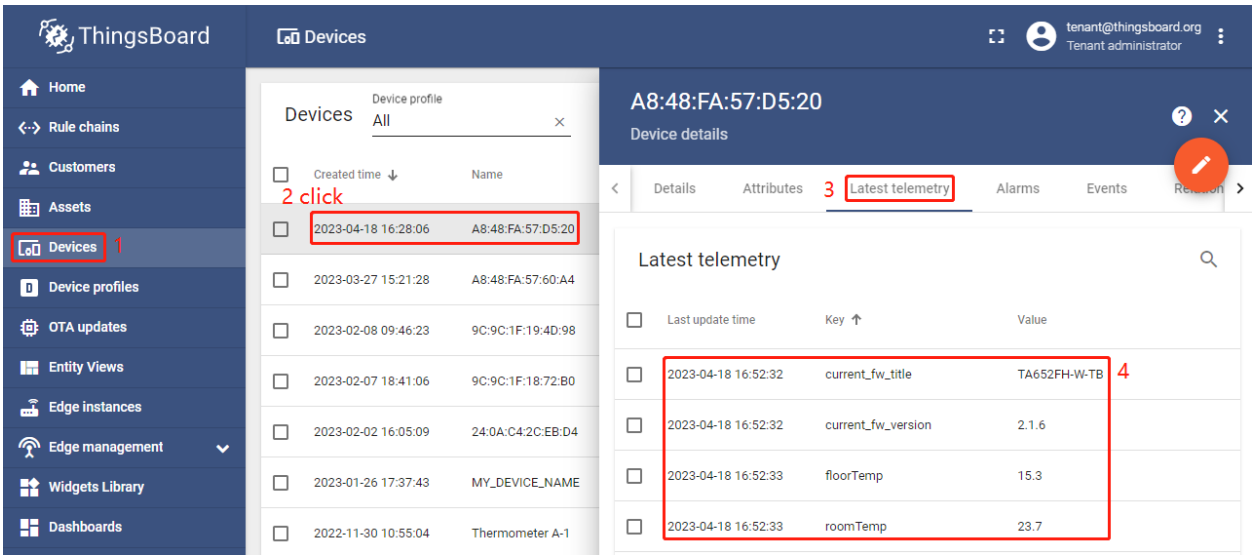
Tip: The Credentials (Access Token), which you need to use when you're configuring your hardware, for example, *j9JiCkID9E7uE1WhKxnc*, *lMTQLZ7VSRQSD7ls*.

Step 5.2 Connect device to ThingsBoard

See *Connect TA652FH-W to ThingsBoard*.

Step 5.3 Publish data to ThingsBoard

Now your device has already published telemetry data to ThingsBoard. You should immediately see them in the Device Telemetry Tab:



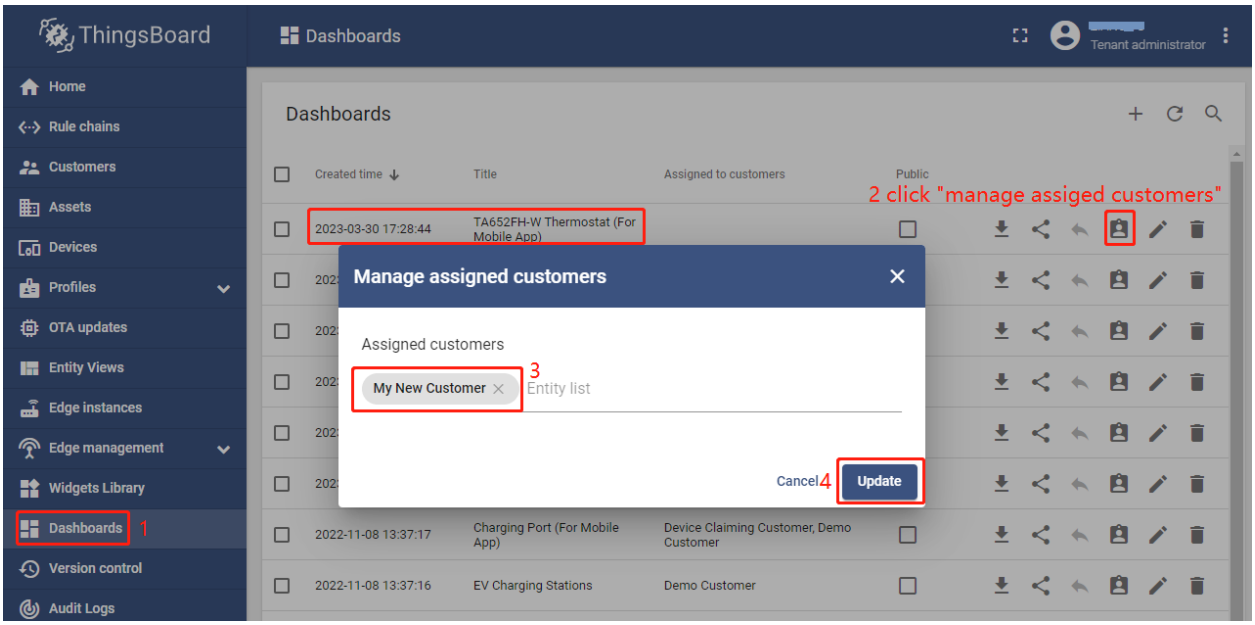
5.2.6 Step 6. Assign Device and Dashboards to Customer

One of the most important ThingsBoard features is the ability to assign Dashboards to Customers. You may assign different devices to different customers. Then, you may create a Dashboard(s) and assign it to multiple customers. Each customer user will see his own devices and will not be able to see devices or any other data that belongs to a different customer.

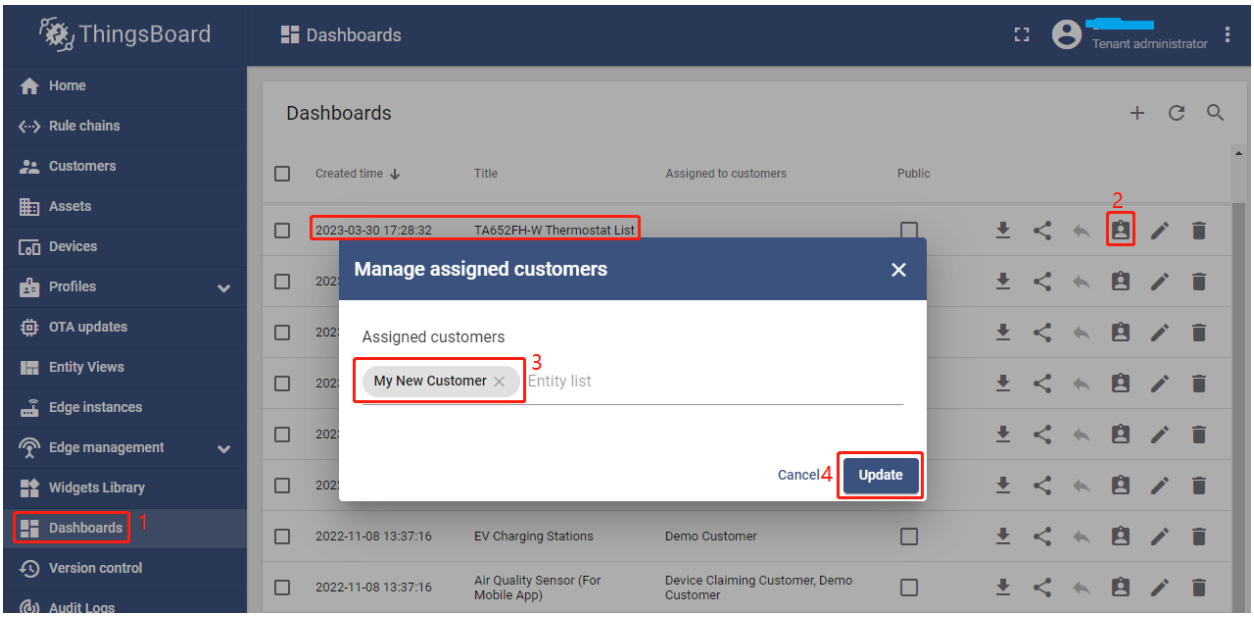
Refer to *Step 7.1 Create customers*, *Step 7.4 Create customer user* & *Step 7.5 Activate customer user*.

Step 6.1 Assign dashboards of TA652FH-W to Customer

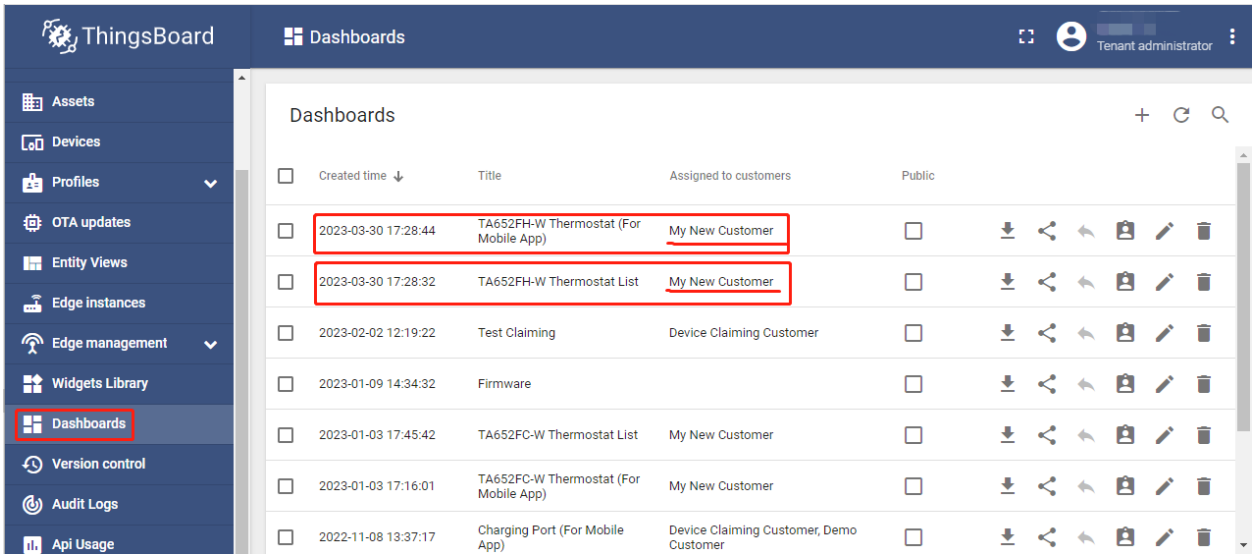
- Assign *Detail dashboard* to Customer: **Dashboards** –> Click **Manage assigned customers** (icon) in *Detail dashboard* line –> **Popup Dialog** –> Select *My New Customer* –> **Update**.



- Assign *List dashboard* to Customer: **Dashboards** –> Click **Manage assigned customers** (icon) in *List dashboard* line –> **Popup Dialog** –> Select *My New Customer* –> **Update**.

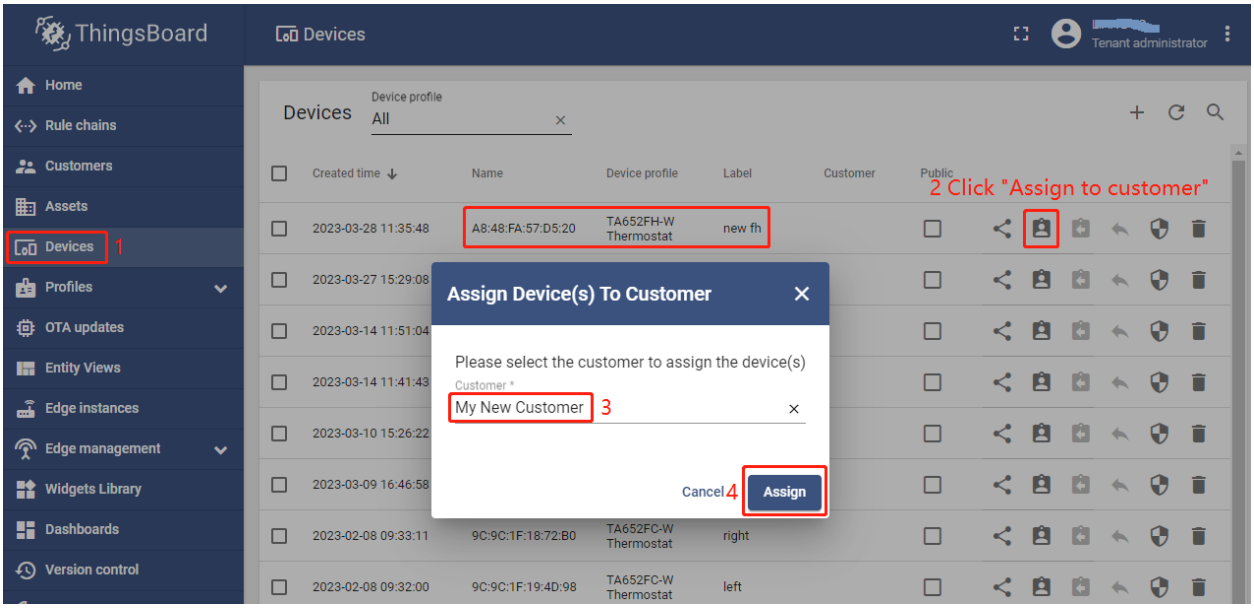


- It's like this now.

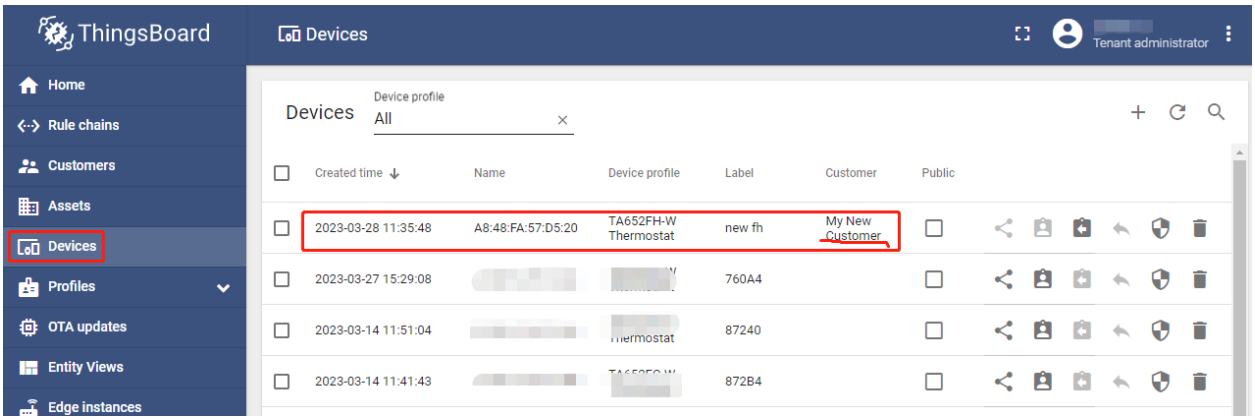


Step 6.2 Assign TA652FH-W device to Customer

- **Devices** –> Click **Assign to customers** (icon) in *My New Device* line –> **Popup Dialog** –> Select *My New Customer* –> **Assign**.

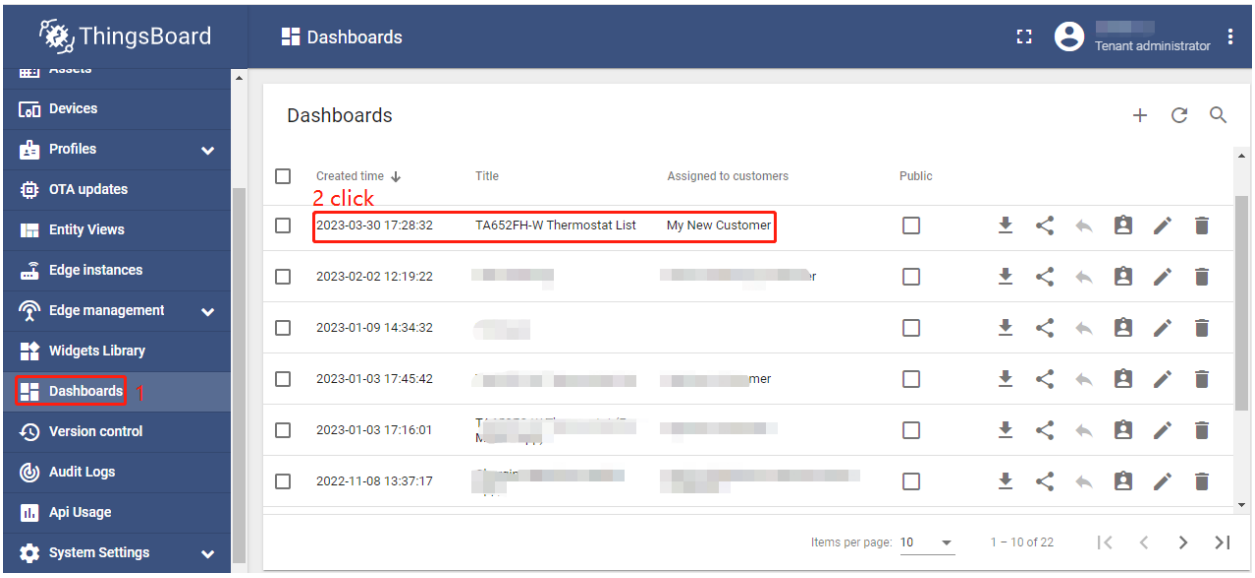


- It's like this now.

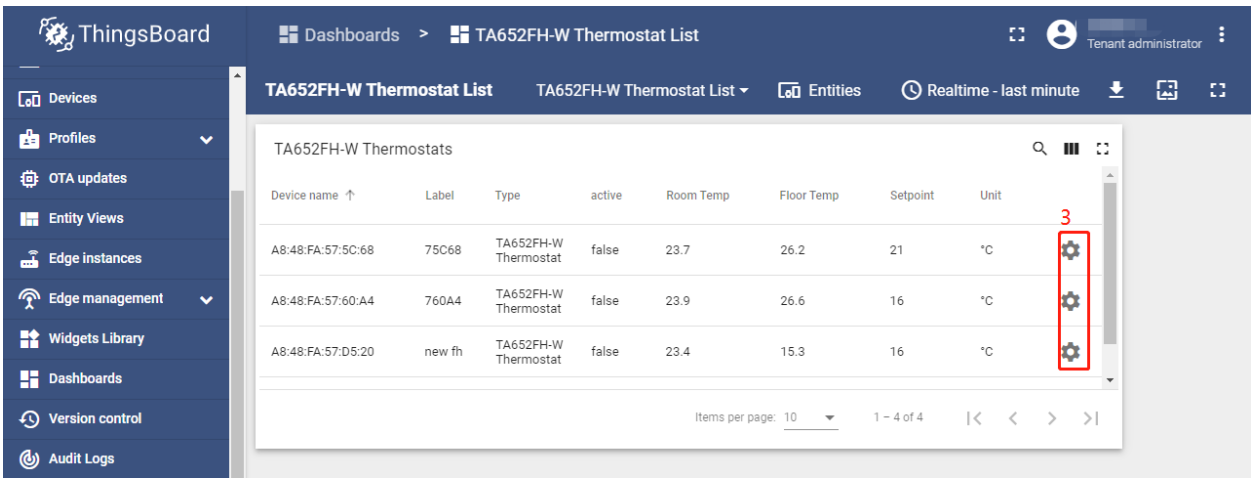


5.2.7 Step 7. Open Dashboards of TA652FH-W

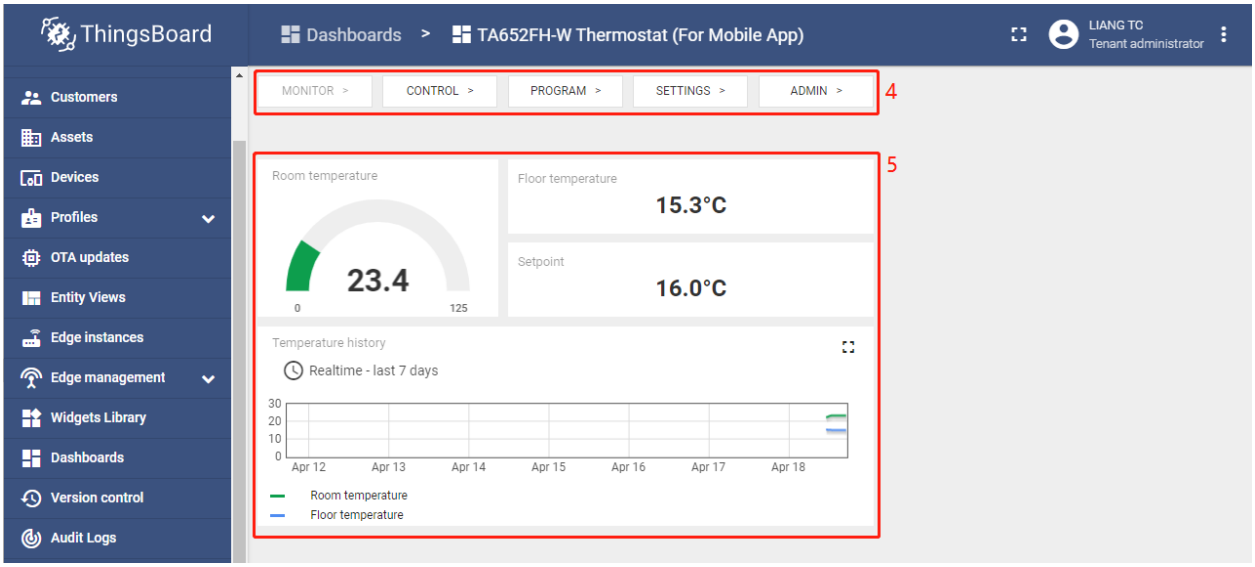
- You are logged in as a Customer User or a Tenant user.
- **Dashboards** –> click *my list dashboard*



- Select my device –> **Settings** (icon)



- Switch page –> Operation



See *TA652FH-W Demo Dashboards Usage*.

5.2.8 Your feedback

Don't hesitate to star Avantec on github to help us spread the word.

5.3 Connect TA652FH-W to ThingsBoard

See *Connect TA652FC-W to ThingsBoard*.

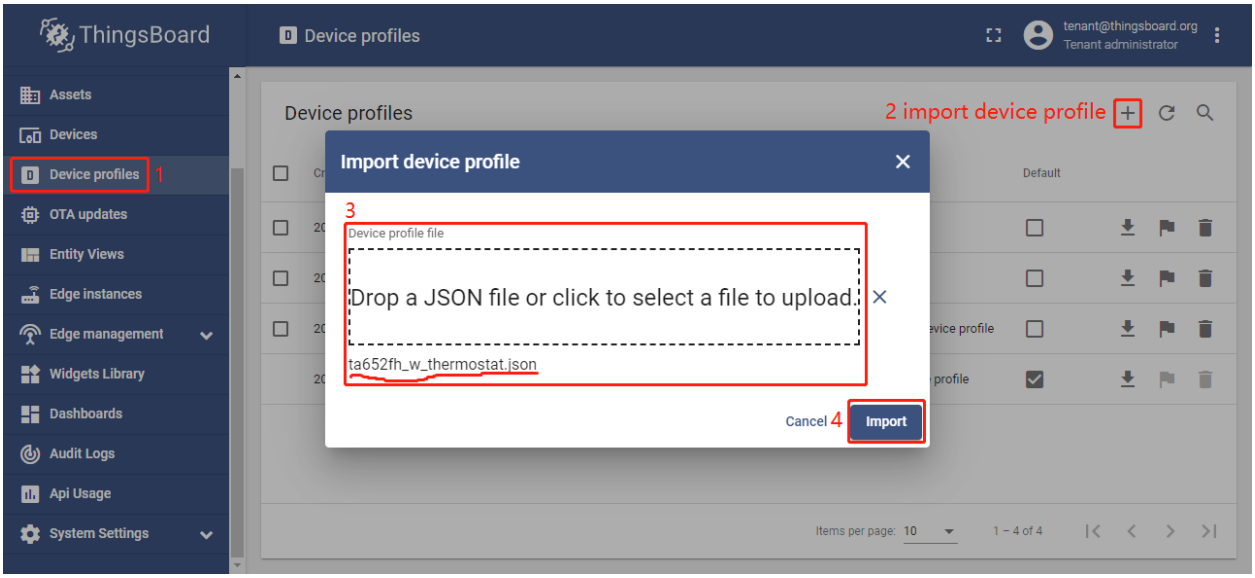
5.4 TA652FH-W Thermostat – Demo Device Profile Usage

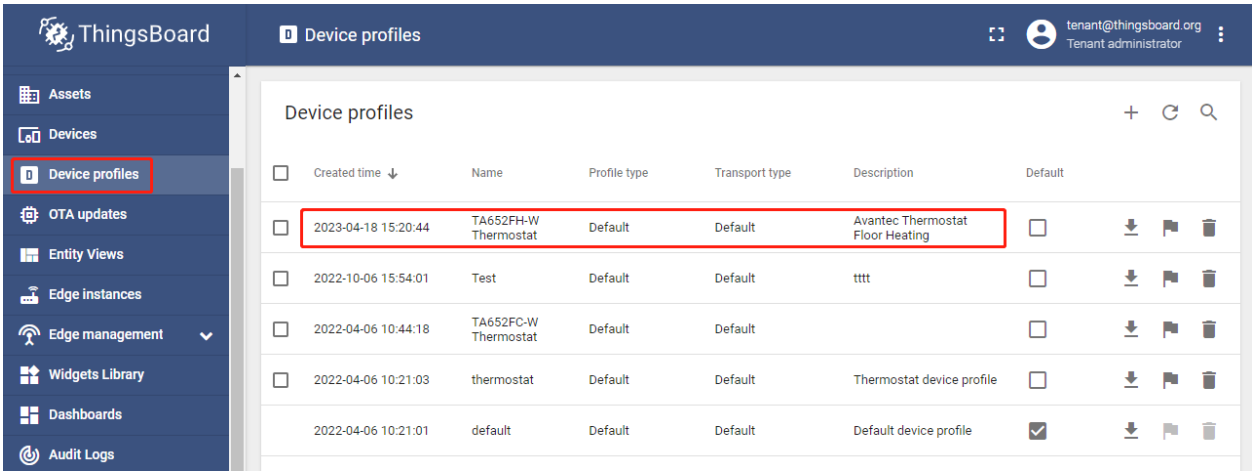
5.4.1 Import device profile

Tip: *A Device Profile file* can only be imported once. If you have already imported it, you do not need and cannot repeat the import.

If you have already imported it, you can skip this step.

- Download `ta652fh_w_thermostat.json`.
- **Profiles** –> **Device profiles** –> **+** –> **Popup dialog: Import device profile** –> Drag and drop *my device profile File* –> **Import**.

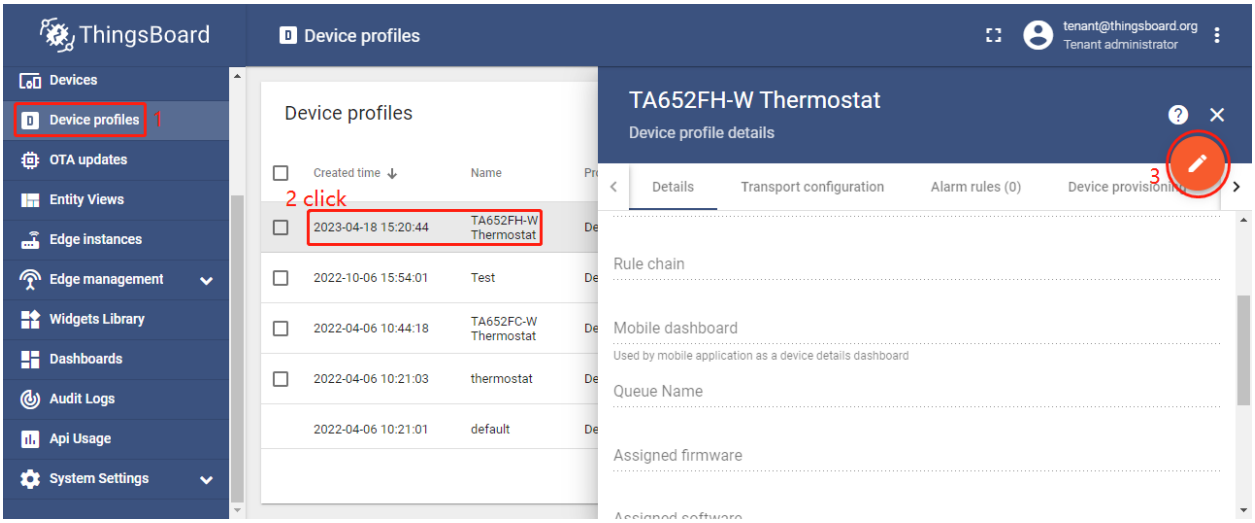




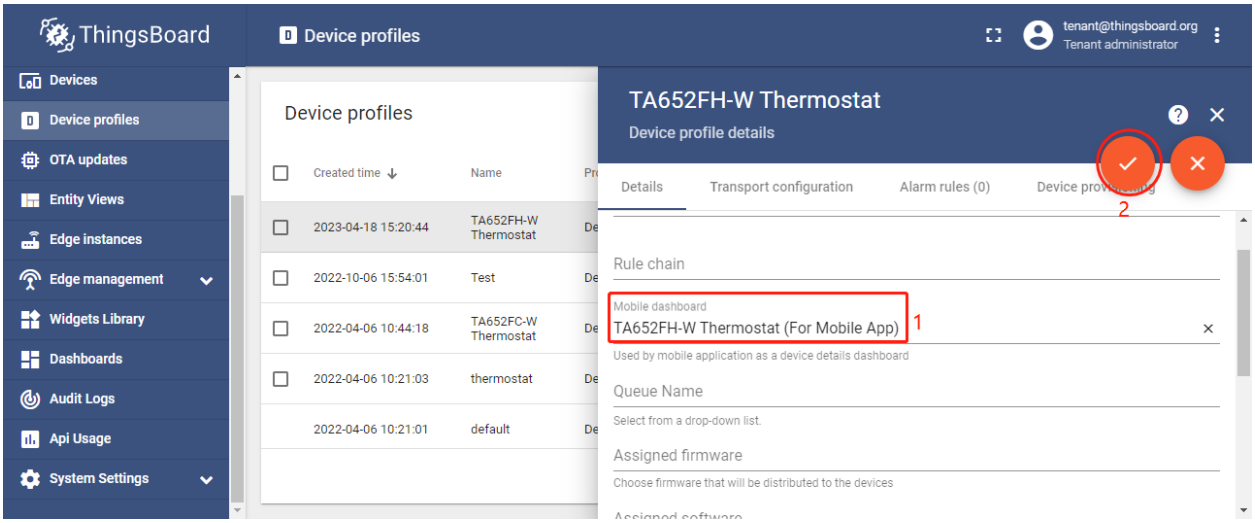
5.4.2 Modify device profile's mobile dashboard

Device profile's mobile dashboard is for `ThingsBoard Mobile Application` or `ThingsBoard PE Mobile Application`.

- **Profiles** –> **Device profiles** –> click *my device profile* –> **Toggle edit mode** (red icon)



- Modify *Mobile dashboard* –> **Apply changes** (red icon)



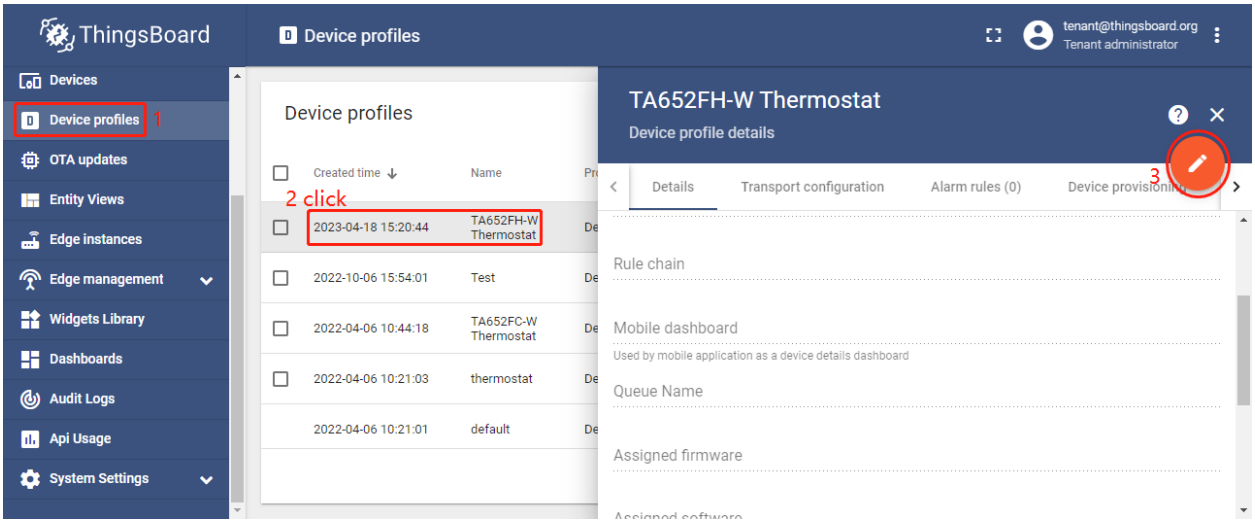
These values are shown in the following table:

Field	Value
Mobile dashboard	TA652FH-W Thermostat (For Mobile App)

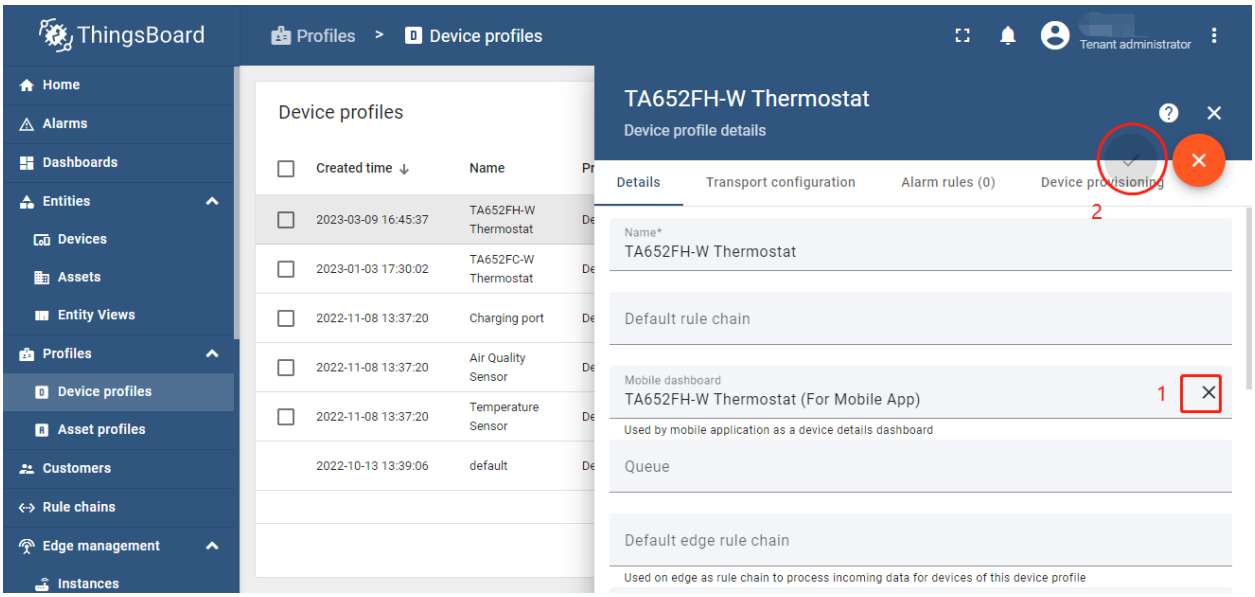
5.4.3 Clear device profile's mobile dashboard

Sometimes if `TA652FH-W Thermostat device profile`'s mobile dashboard is cleared, `TA652FH-W Thermostat (For Mobile App)` can only be deleted.

- **Profiles** –> **Device profiles** –> click *my device profile* –> **Toggle edit mode** (red icon)



- Clear *Mobile dashboard* –> **Apply changes** (red icon)



5.5 TA652FH-W Demo Dashboards Usage

5.5.1 Overview

There are some dashboards related to TA652FH-W, namely `TA652FH-W Thermostat List`, `TA652FH-W Thermostat (For Mobile App)` and `Office center - TA652FH-W Thermostats`. We open the former to start operating TA652FH-W.

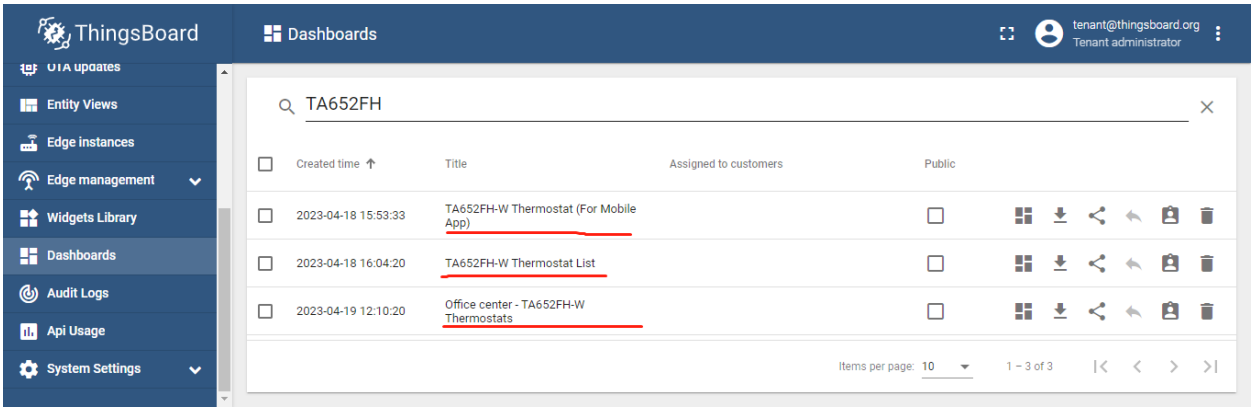


Table 2: TA652FH-W Demo Dashboards

Dashboard	Description	For Web UI	For Mobile App	Entry*
TA652FH-W Thermostat List*	list	Yes	No	Yes
TA652FH-W Thermostat (For Mobile App)	details	Yes	Yes	No
Office center - TA652FH-W Thermostats**	list & details	Yes	Yes	Yes

Hint:

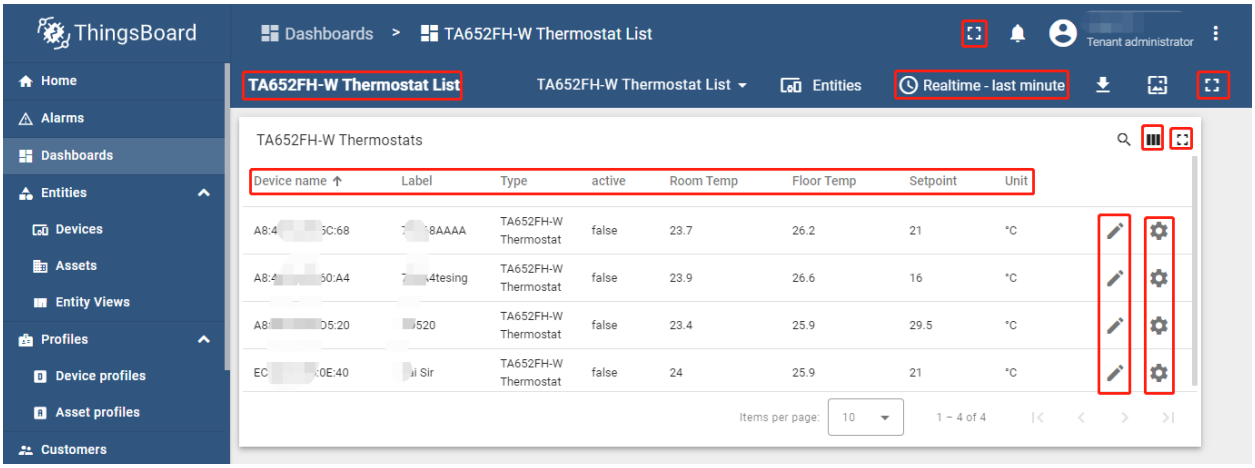
- If *Entry* is *Yes*, then directly enter the Dashboard and there will be data displayed.
- If *Entry* is *No*, there will be no data display when entering this Dashboard directly, and you need to jump to this Dashboard from other Dashboards.
-
- `TA652FH-W Thermostat List` depends on `TA652FH-W Thermostat (For Mobile App)`.
- `Office center - TA652FH-W Thermostats` can be used independently.

5.5.2 TA652FH-W Thermostat List

Dashboard states

Default state

`Default state` is root state.



- **Dashboard bar:**
  - TA652FH-W Thermostat List : Click here to skip to **root state**. Since **default state** is *root state*, click here and there is no response.
  - : Click the two ICONS in the upper left corner to display the page in full screen.
  - Realtime - last minute : Edit time window.
- **Thermostats widgets:**
  - **Fields:**
    - Device name, Label, Type, active.
    - Room temperature, Floor Temperature, Setpoint, Unit: Refer to *Monitor state*.
  - **Actions:**
    - : skip to *TA652FH-W Thermostat (For Mobile App)*.
    - : Popup dialog to editing a device's label.

Import List Dashboard

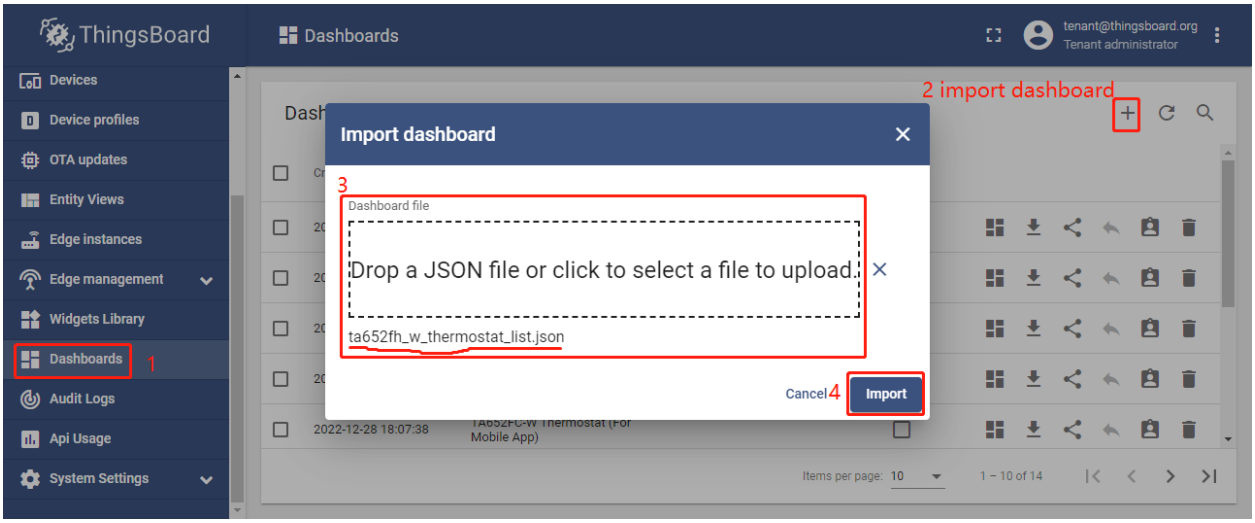
Tip: *A Dashboard file* can only be imported once. If you have already imported it, you do not need and cannot repeat the import.

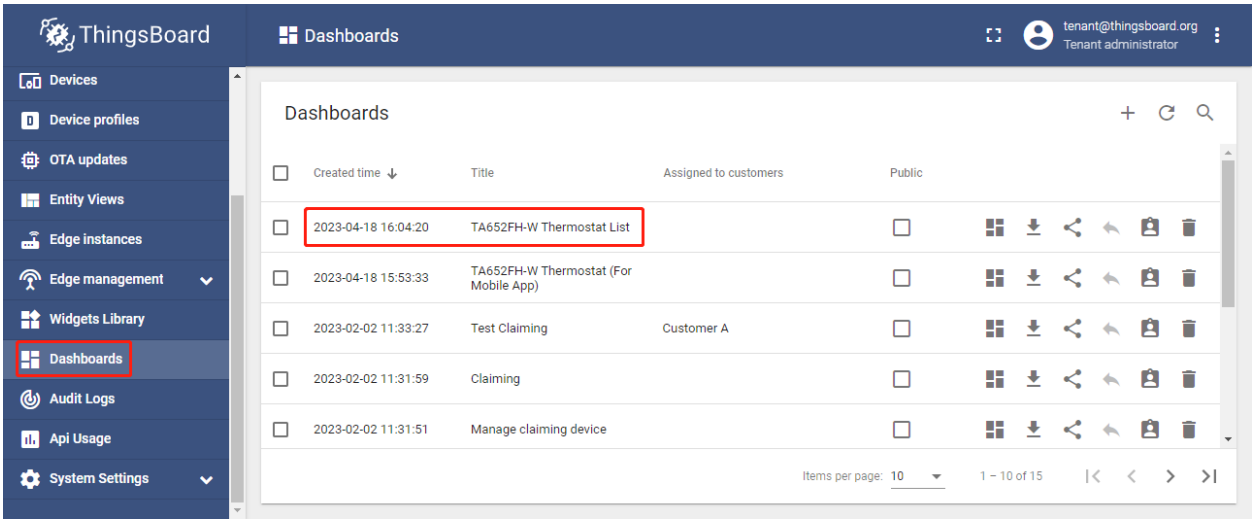
If you have already imported it, you can skip this step.

In order to use this dashboard, you must to create `TA652FH-W Thermostat Device Profile` and `TA652FH-W Thermostat (For Mobile App)`. If they don't exist, you can import them. See *Import Device Profile of TA652FH-W Thermostat* or *Import TA652FH-W Detail Dashboard*.

First, you can import this dashboard.

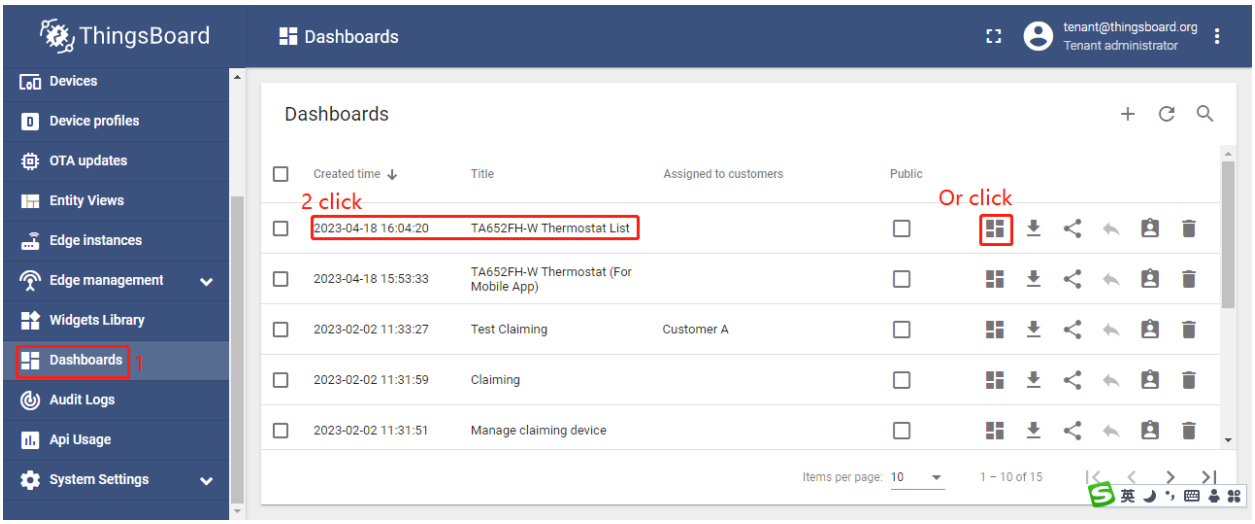
- Download `ta652fh_w_thermostat_list.json`.
- **Dashboards** –> **+** –> **Popup dialog: Import dashboard** –> Drag and drop *list dashboard File* –> **Import**.



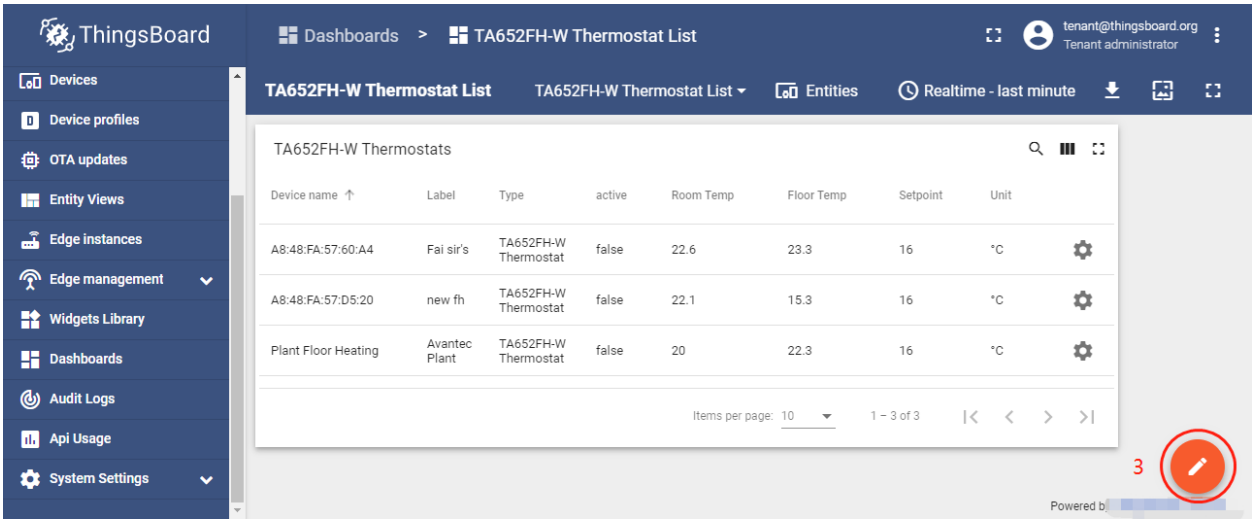


Next, modify a action's target dashboard and target dashboard state.

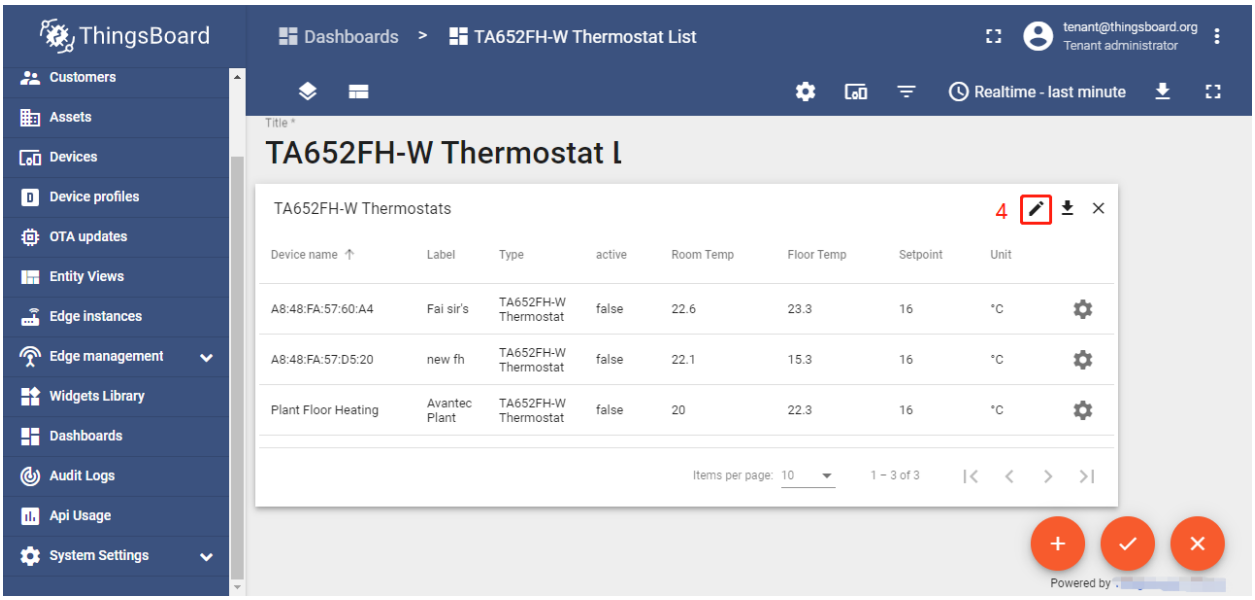
- **Dashboards** –> Click *my list dashboard*



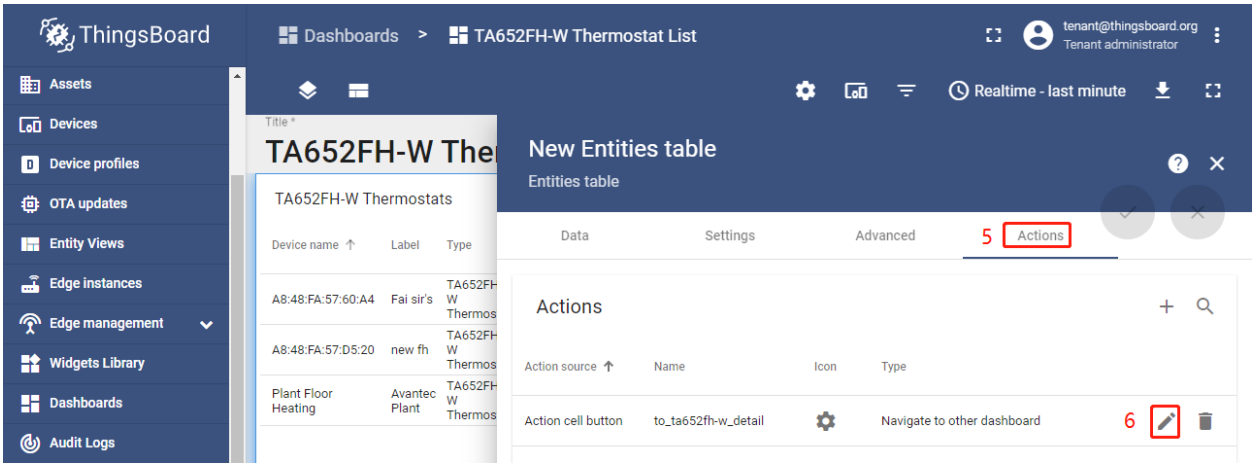
- **Edit** (red icon on the bottom and right)



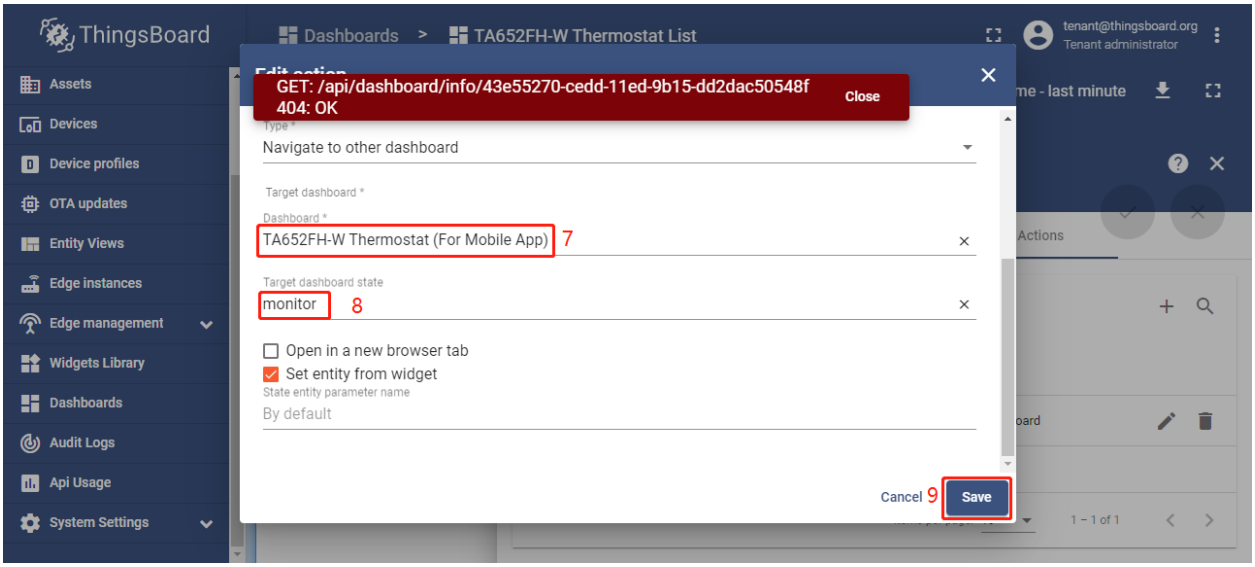
- Enter *Edit Dashboard Mode* –> **Edit Widget** (icon)



- **Action** –> **Edit Action** (icon)



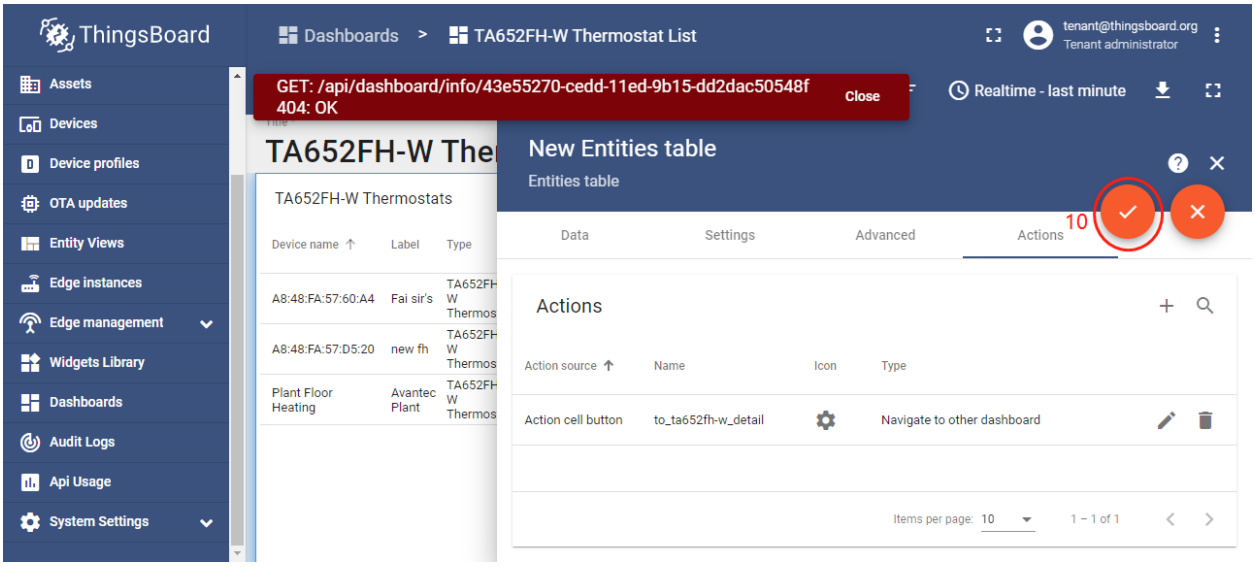
- Modify **Target dashboard** –> modify **Target dashboard state** –> **Save**



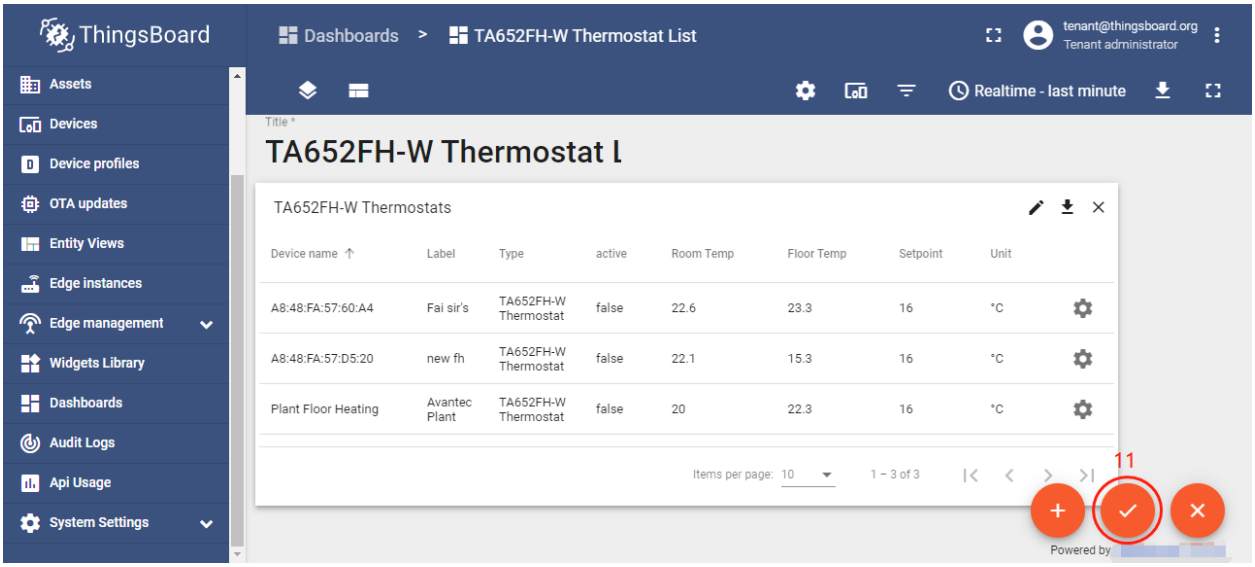
These values are shown in the following table:

Field	Value
Target dashboard	TA652FH-W Thermostat (For Mobile App)
Target dashboard state	monitor

- **Apply changes** (red icon)

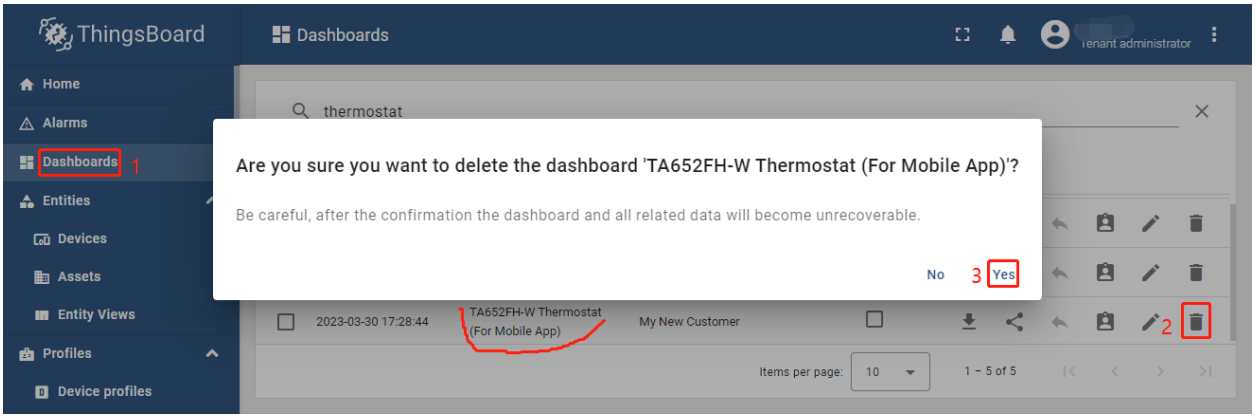


- **Apply changes** (red icon on the bottom and right)



Update List Dashboard

- First, delete this dashboard: **Dashboards** –> Click  in the row of `TA652FH-W Thermostat List` –> **Popup dialog: Are you sure you want to delete ...? –> Yes**.



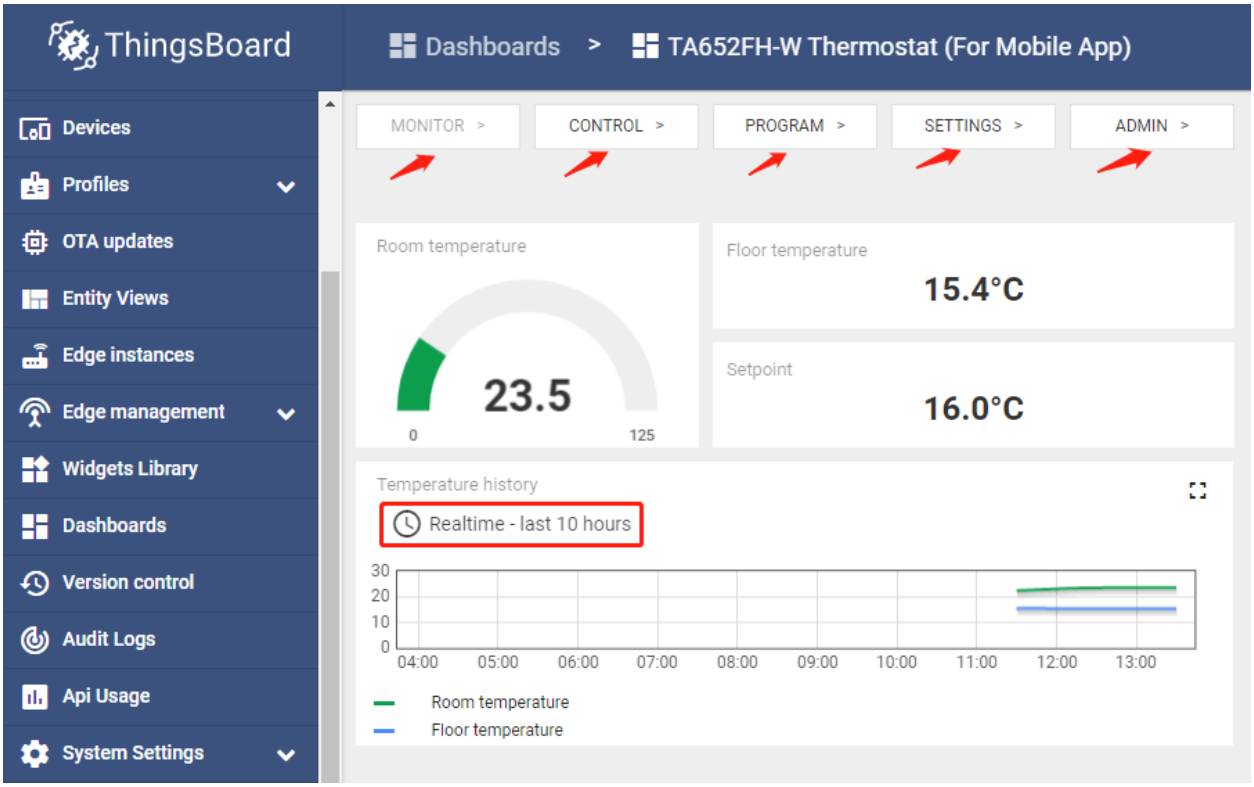
- Next, *import TA652FH-W List Dashboard*.

5.5.3 TA652FH-W Thermostat (For Mobile App)

Dashboard states

Monitor state

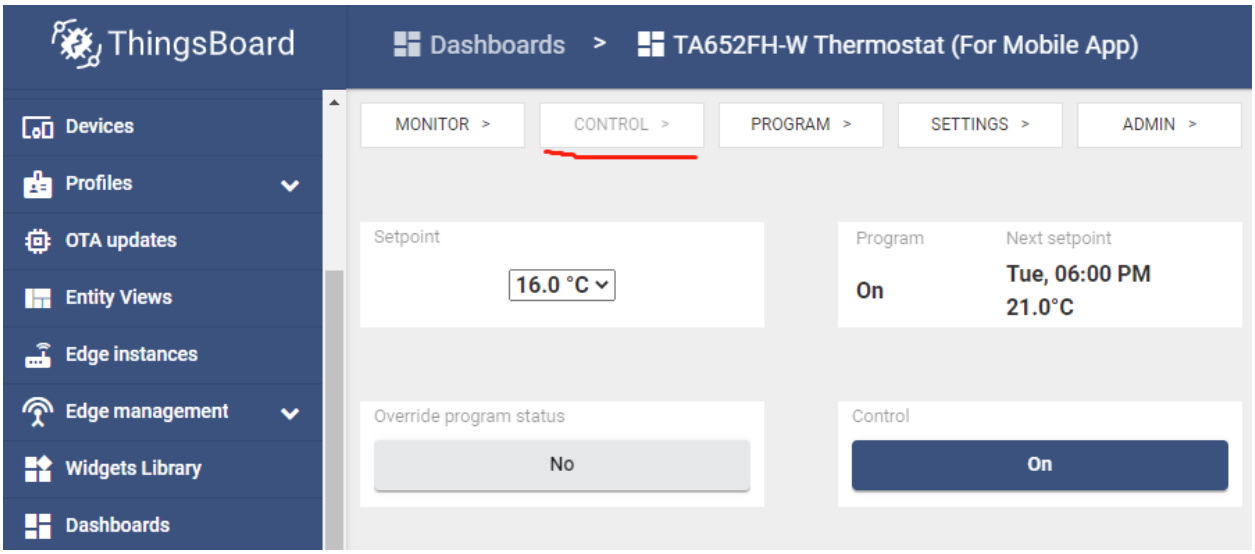
`Monitor state` is root state.



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
MONITOR	skip to *Monitor state*
CONTROL	skip to *Control state*
PROGRAM	skip to *Program state*
SETTINGS	skip to *Settings state*
ADMIN	skip to *Admin state*
Room Temperature	room temperature
Floor Temperature	floor temperature
Setpoint	current setpoint value
Temperature history	Room temperature & Change Over Sensor temperature history. Click  to edit this timewindow. Refer to *Default state*

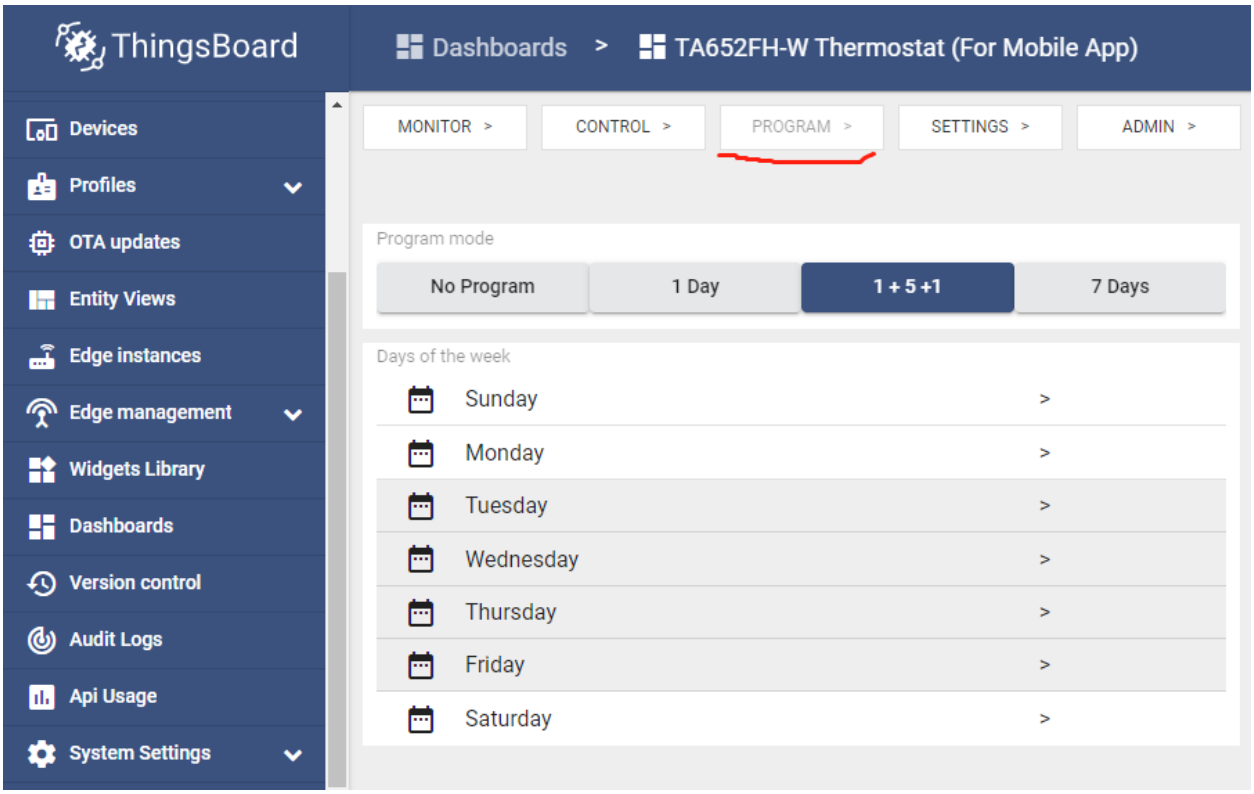
Control state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
Setpoint	If you adjust *setpoint*, *override program status* is YES (true)
Program	program on or off
PRG next setpoint	next program time & setpoint
Override program status	“YES”(true) or “NO”(false)
Control Mode	“Off” or “On”

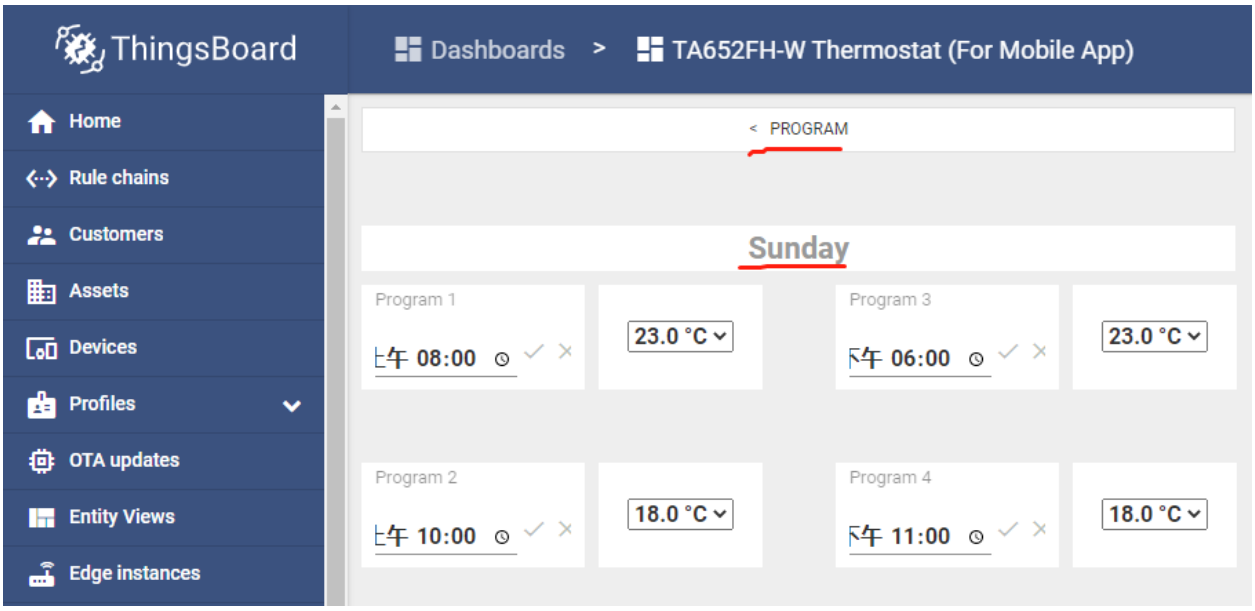
Program state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Program Mode	Description
NO PROGRAM	Program disabled
1 DAY (MON)	Using 4 set points of Monday every day
1+5+1 (SUN+MON+SAT)	Using 4 set points of Monday from Monday to Friday
7 DAYS (SUN~SAT)	Using 4 set points every day
Sunday, . . .	Skip to *Program_setpoints state*

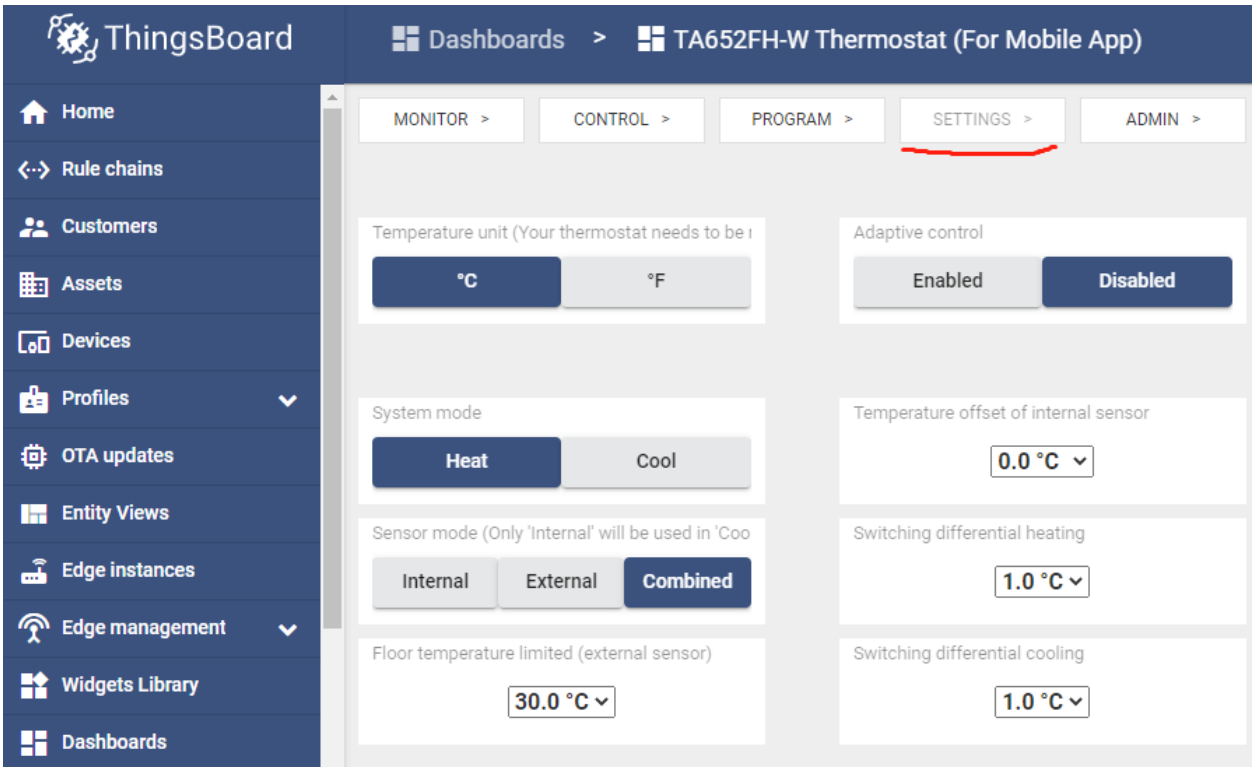
Program_setpoints state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
Program 1 ~ Program 4	time, hour:minute
Setpoint 1 ~ Setpoint 4	setpoint value, temperature

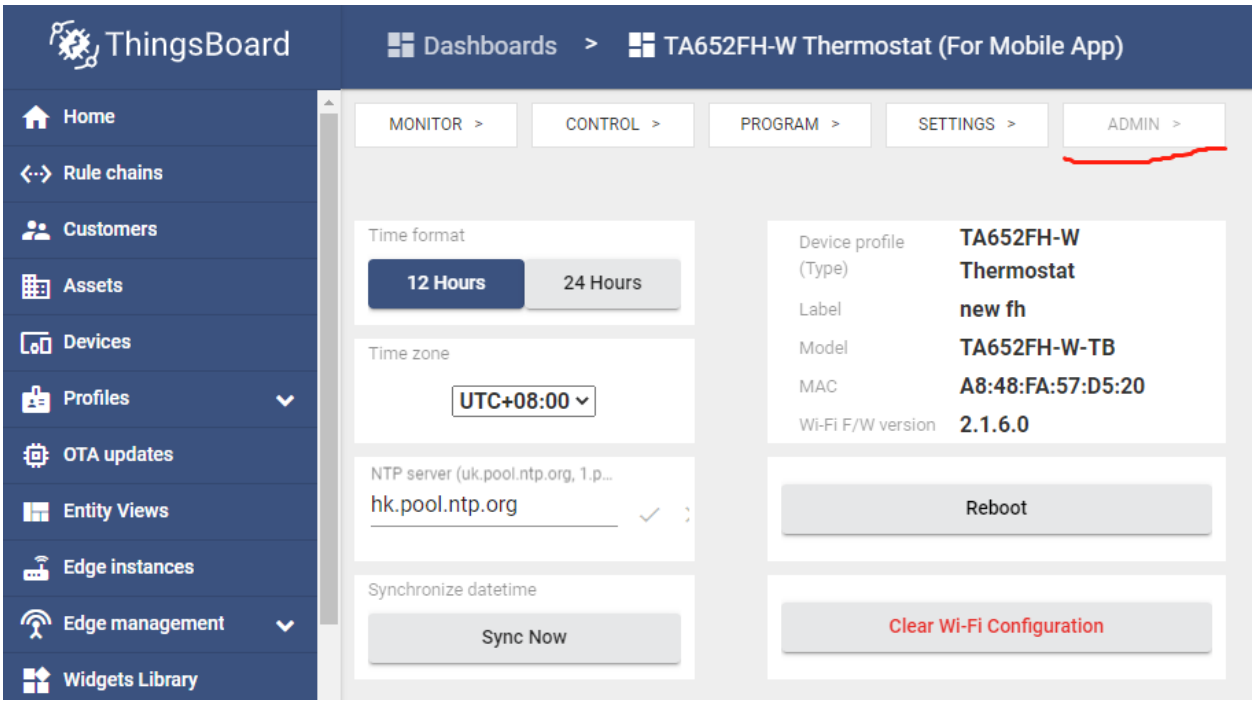
Settings state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
Temp Unit	"°C" or "°F". **Reboot the device to take effect**
Adaptive control	Enabled or disabled
System Mode	"Heat" or "Cool"
Sensor Mode	"Internal" / "External" / "Combined" senosr can be selected when it is in "Heat" mode. Only "Internal" Sensor will be used when it is in "Cool" mode.
Floor temperature limited	external sensor temperature offset
Temp Offset(Internal Sensor)	Internal sensor temperature offset
Switching Diff Heating	Switching differential heating
Switching Diff Cooling	Switching differential cooling

Admin state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
Time Format	"12 Hours" or "24 Hours"
Timezone	See *Step 4.2 Add shared attributes of new device*
NTP Server	SNTP protocol server URL, e.g. pool.ntp.org, 0.pool.ntp.org, 1.pool.ntp.org, time.nist.gov, ... see *Step 4.2 Add shared attributes of new device*
Sync Time	Sync time per syncTimeFreq seconds. If you change *Timezone* or *NTP Server*, you have to do it. See *Step 4.2 Add shared attributes of new device*
Device attributes	Device name, device profile (type), device label, model, MAC, device Wi-Fi Module F/W version, device Main MCU F/W version
Reboot	Reboot device
Clear Wi-Fi Config	Clear device's Wi-Fi configuration

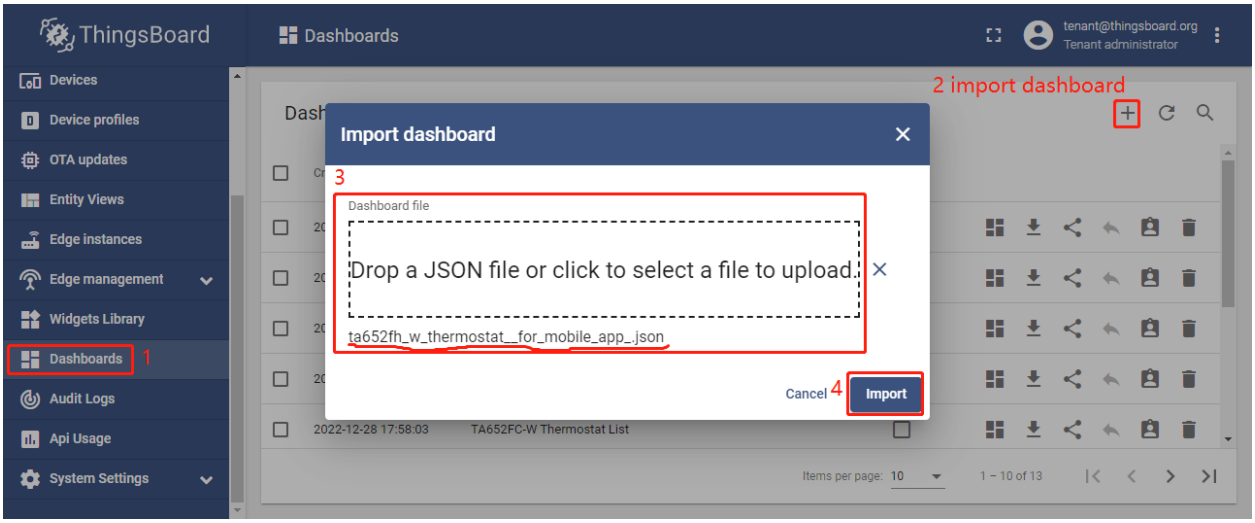
Import Detail Dashboard

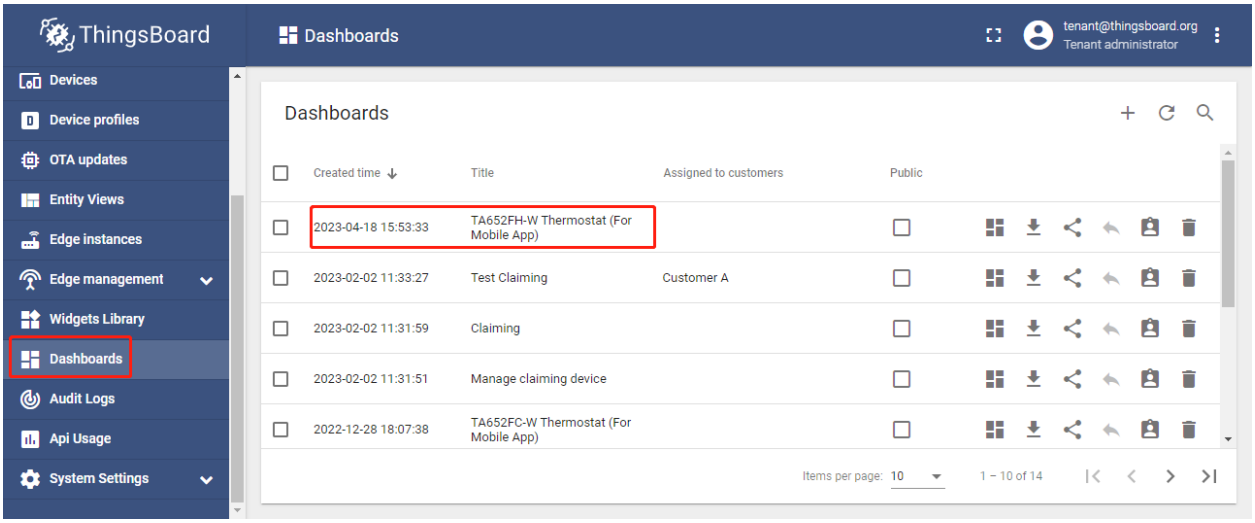
Tip: *A Dashboard file* can only be imported once. If you have already imported it, you do not need and cannot repeat the import.

If you have already imported it, you can skip this step.

In order to use this dashboard, you must to create `TA652FH-W Thermostat Device Profile`. If it doesn't exist, you can import it. See *Import Device Profile of TA652FH-W Thermostat*.

- Download `ta652fh_w_thermostat__for_mobile_app_.json`.
- **Dashboards** –> **+** –> **Popup dialog: Import dashboard** –> Drag and drop *detail dashboard File* –> **Import**.

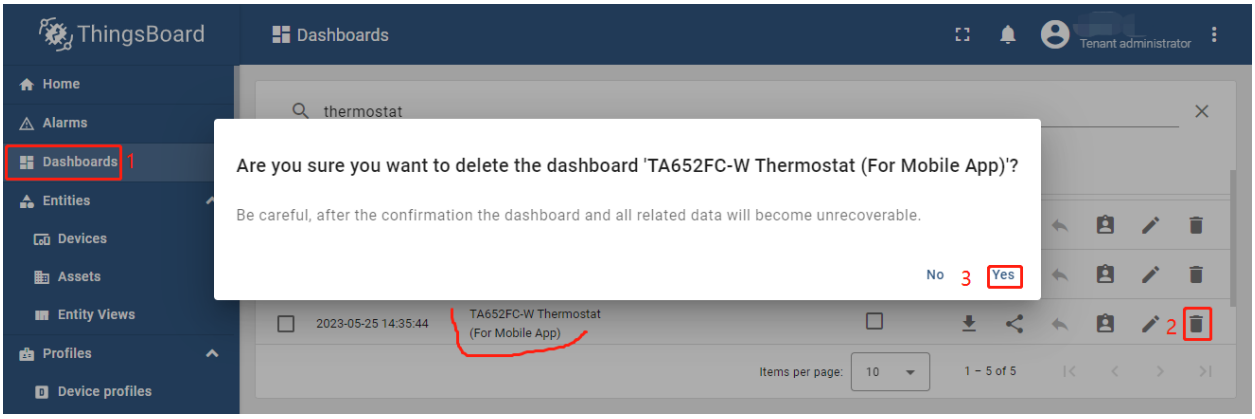




- Optional, This dashboard can be set as `TA652FH-W Thermostat Device Profile`'s mobile dashboard. See *Modify TA652FH-W Thermostat device profile's mobile dashboard*.

Update Detail Dashboard

- First, *clear TA652FH-W Thermostat device profile's mobile dashboard*.
- Next, delete this dashboard: **Dashboards** –> Click  in the row of `TA652FH-W Thermostat (For Mobile App)` –> **Popup dialog: Are you sure you want to delete ...? –> Yes**.



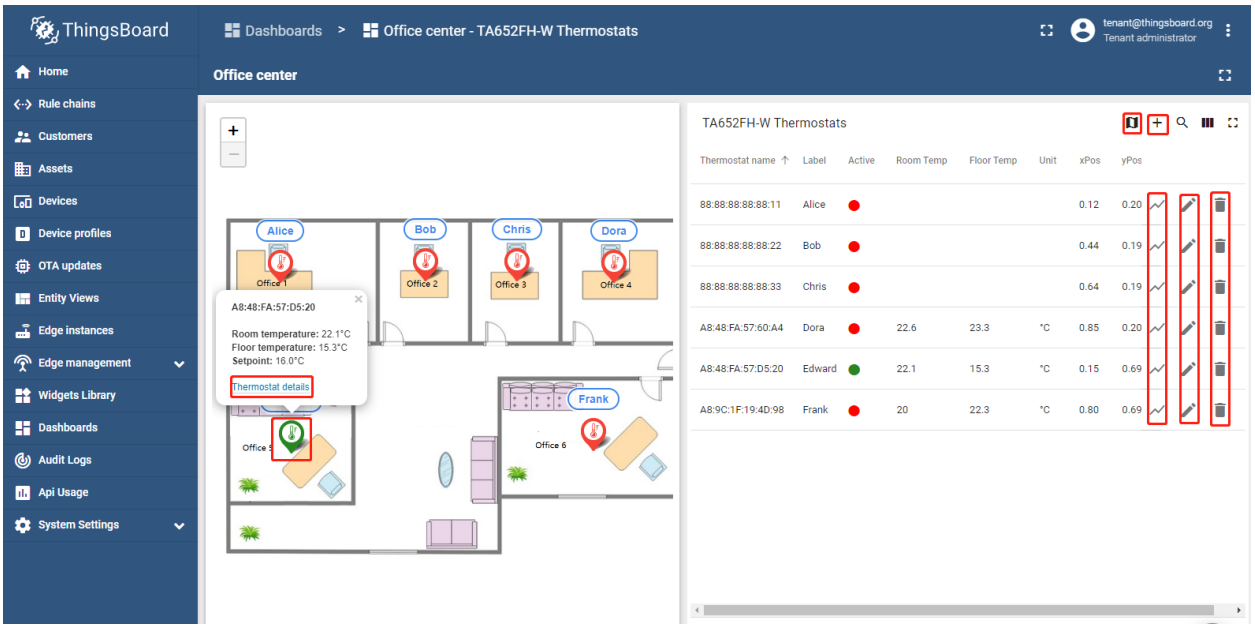
- Then *import TA652FH-W Detail Dashboard*.

5.5.4 Office center - TA652FH-W Thermostats

Dashboard states

Office state

`Office state` is root state.



- **Dashboard bar:**

- Office center : Click here to skip to **root state**. Since **default state** is *root state*, click here and there is no response.

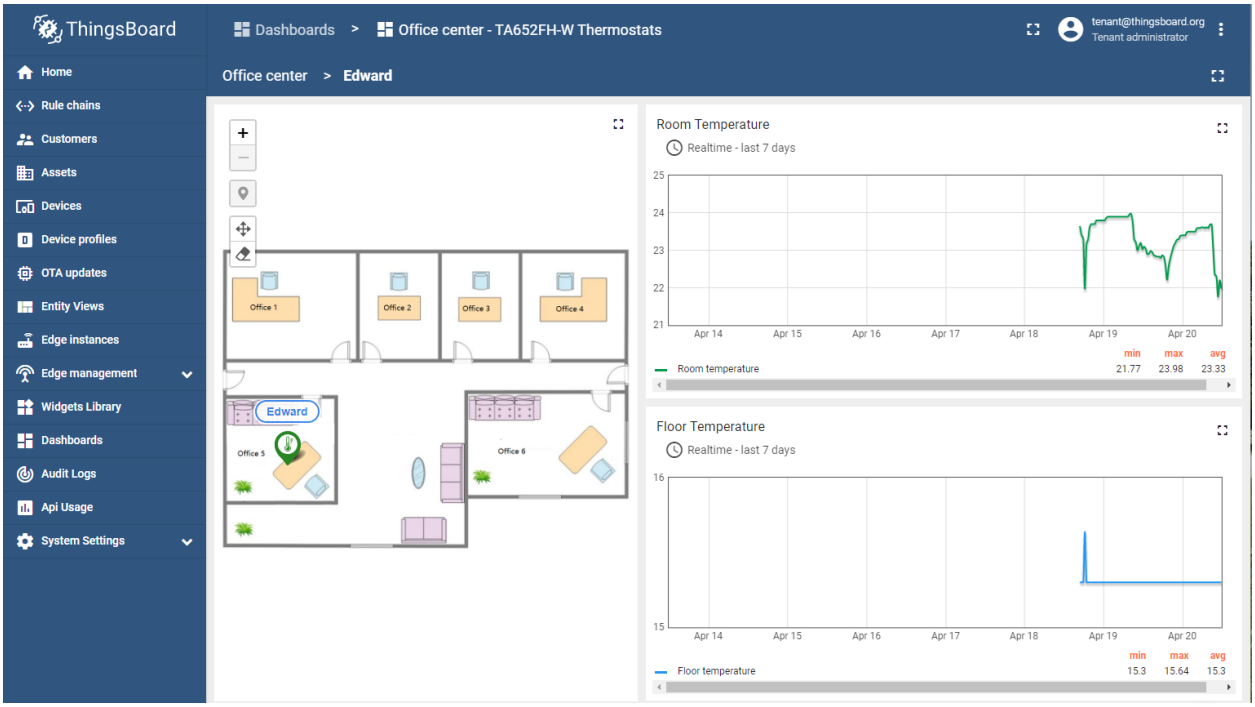
- **Thermostats List:**
  - **Fields:**
    - Thermostat name, Label, active.
    - Room temperature, Floor Temperature, Setpoint, Unit, xPos, yPos.
  - **Actions:**
    - : Skip to *Map state*.
    - : Open a dialog, to add a new thermostat.
    - : Skip to *Chart state*.
    - : Open a dialog, to edit a thermostat.
    - : Open a dialog, to edit a thermostat.

- **Map widget:**
  - : Open a box, to show some text.
  - Thermostat details : Skip to *Chart state*.

Map state

- **Map widget:**
  -  : Click to enter drag-drop mode, you can modify the position of the thermostat. Click again to save the modification and exit drag-drop mode.

Chart state



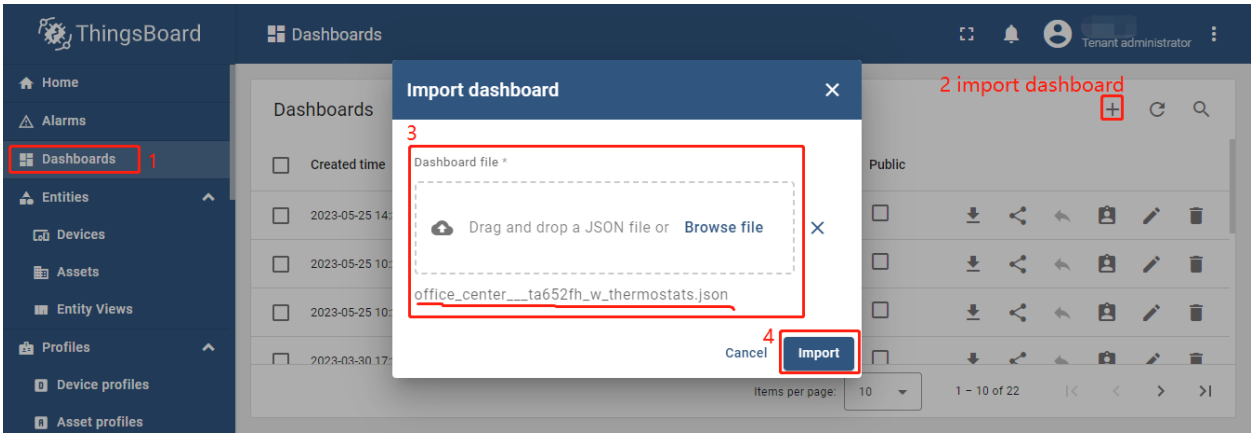
Import Office Center Dashboard

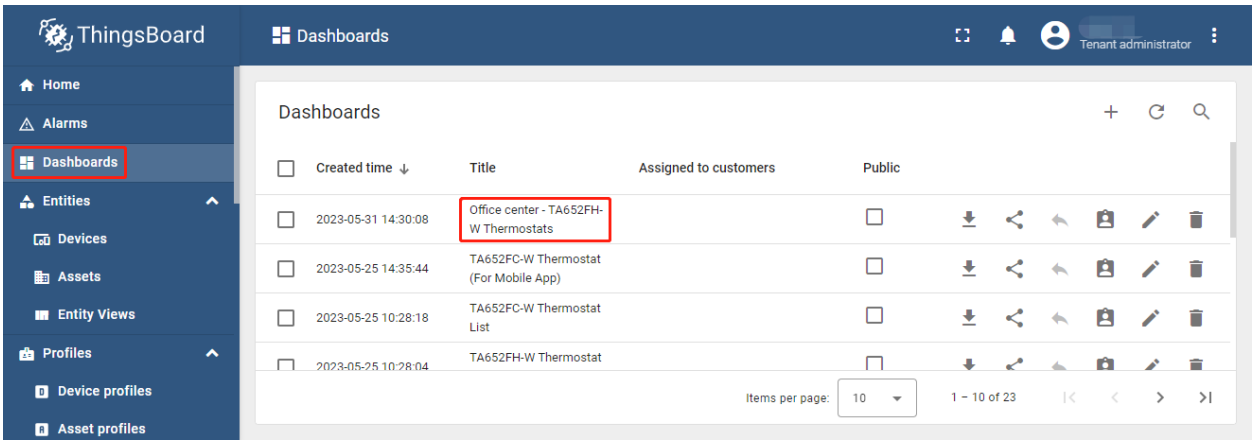
Tip: *A Dashboard file* can only be imported once. If you have already imported it, you do not need and cannot repeat the import.

If you have already imported it, you can skip this step.

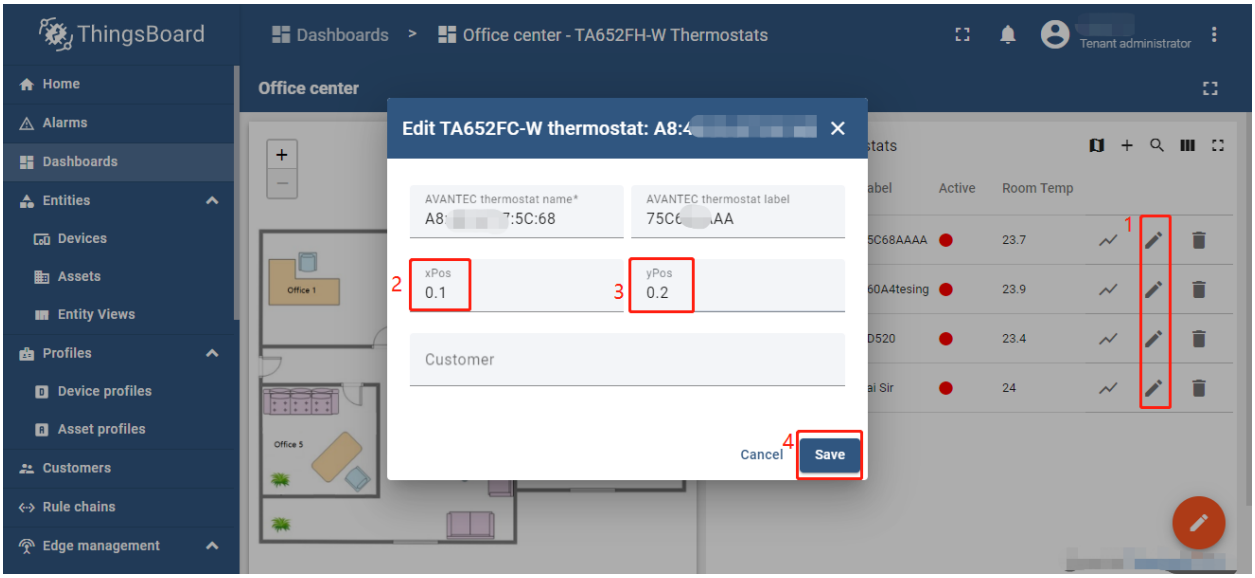
In order to use this dashboard, you must to create `TA652FH-W Thermostat Device Profile`. If it doesn't exist, you can import it. See *Import Device Profile of TA652FH-W Thermostat*.

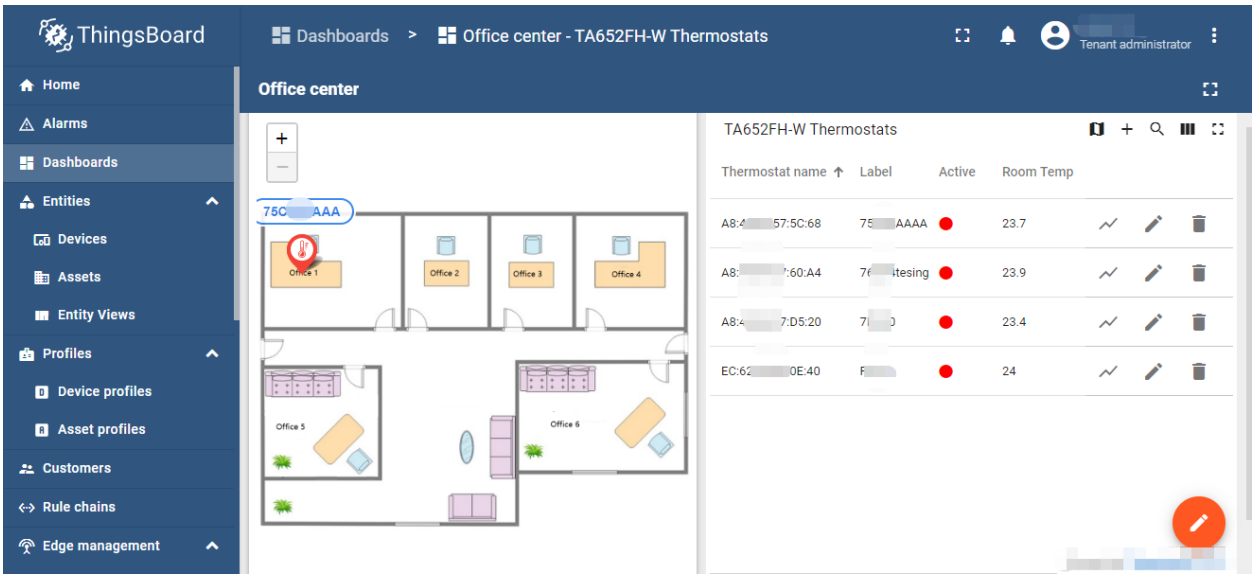
- Download `office_center___ta652fh_w_thermostats.json`.
- **Dashboards** –> **+** –> **Popup dialog: Import dashboard** –> Drag and drop *Office center dashboard File* –> **Import**.





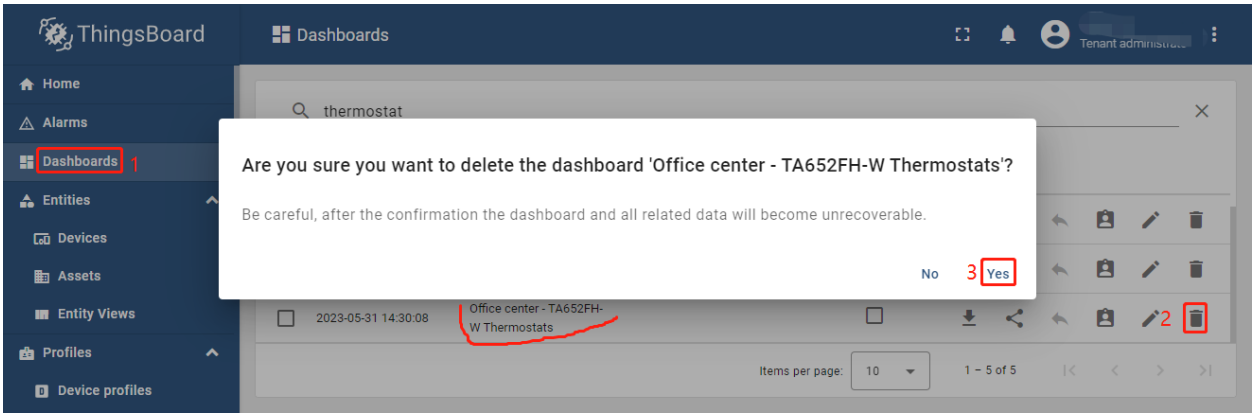
- Edit the position: Click  in a row –> Enter xPos/yPos in Popup dialog –> **Save**.





Update Office Center Dashboard

- First, delete this dashboard: **Dashboards** –> Click  in the row of `Office center - TA652FH-W Thermostats` –> **Popup dialog: Are you sure you want to delete ...?** –> **Yes**.



- Next, *import TA652FH-W List Dashboard*.

5.6 TA652FH-W MQTT API

See *TA652FC-W MQTT API*.

CHAPTER

SIX

TA692FC-L-5 LORAWAN THERMOSTAT

These references will help you learn more about TA692FC-L-5 LoRaWAN Thermostat, operate it, and even realize your personalized Dashboard.

Specification

Add to ThingsBoard | *Demo Dashboards*

LoRaWAN Device API

6.1 TA692FC-L – FCU Thermostat Series

Operating Voltage	230 VAC ±10%
Measurable range	0 - 40 °C, 0.1°C
LoRaWAN	Class C
EU868 band	868.1 MHz ~ 868.5 MHz
AS923 band (Optional)	923.2 MHz ~ 923.4 MHz

6.1.1 Features

- Wireless thermostats for fan coil units
- 1.5” VA TN with backlit - lite grey text on dark background
- Touch keys x 5
- Flush-mount installation in an 86 x 86 / British single-gang wall-box
- White gloss housing with light grey silk-printed keys
- **Controls:**
  - 3-speed fan
  - One DC 0…10V valve actuators
- **Used in systems with:**
  - Fan coil units
  - Heating and cooling appliances

6.1.2 Technical Specification

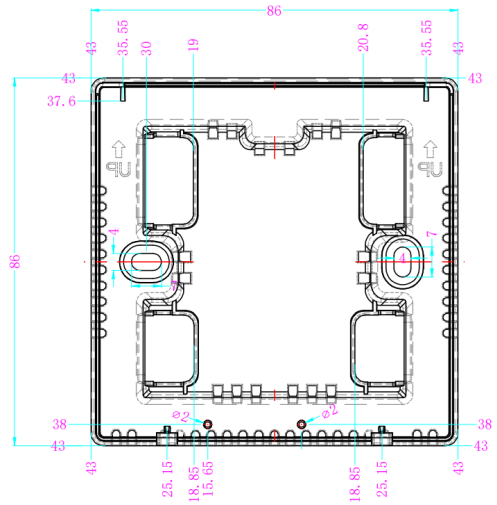
Transmitting power	21.0dBm
Receiving sensitivity	-140dBm
Effective range outdoors	TBD
Measuring temperature	0 ~ 40°C
Controlling temperature	5 ~ 35°C
Adjustable span	1.0°C ~ 4.0°C
Sensing Element	103AT
Storage Temperature	-5 ~ 50°C
Measuring accuracy/resolution	±0.5°C
On/Off Relay Contact Rating	230VAC 2(1)A max
AO Contact Rating	10VDC 1mA max
Terminals	2 mm^2 cable
Operating Temperature	0 ~ 50°C
Operating Voltage	230VAC ±10%
Operating Humidity	5 ~ 95%R.H. non-condensing

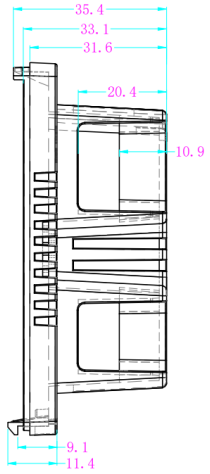
6.1.3 Order Code

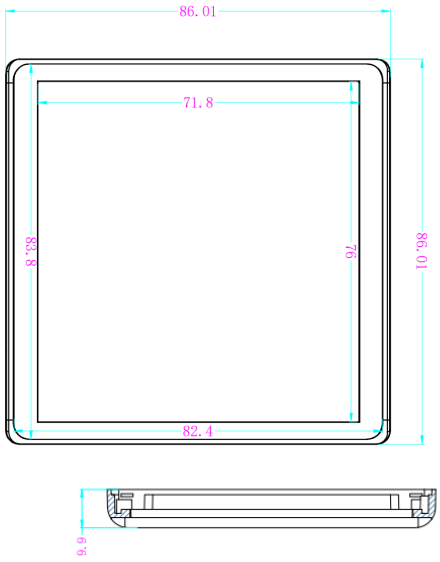
Symbols	Fan Control	Heating	Cooling	LoRa	Frequnecy
TA692FC-L-1	3-Speed	On/Off heater	On/Off valve	LoRoWAN	endpoint 868.1M~868.5MHz, or 920M~925MHz
TA692FC-L-2	0~10V	On/Off heater	On/Off valve	LoRoWAN	endpoint 868.1M~868.5MHz, or 920M~925MHz
TA692FC-L-3	0~10V	On/Off heater	0~10V modulating	LoRoWAN	endpoint 868.1M~868.5MHz, or 920M~925MHz
TA692FC-L-4	0~10V	0~10V modulating	0~10V modulating	LoRoWAN	endpoint 868.1M~868.5MHz, or 920M~925MHz
TA692FC-L-5	3-Speed	—	0~10V modulating	LoRoWAN	endpoint 868.1M~868.5MHz, or 920M~925MHz

6.1.4 Dimensions / Outline

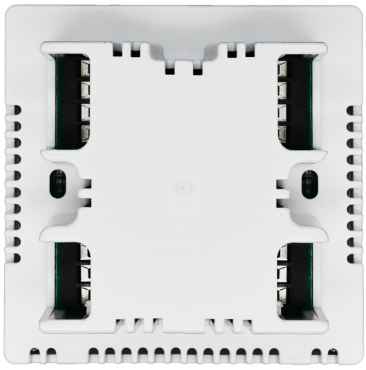
- Protruding part - 86.0mm(W) x 86.0mm(H) x 16.5mm(D)
- Concealed part - 64.0mm(W) x 66.5mm(H) x 26.6mm(D)


86
43
35.55
30
19
20.8
35.55
43
43
37.6
86
4
7
38
43
38
43
43
25.15
18.85
15.65
18.85
25.15
43

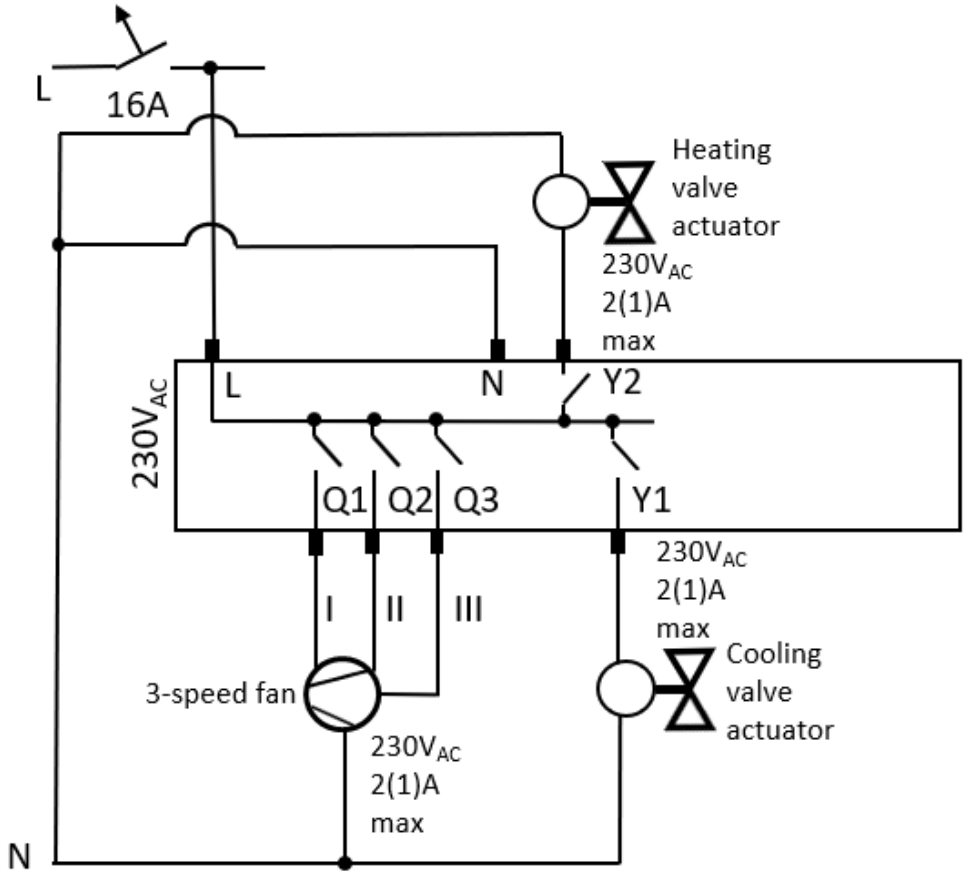

35.4
33.1
31.6
20.4
10.9
9.1
11.4


86.01
71.8
82.8
76
86.01
82.4
9.9

6.1.5 Product pictures

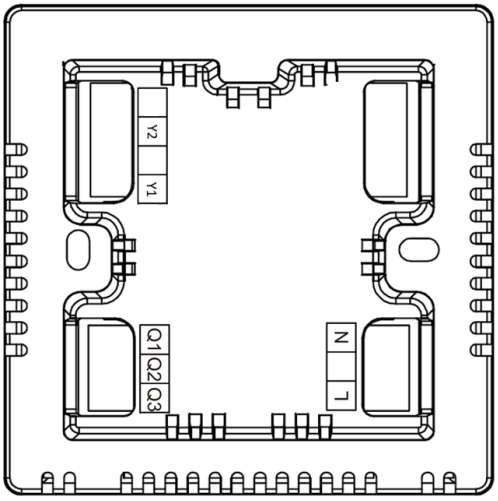


6.1.6 Wiring Example for TA692FC-L-1

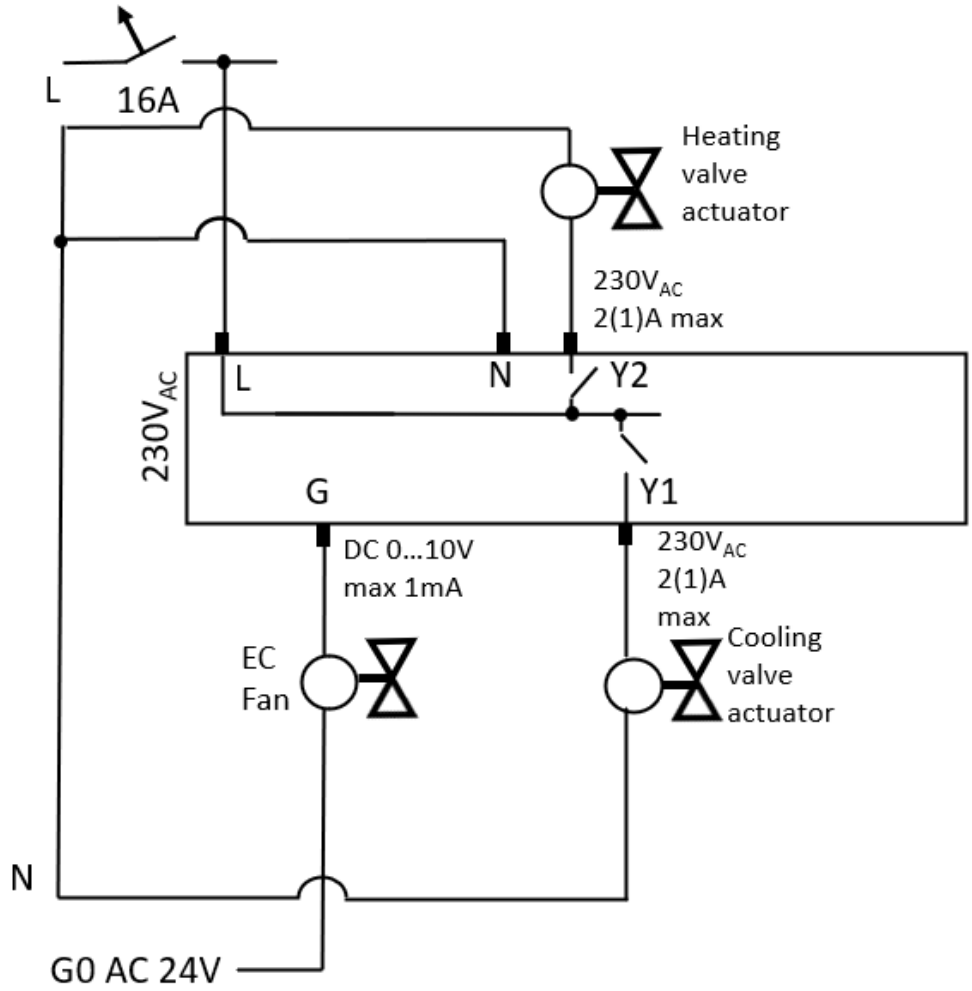


Symbols	Terminals
L	Live
N	Neutral
Q1	Control output Fan speed 1, 230VAC
Q2	Control output Fan speed 2, 230VAC
Q3	Control output Fan speed 3, 230VAC
Y1	Control output for Cool Valve ON/OFF, 230VAC
Y2	Control output for Heater ON/OFF, 230VAC

6.1.7 Terminal Labels on TA692FC-L-1

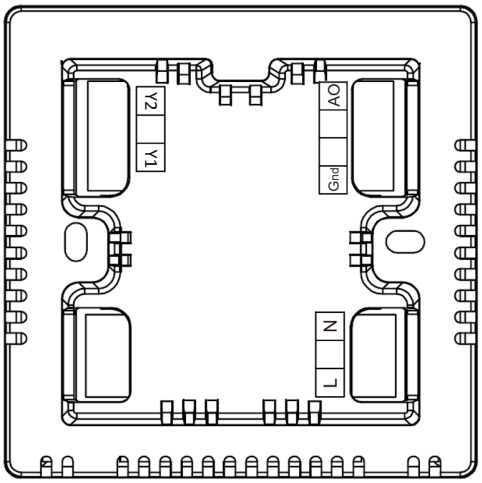


6.1.8 Wiring Example for TA692FC-L-2

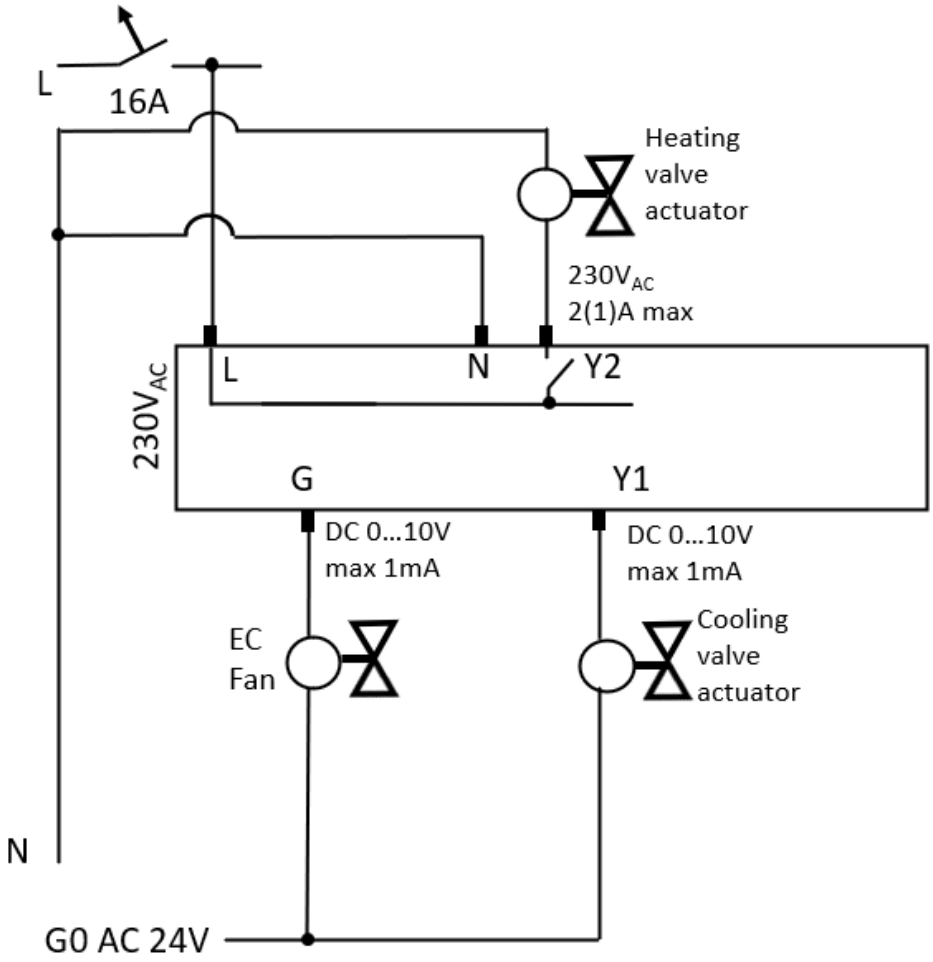


Symbols	Terminals
L	Live
N	Neutral
G	Control output to EC Fan 0…10VDC
Y1	Control output Cool valve ON/OFF. 230VAC
Y2	Control output Heater ON/OFF. 230VAC

6.1.9 Terminal Labels on TA692FC-L-2

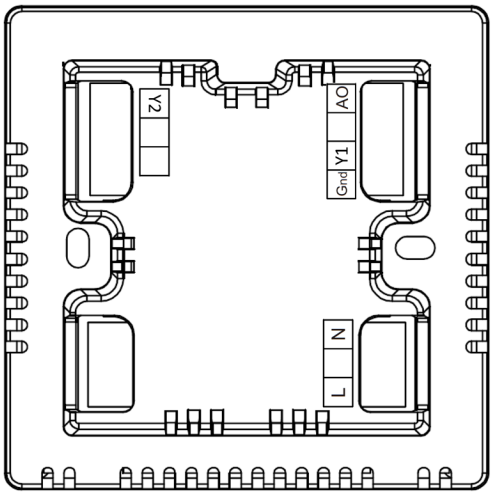


6.1.10 Wiring Example for TA692FC-L-3

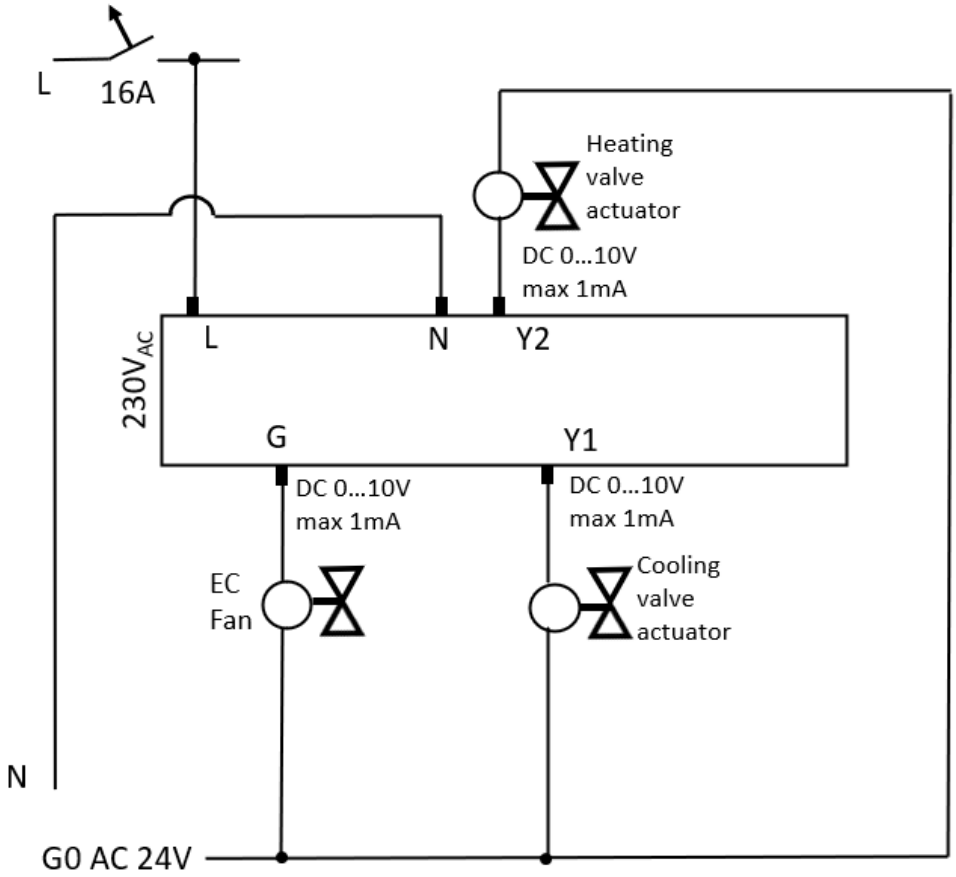


Symbols	Terminals
L	Live
N	Neutral
G	Control output to EC Fan 0…10VDC
Y1	Modulating control to Cool valve 0…10VDC
Y2	Control output Heater ON/OFF. 230VAC

6.1.11 Terminal Labels on TA692FC-L-3

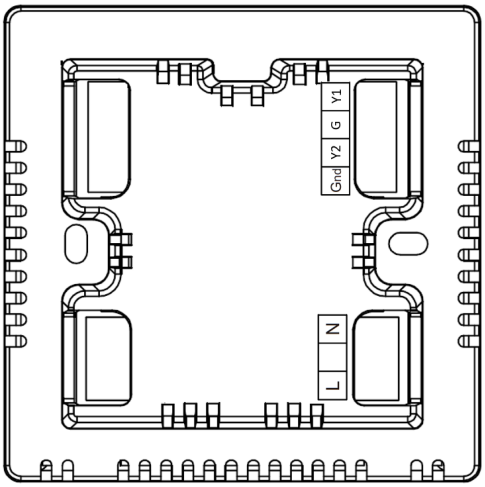


6.1.12 Wiring Example for TA692FC-L-4

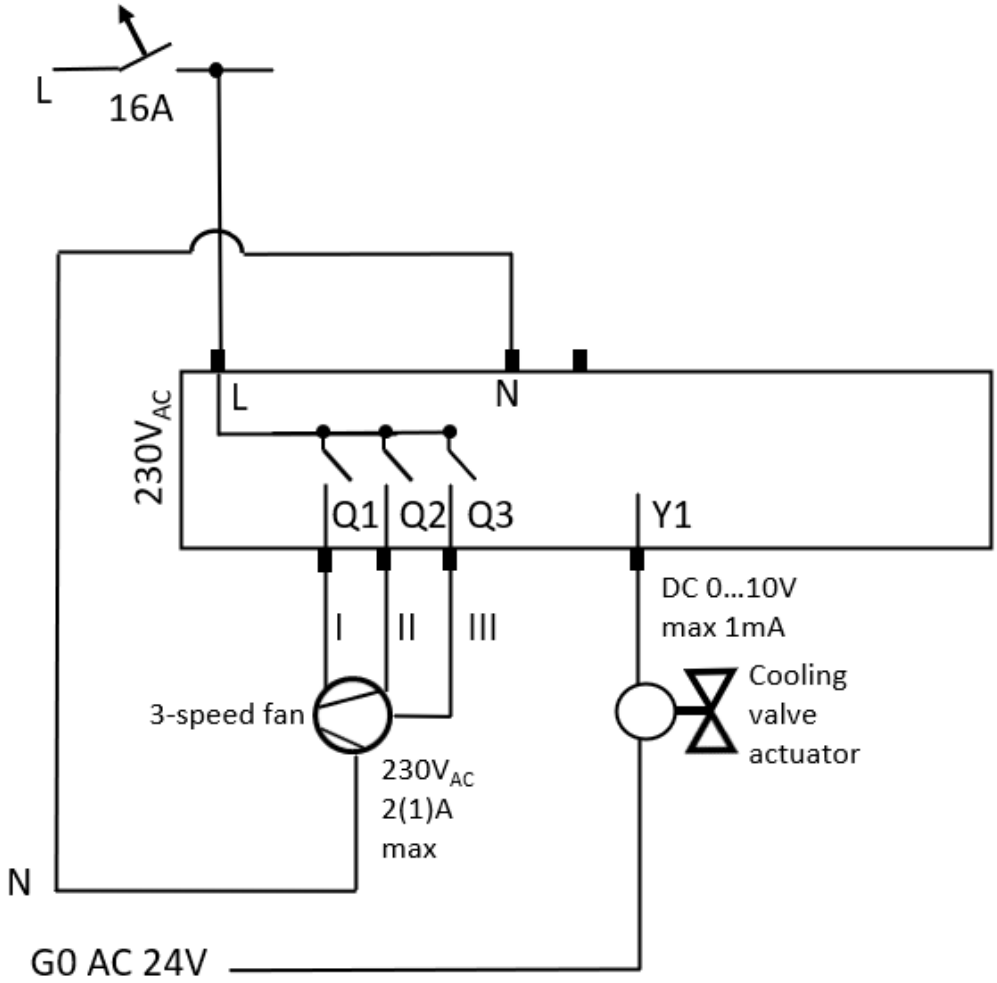


Symbols	Terminals
L	Live
N	Neutral
G	Control output to EC Fan 0…10VDC
Y1	Modulating control to Cooling valve 0…10VDC
Y2	Modulating control to Heating valve 0…10VDC

6.1.13 Terminal Labels on TA692FC-L-4

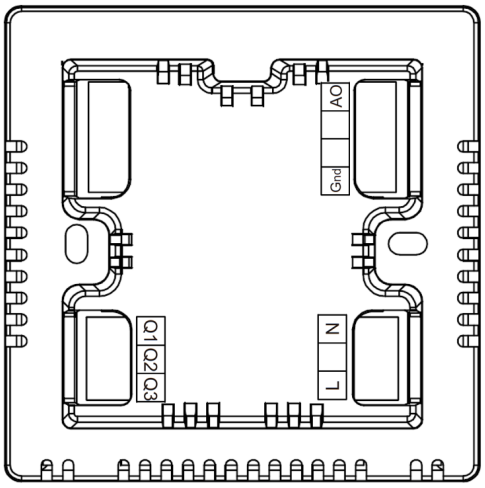


6.1.14 Wiring Example for TA692FC-L-5



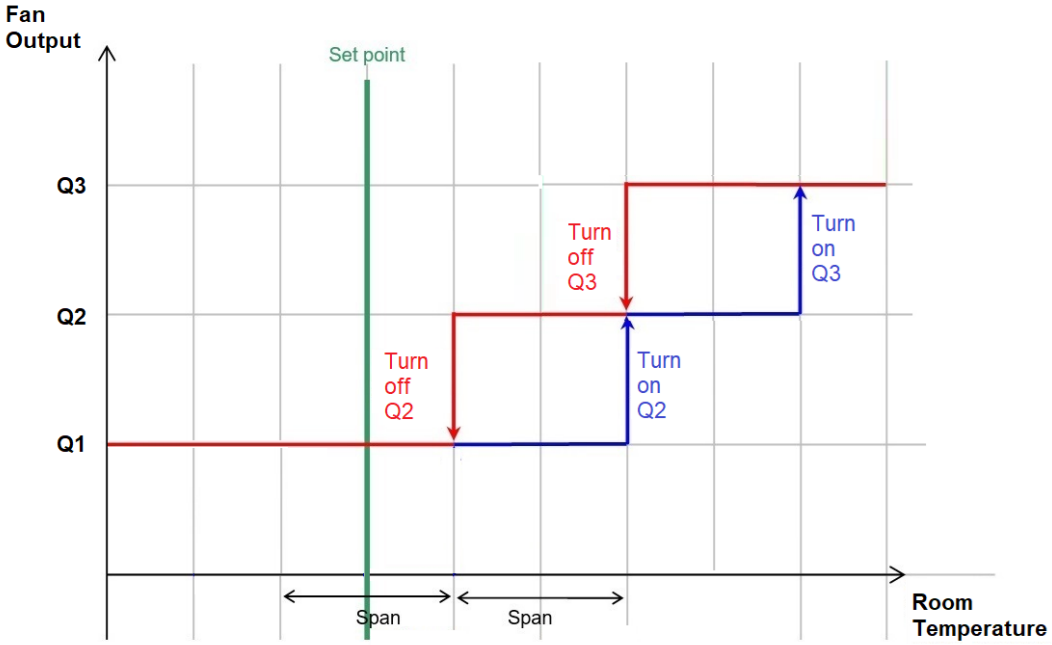
Symbols	Terminals
L	Live
N	Neutral
Q1	Control output Fan speed 1, 230VAC
Q2	Control output Fan speed 2, 230VAC
Q3	Control output Fan speed 3, 230VAC
Y1	Control output to Cooling valve 0…10VDC

6.1.15 Terminal Labels on TA692FC-L-5



6.1.16 Output diagrams

- **Fan controls** - Q $_1$ Q $_2$ Q $_3$ - in **Auto Fan Mode**. Applicable to TA692FC-L-1, TA692FC-L-5 Except when Power Off, TA692FC-L is always running at low-fan (Q $_1$ On).



- **Cooling Valve (Y $_1$)**

  PI control of Cooling Valve (Y $_1$) in Cool Mode.

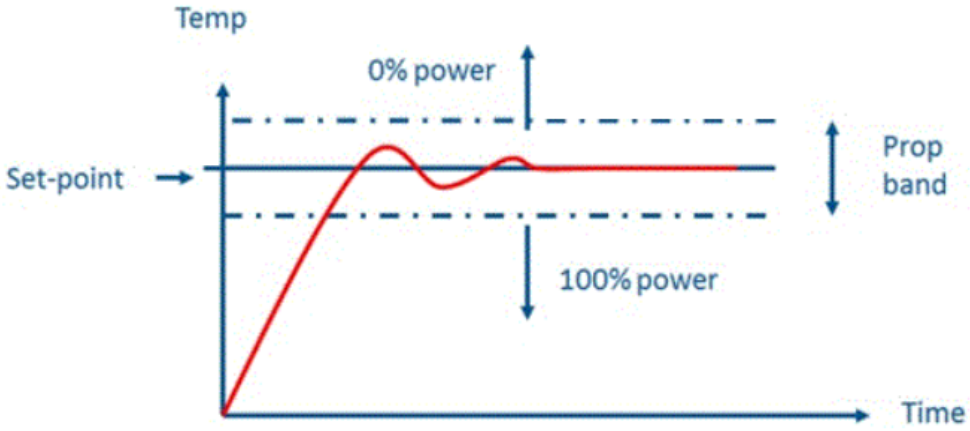
  Applicable to TA692FC-L-3, TA692FC-L-4, TA692FC-L-5.

  TA692FC-L employs proportional-integrative modulating control (PI).

  Diagram shows changing in temperature difference versus Y1 voltage level over time.

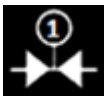
Ion  blinks when output power is under 70%; persistently on at 100%; disppears at 0%.

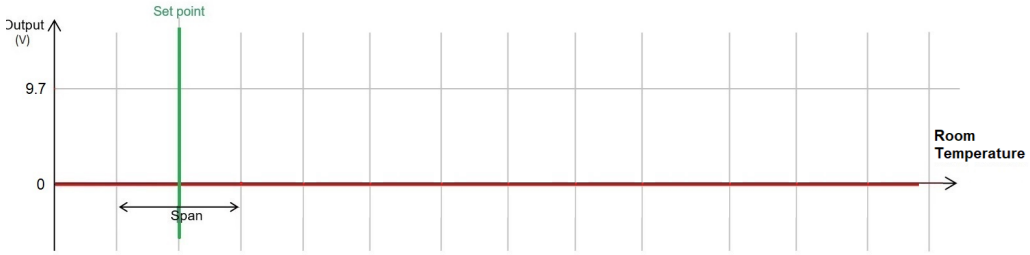
Refer to subsequent sections for K-Factor, P-band and I-time settings.



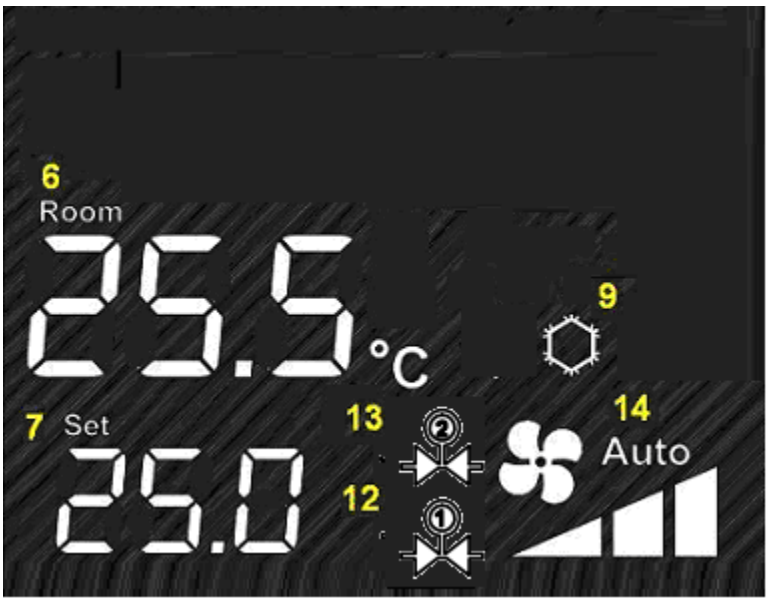
- **Cooling Valve (Y1) in Fan-Only Mode**

  Applicable to TA692FC-L-3, TA692FC-L-4, TA692FC-L-5.

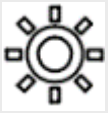
  If Fan-Only Mode is selected, Y1 simply shuts off.  disappears.



6.1.17 LCD Display Content



Icons

Label	Description
6	Room temperature
7	Temperature Setpoint
9	System Mode icon  Cool mode  Heat mode no icon - **Fan-Only mode**
12	Y1 output status indicator
13	Y2 output status indicator
14	Fan status indictor  Auto Fan Mode no icon - Manual Fan Mode
	High Fan Speed indicator
	Med Fan speed indicator
	Low Fan speed indicator

Buttons

Keys	Function
	Menu Key Short press: change mode Press-n-hold: Internal setting
	Fan Speed Short press: cycle-through L->M->H->Auto->L
	Power On/Off Key
	Traverse Up in Setting Menu
	Traverse Down in Setting Menu

6.1.18 Internal Parameter Menu in TA692FC-L-5

Items	Selection	Default
System Mode (P00)	Cool / Fan-only (CL/FAN)	Cool (CL)
Calibration (P04)	-4°C ~ 4°C	0°C
Span for Cool (P09)	1.0°C ~ 4.0°C	1.0°C
K-Factor(1/K) (P10)	1 ~ 9	3
P-band Cool (P12)	1.0oC ~ 4.0°C	4.0°C
I-Time Cool (P14)	5 ~ 180 sec	30 sec

6.1.19 Advanced Parameter Menu in TA692FC-L-5

Items	Selection	Default
Restore Default on the next power-cycle (P20)	Disabled/Enabled (DIS/EN)	Disabled(DIS)
LoRa status (P36)	Active/disconnect (on/dis)	Active (on)
Dev EUI (P37 ~ P44)	HEX. Read-only	–

6.2 Add TA692FC-L-5 to ThingsBoard

Tip:

- This section applies to the situation where you add a TA692FC-L-5 to the ThingsBoard PE. It implement two-way communication between a TA692FC-L-5 and a ThingsBoard PE.
- Only ThingsBoard PE supports **Platform Integrations** feature.

Tip:

- If you only need one-way communication from TA692FC-L-5 to ThingsBoard, you can use **chirpstack v3 + ThingsBoard CE** or **chirpstack v4 + ThingsBoard CE**.
- Refer to ThingsBoard getting started for ChirpStack v3 and ThingsBoard Integration for ChirpStack v3 .
- Refer to ThingsBoard getting started for ChirpStack v4 and ThingsBoard Integration for ChirpStack v4.

6.2.1 Introduction

Note: The frequency of LoRaWAN device and gateway must match!

Warning: ChirpStack v4, the latest version, doesn't handle downlink data from ThingsBoard PE v3.5.x.

The ChirpStack open-source LoRaWAN Network Server stack provides open-source components for LoRaWAN networks. After integrating ChirpStack with ThingsBoard, you can connect, communicate, process and visualize data from TA692FC-L-5 thermostat in the ThingsBoard IoT platform.

Item	Description
LoRaWAN Device	TA692FC-L-5, Frequency 868 MHz*
LoRaWAN Gateway	MTCAP-868-041A, Frequency 868 MHz*
LoRaWAN Network Server	ChirpStack v3**
LoRaWAN Application Server	ThingsBoard PE v3.5.x**

6.2.2 Prerequisites

Tip: You need a ChirpStack instance that can be accessed by your ThingsBoard PE instance.

- If your ThingsBoard PE instance is installed in a LAN, you may also install a ChirpStack instance in the same LAN.
- If your ThingsBoard PE instance is installed in the cloud, you may also install a ChirpStack instance on the corresponding cloud host.

- Obtain the following TA692FC-L-5 LoRaWAN Paramters from your equipment vendor.

Item	Paramter
Model	TA692FC-L-5, Frequency 868 MHz
LoRaWAN	Class C
EU868 band	868.1MHz ~ 868.5MHz
DevEUI/AppEUI/JoinEUI*	*YOUR_DEV_EUI*, *eg: 00:12:BD:FF:FE:02:AD:04*
AppKey/Application Key/Network Key*	*YOUR_APP_KEY*, *eg: 72357538782F413F4428472B4B625065*

Note: These parameters are different for every thermostat.

- **Setup the MTCAP-868-041A**
  - *First-Time Setup of Gateway*
  - *Optional: Firmware Upgrade*
- **Install a ChirpStack v3 instance on**
  - *Amazon AWS*, or
  - Microsoft Azure, or
  - Google Cloud, or
  - Debian/Ubuntu, or
  - Docker Compose
- **Subscribe or install a ThingsBoard PE instance**
  - Use ThingsBoard Cloud, or
  - Install your own ThingsBoard PE instance

6.2.3 Step 1. MTCAP configuration

- *Configuring LoRa Packet Forwarder*.

6.2.4 Step 2. ChirpStack configuration

- *Connect gateway to ChirpStack*.
- *Connect device to ChirpStack*.

6.2.5 Step 3. Integrating ChirpStack with ThingsBoard PE

Refer to ChirpStack Integration.

Step 3.1 Uplink Converter

Before creating the integration, you need to create/import an Uplink converter in Data converters. Uplink is necessary in order to convert the incoming data from the device into the required format for displaying them in ThingsBoard. To view the events, enable **Debug**. In the function decoder field, specify a script to parse and transform data.

NOTE Although the Debug mode is very useful for development and troubleshooting, leaving it enabled in production mode may tremendously increase the disk space, used by the database, because all the debugging data is stored there. It is highly recommended to turn the Debug mode off when done debugging.

sample uplink message

Let's review sample uplink message from ChirpStack:


```
{
    "applicationID": "1",
    "applicationName": "TA692FC-L-5-Application",
    "deviceName": "Sales-Office",
    "devEUI": "ABK9//4CrQQ=",
    "rxInfo": [{
        "gatewayID": "AIAAAAACDgs=",
        "time": null,
        "timeSinceGPSEpoch": null,
        "rssi": -52,
        "loRaSNR": 8.5,
        "channel": 2,
        "rfChain": 0,
        "board": 0,
        "antenna": 0,
        "location": {
            "latitude": 22.31025463915414,
            "longitude": -245.77515719803597,
            "altitude": 0,
            "source": "UNKNOWN",
            "accuracy": 0
        },
        "fineTimestampType": "NONE",
        "context": "LZVORA==",
        "uplinkID": "p7k/E6nyQpeMTwedtMqHgA==",
        "crcStatus": "CRC_OK"
    }],
    "txInfo": {
        "frequency": 868500000,
        "modulation": "LORA",
        "loRaModulationInfo": {
            "bandwidth": 125,
            "spreadingFactor": 12,
            "codeRate": "4/5",
```


(continues on next page)

(continued from previous page)


```
            "polarizationInversion": false
        }
    },
    "adr": true,
    "dr": 0,
    "fCnt": 114,
    "fPort": 10,
    "data": "AOAA12QCAwIBKAAeAw==",
    "tags": {},
    "confirmedUplink": false,
    "devAddr": "ABCDuw==",
    "publishedAt": "2023-06-15T08:24:14.436509221Z",
    "deviceProfileID": "e87f230b-51a7-407a-aa6c-468308601139",
    "deviceProfileName": "TA692FC-L-5-868 Thermostat"
}
```


Device fields

- As you can see the device EUI arrives in the **devEUI** field. We will use it as a **device name** in ThingsBoard.
- As you can see the device profile name arrives in the **deviceProfileName** field. We will use it as a **device Type (device profile name)** in ThingsBoard.
- As you can see the device name arrives in the **deviceName** field. We will use it as a **device label** in ThingsBoard.

Table 1: ChirpStack fields v.s. ThingsBoard fields in this case :widths: auto :header-rows: 1

No.	ChirpStack field	Editable	ThingsBoard field	Editable
1	devEUI	No	deviceName	No
2	deviceProfileName	No	deviceType (deviceProfileName)	Yes[1]
3	deviceName	Yes[2]	deviceLabel	Yes[2]

Notes

In the converter it will be indicated like this:

```
var deviceLabel = data.deviceName; // "Sales-Office"
var deviceName =  base64ToHexWithoutUppercase(data.devEUI); //'0012bdfffe02ad04', unique
var deviceType = data.deviceProfileName; //"TA692FC-L-5-868 Thermostat"

var result = {
  deviceName: deviceName,
  deviceType: deviceType,
  deviceLabel: deviceLabel
}
```

[1] In this case, if **deviceType (deviceProfileName)** of the device is modified, the device may not be able to receive messages from ChirpStack or send messages to ChirpStack.

[2] Both are the same only when ThingsBoard automatically creates the device. They are not automatically kept in sync afterwards.

Device data

Device data is encoded in the "data" field. The Base64 encoded data here is:

```
"data": "AOAA12QCAwIBKAAeAw=="
```

Let's convert them into roomTemperature, setTemperature, fanMode and fanState, etc.

In the decoded form we have the following string: **00 E0 00 D7 64 02 03 02 01 28 00 1E 03**

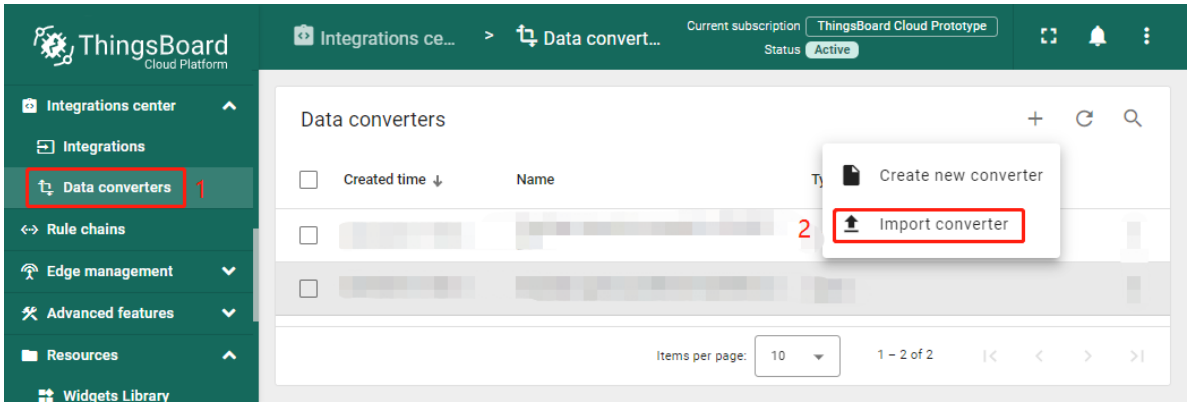
- **00 E0** is the value for roomTemperature, 22.4.
- **00 D7** is the value for setTemperature, 21.5.
- **64** is the value for coolProportionalOutput, 100%.
- **02** is the value for fanMode, MED.
- **03** is the value for fanState, HIGH.
- **02** is the value for threshold, 0.2.
- **01** is the value for systemMode, COOL.
- **28** is the value for coolPBand, 4.0.
- **00 1E** is the value for coolITime, 30.
- **03** is the value for kFactor, 3.

In the converter it will be indicated like this:

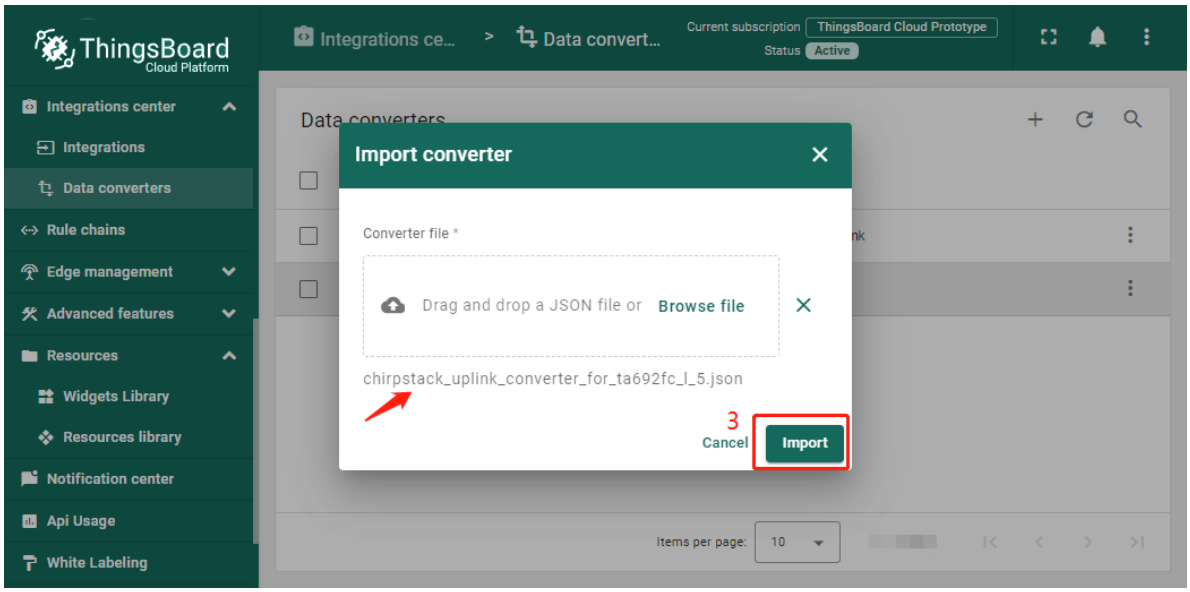
```
var result = {
  attributes: {
    setTemperature: parseInt(incomingHexData.substring(4, 8), 16)/10,
    coolProportionalOutput: parseInt(incomingHexData.substring(8, 10), 16)/100,
    fanMode: fanModeStateMeta[parseInt(incomingHexData.substring(10, 12), 16)],
    fanState: fanModeStateMeta[parseInt(incomingHexData.substring(12, 14), 16)],
    threshold: parseInt(incomingHexData.substring(14, 16), 16)/10,
    systemMode: systemModeMeta[parseInt(incomingHexData.substring(16, 18), 16)],
    coolPBand: parseInt(incomingHexData.substring(18, 20), 16)/10,
    coolITime: parseInt(incomingHexData.substring(20, 24), 16),
    kFactor: parseInt(incomingHexData.substring(24, 26), 16)
  },
  telemetry: {
    roomTemperature: parseInt(incomingHexData.substring(0, 4), 16)/10
  }
}
```

Importing uplink Converter

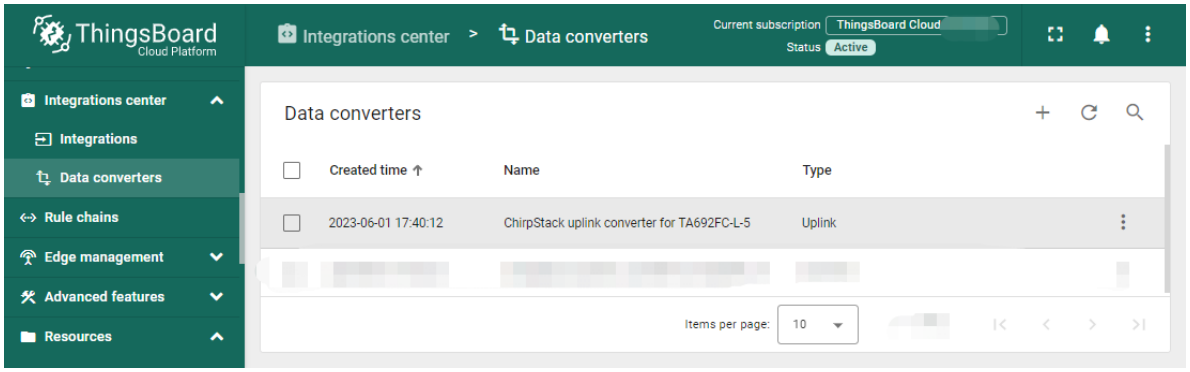
- Download `ChirpStack uplink converter for TA692FC-L-5`.
- **Data converters** –> **+** –> **Import converter**.



- Popup dialog: Import converter –> Drag and drop the converter file –> **Import**.



- Show it in the list of Data Converters.



You can change the decoder/encoder function while creating the converter or after creating it. If the converter has already been created, then click on the “pencil” icon to edit it. Copy the configuration example for the converter (or your own configuration) and insert it into the decoder/encoder function. Save changes by clicking on the “checkmark” icon.

Step 3.2 Downlink Converter

You can customize the downlink according to your configuration. Let's consider an example where we send an shared attribute update message - **remoteSetSetTemperature**.

```
data: msg.remoteSetSetTemperature
```

Also, indicate the required parameters in the metadata:

```
metadata: {
  "cs_devEUI": "$Device_EUI"
}
```

Example for downlink converter:

```
var remoteSetSetTemperature = msg.remoteSetSetTemperature;
var fPort = 91;
var content = Math.round(remoteSetSetTemperature * 10);
var contentBase64 = Uint16ToBase64(content);

// Result object with encoded downlink payload
var result = {
    // downlink data content type: JSON, TEXT or BINARY (base64 format)
    contentType: "TEXT",

    // downlink data
    data: contentBase64,//JSON.stringify(data),

    // object: {...},   //ChirpStack v4 // decoded object (when application coded has␣
↪been configured)
    // Optional metadata object presented in key/value format
    metadata: {
            DevEUI: metadata.cs_devEUI, //ChirpStack v3
            fPort: fPort                //ChirpStack v3
    }
};

function Uint16ToBase64(value) {
    let myArr = new Uint8Array(2);
    myArr[0] = value >> 8; // High byte
    myArr[1] = value >> 0; // Low byte

    let myStr = Uint8ArrayToString(myArr);
    return btoa(myStr);
}

function Uint8ArrayToString(fileData){
  var dataString = "";
  for (var i = 0; i < fileData.length; i++) {
    dataString += String.fromCharCode(fileData[i]);
  }

  return dataString;
}
```

(continues on next page)

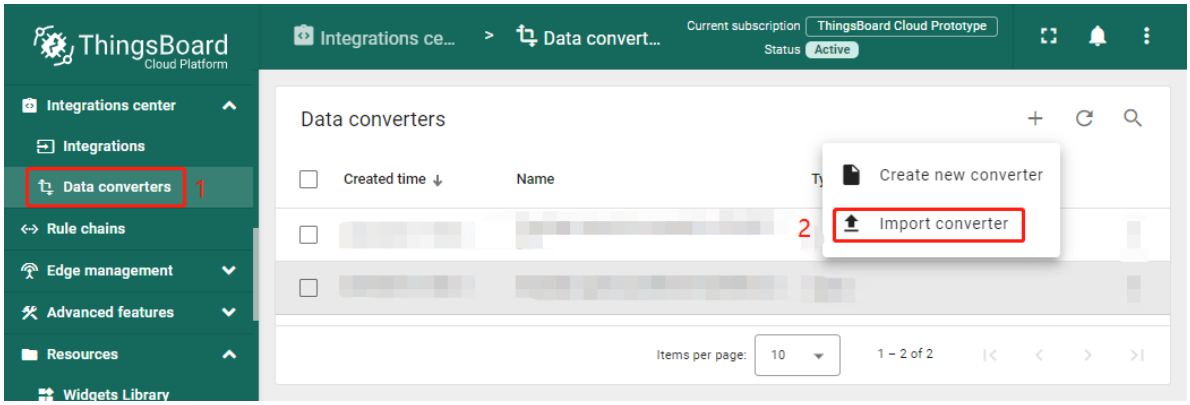
(continued from previous page)

```
return result;
```

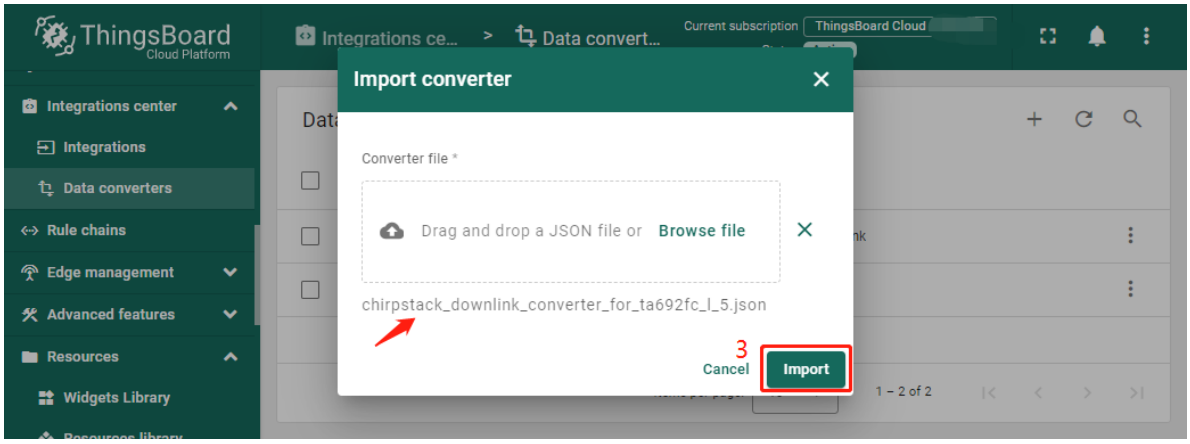
Where **cs_devEUI** is device EUI, it will be taken from the device uplink message.

Importing downlink Converter

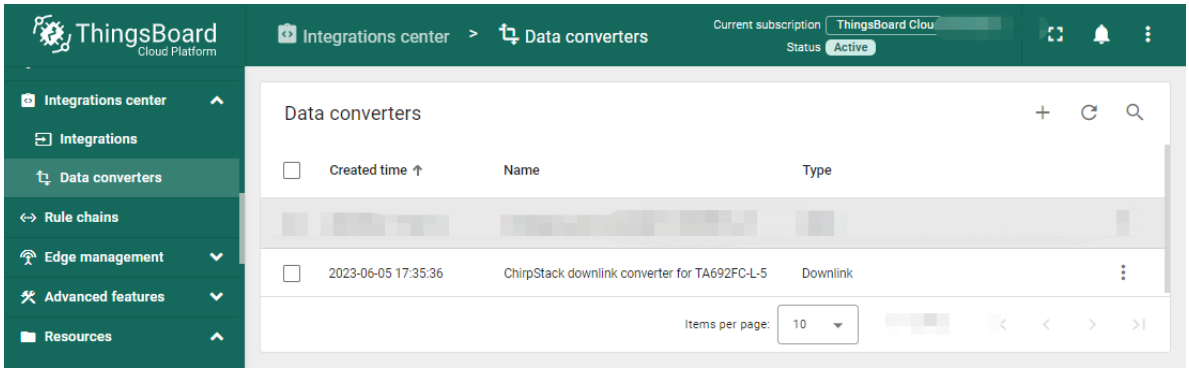
- Download `ChirpStack downlink converter for TA692FC-L-5`.
- **Data converters** –> **+** –> **Import converter**.



- Popup dialog: Import converter –> Drag and drop the converter file –> **Import**.



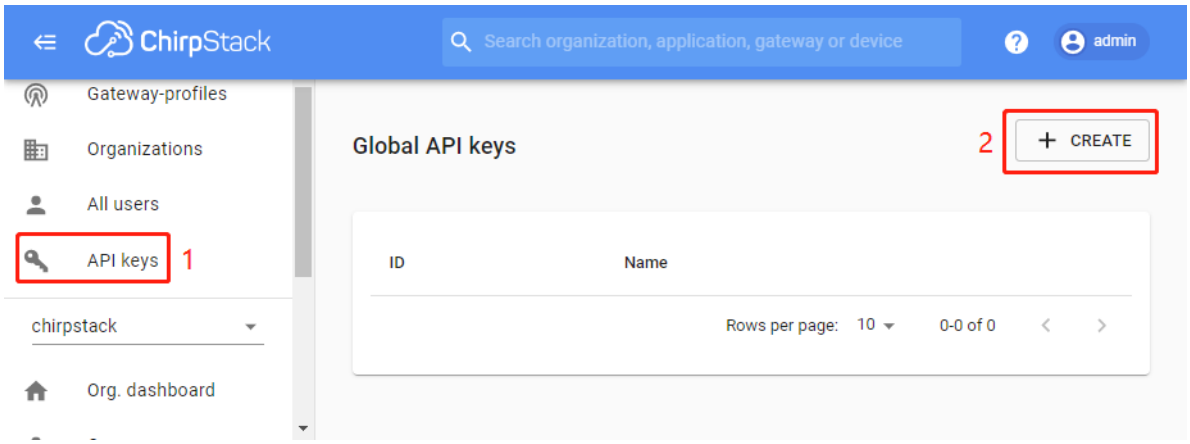
- Show it in the list of Data Converters.



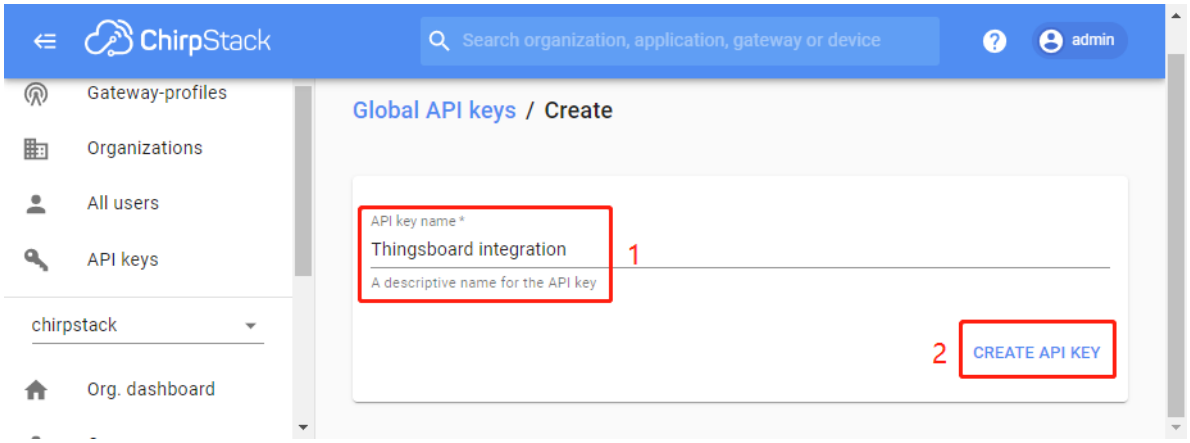
Step 3.3 Create Integration

Step 3.3.1 Get Application API key from ChirpStack

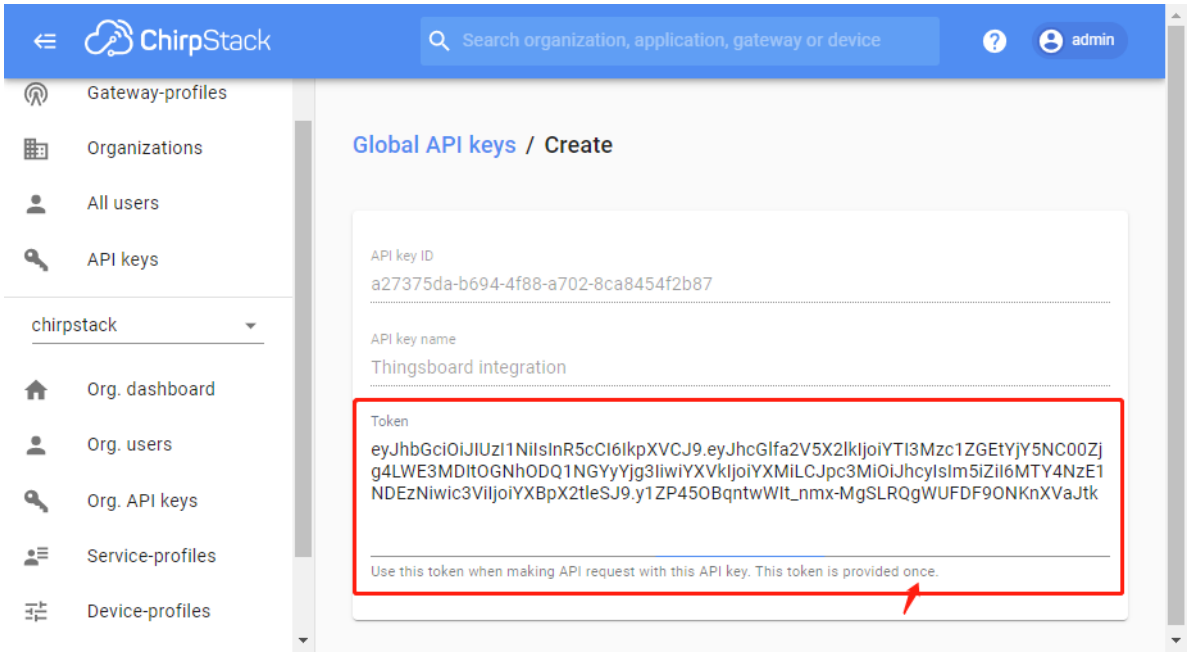
- To get the API key we need to open Application server UI, open **API keys** tab from the left top menu and **Create** an API key.



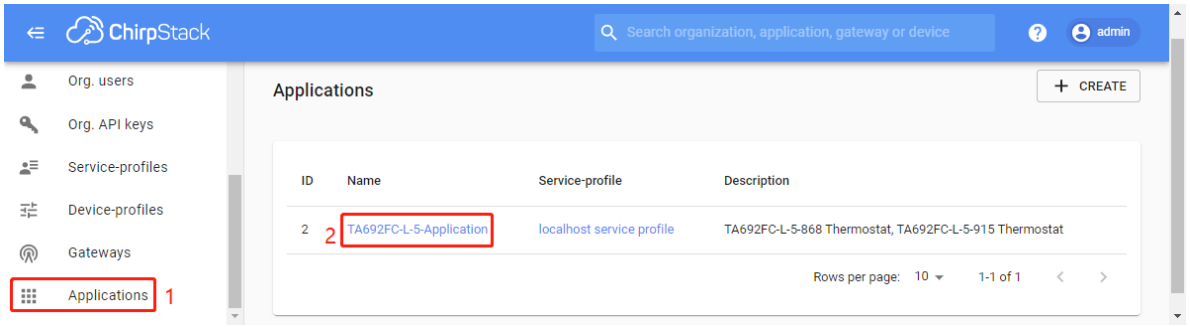
- Input your API key name –> **Create API key**.



- Copy your token.



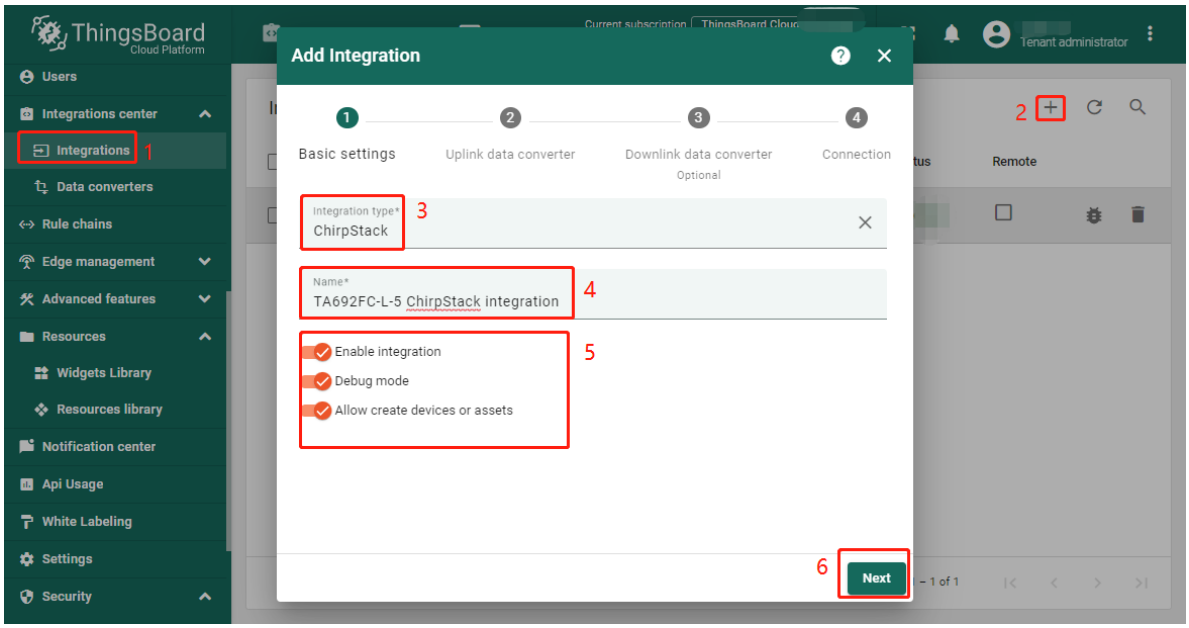
- Show it in the list of global API keys.



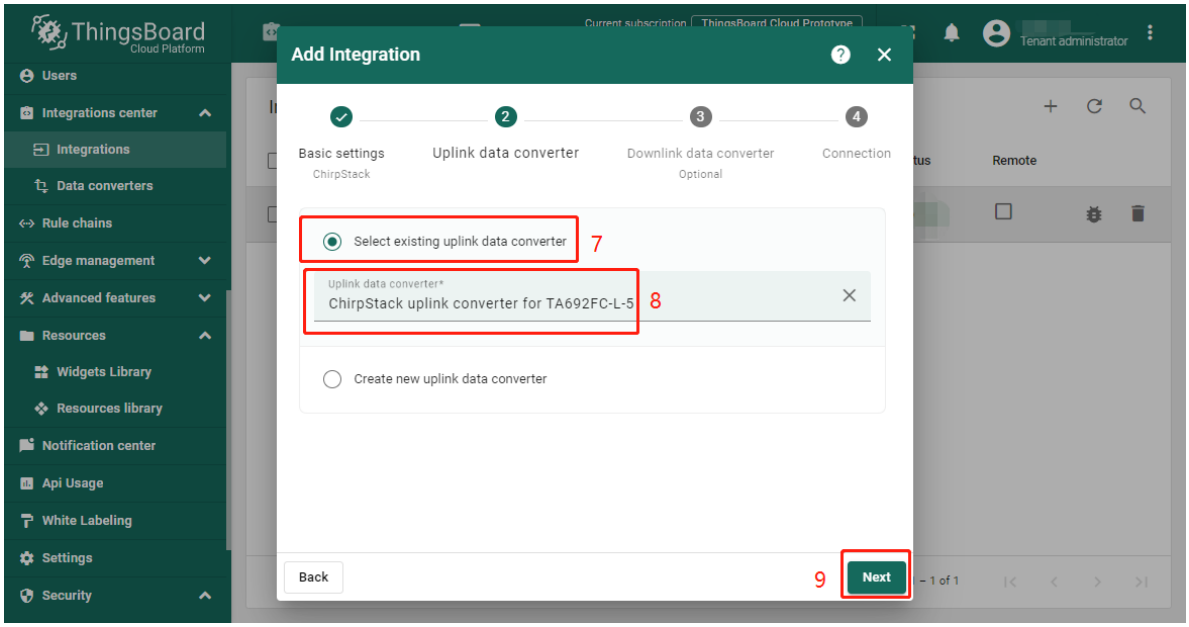
Step 3.3.2 Adding ChirpStack intergration on ThingsBoard

Now that the Uplink converter and Downlink converter have been created, and we have all required data, it is possible to create an integration.

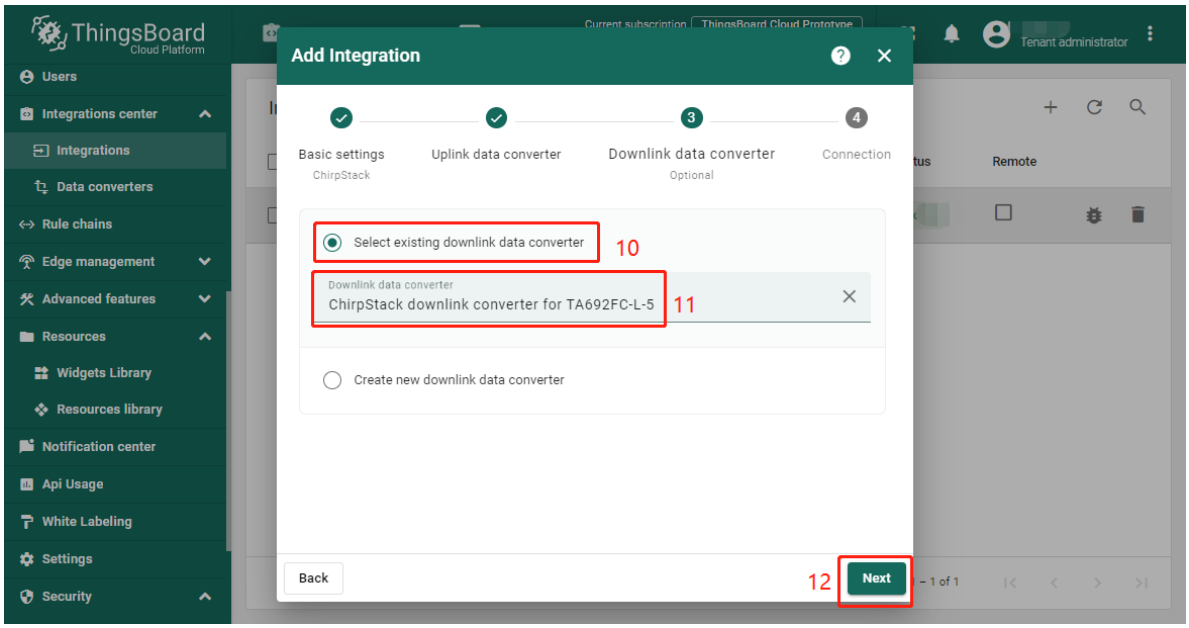
- **Integrations** –> select a integration type: **ChirpStack** –> input name: *TA692FC-L-5 ChirpStack integration* –> enable **integration**, **debug mode** and **allow create devices or assets** –> **Next**.



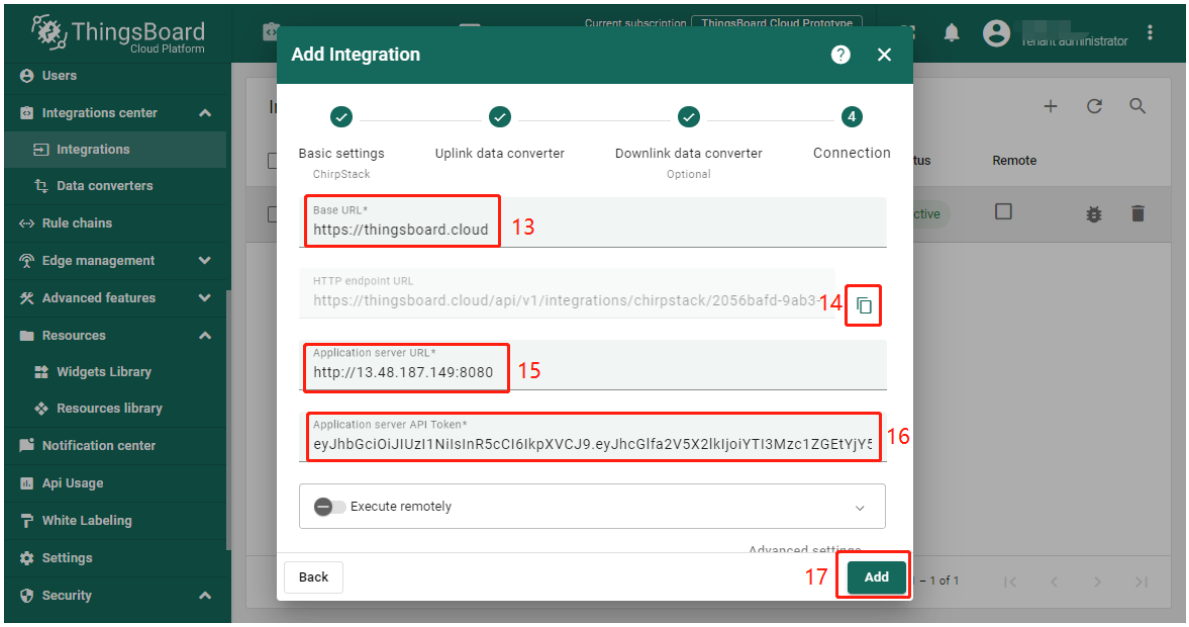
- Select Uplink data convert: *TA692FC-L-5 downlink from ChirpStack*.



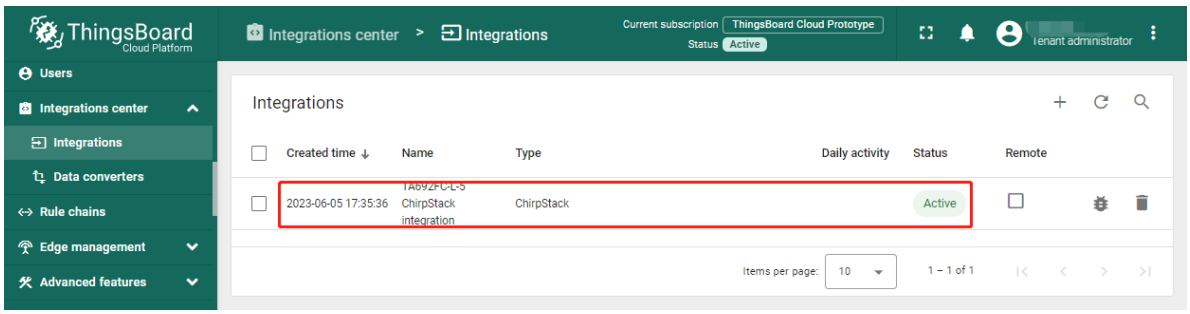
- Select Downlink data convert: *TA692FC-L-5 uplink from ChirpStack*.



- Check **Base URL** –> copy **HTTP endpoint URL** –> paste your ChirpStack **Application server URL** –> paste your ChirpStack **Application server API Token**.



- Show it in the list of integrations.

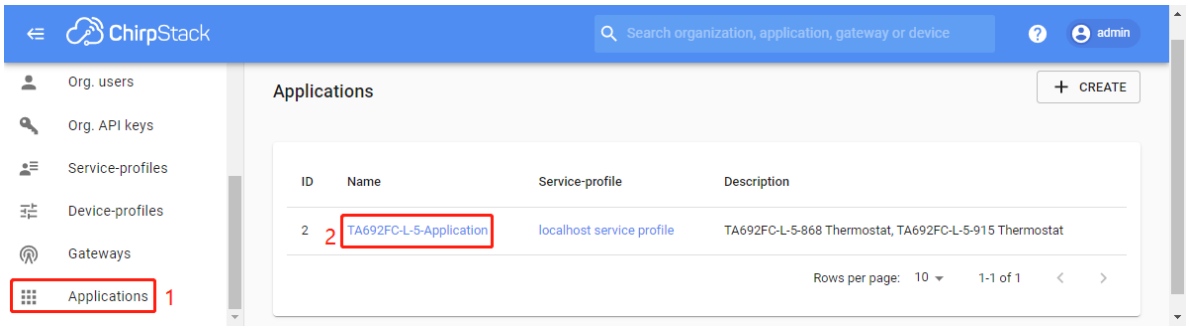


NOTE: It is recommended to enable Debug mode for debug purposes to see uplink/downlink events on integration.

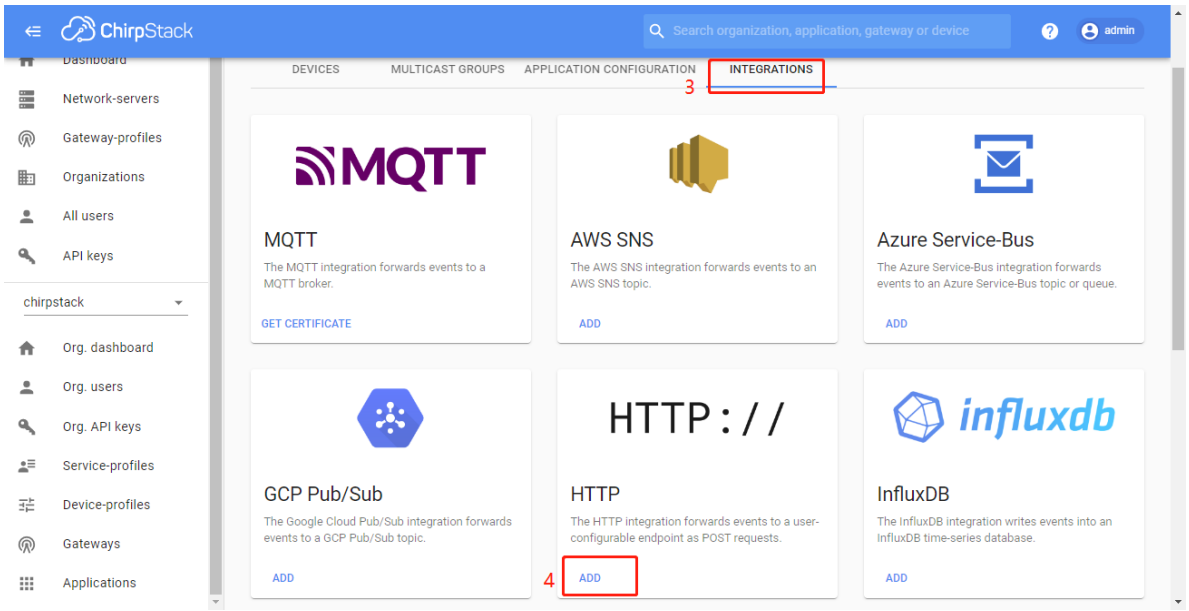
Step 3.3.3 Configure an Integration for your ChirpStack application

To create integration on ChirpStack Network server stack, we need to do the following steps:

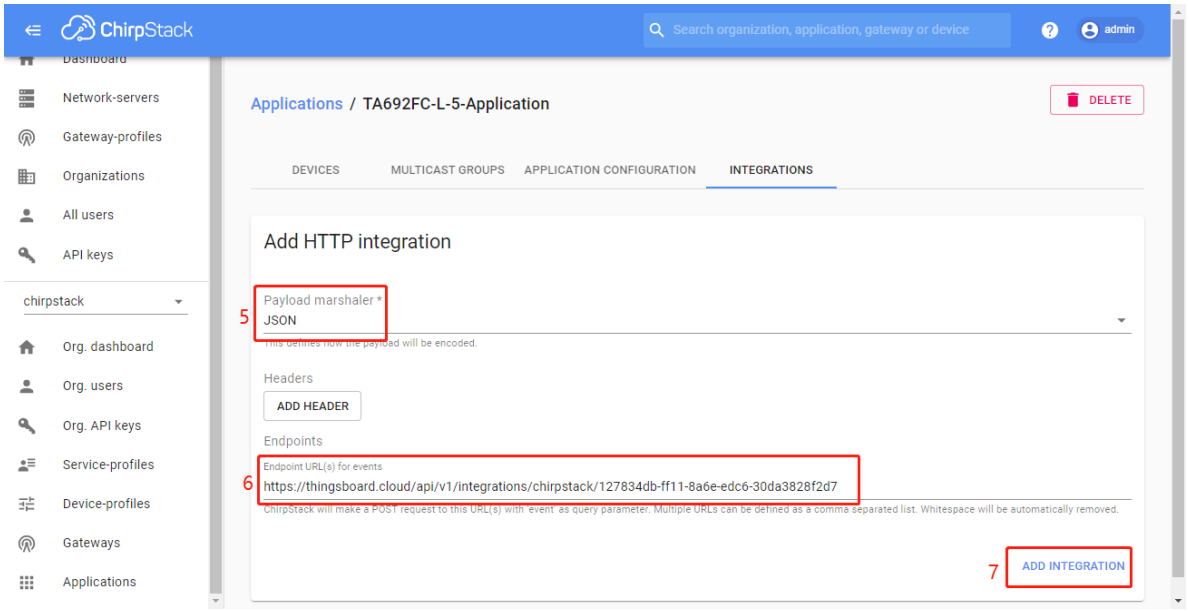
- Login to ChirpStack Network server stack user interface (Default login/password - **admin/admin**).
- We go to the tab **Applications** in the left menu and open our application (our application is named Application).



- Open the **Integrations** tab and create a **HTTP** integration.



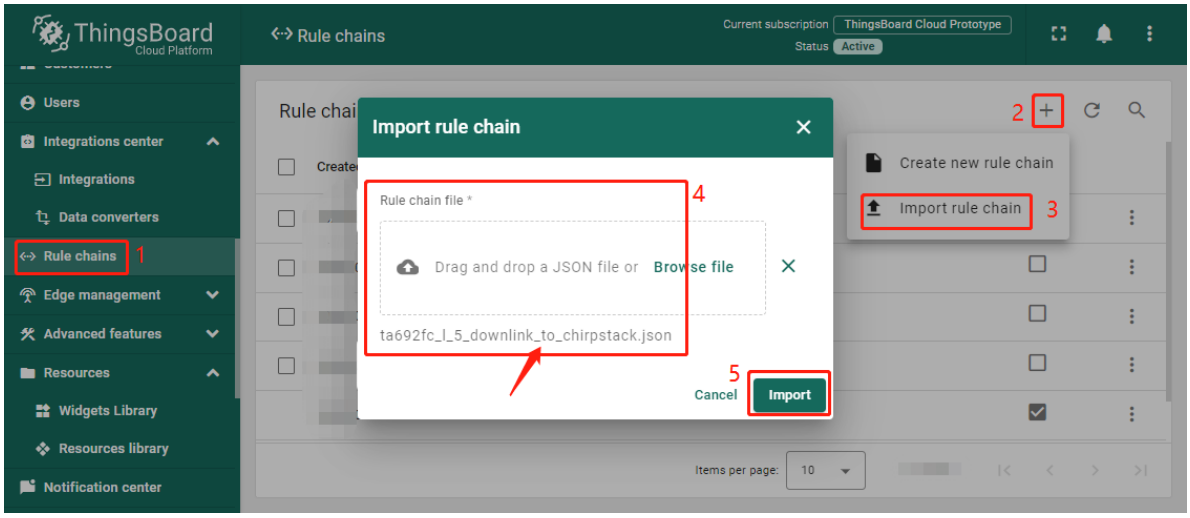
- Let`s go to the **Integrations** tab in ThingsBoard. Find your ChirpStack integration and click on it. There you can find the HTTP endpoint URL. Click on the icon to copy the url.
- Fill the fields with endpoint url from ThingsBoard integration:



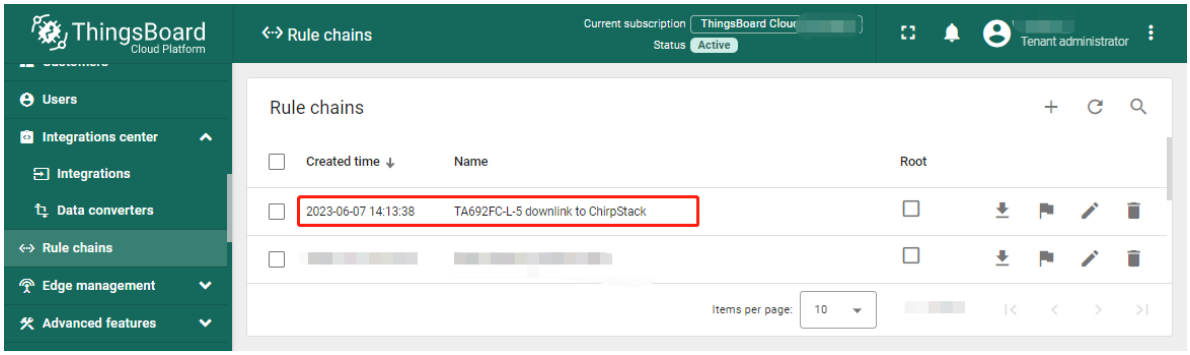
Step 3.3.4 Importing rule chain for Downlink

In order to send Downlink, we use the rule chain to process shared attribute update. To get **devEUI** from device we have to import rule-chain.

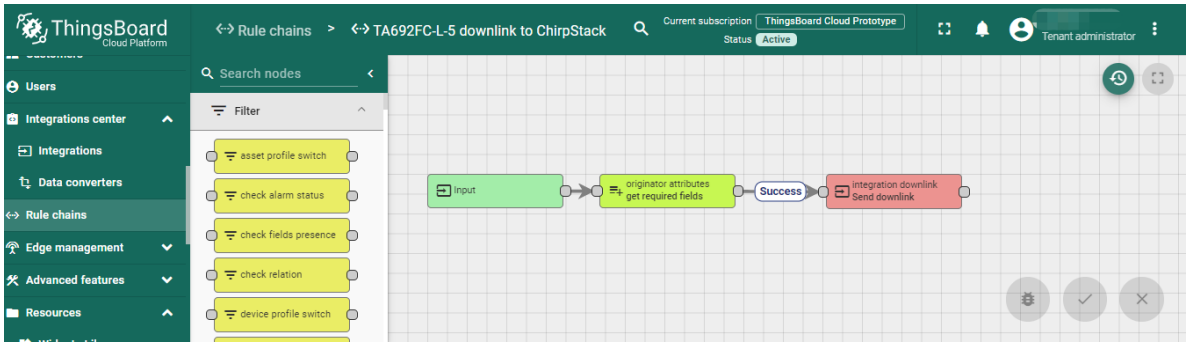
- Download `Rule chain: TA692FC-L-5 downlink to ChirpStack`.
- **Rule chains** –> **+** –> **Import rule chain** –> Popup dialog: Import rule chain –> Drag and drop the Rule chain file –> **Import**.



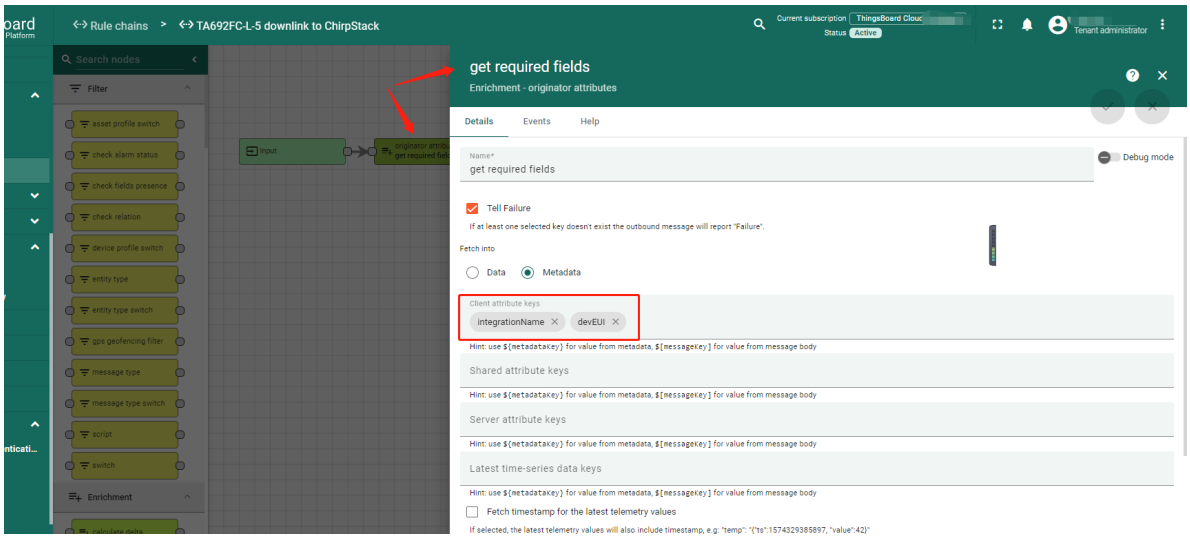
- Show it in the list of Rule chains –> Click on the row.



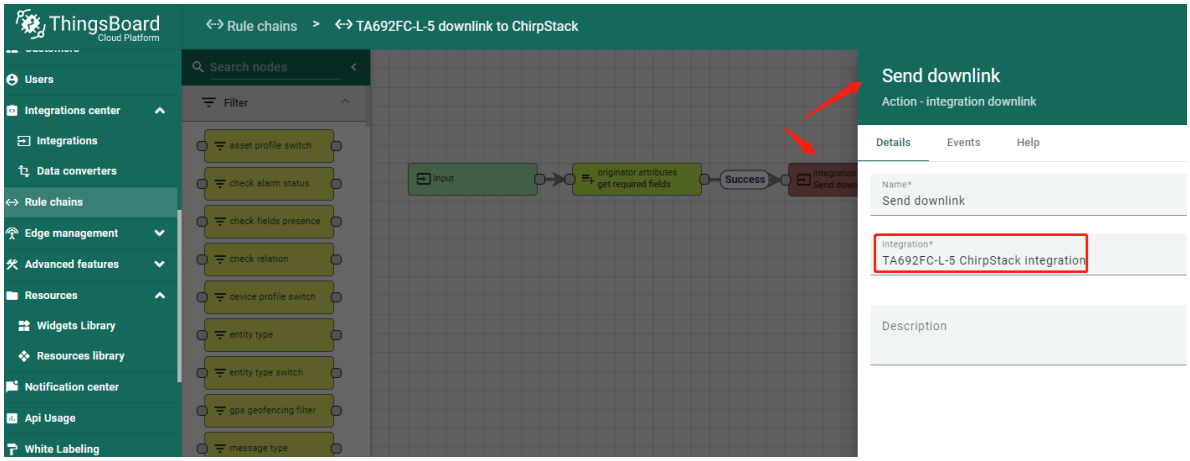
- Show the rule chain details.



- Check the node of **get required fields**.

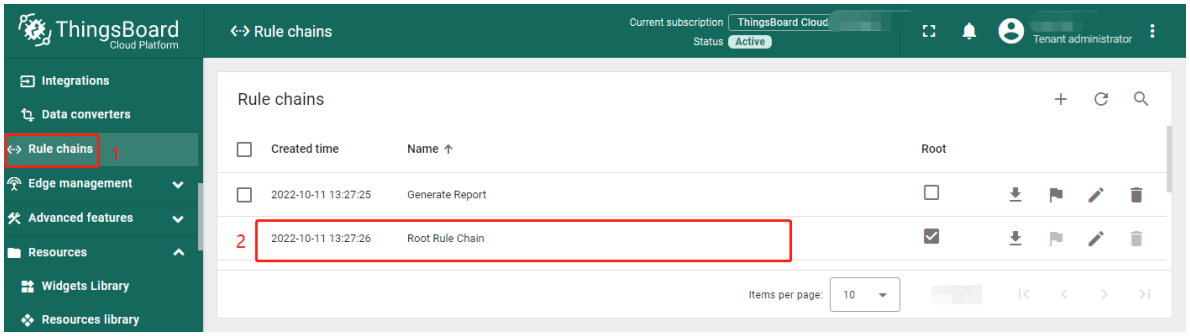


- Check the node of **Send downlink**.

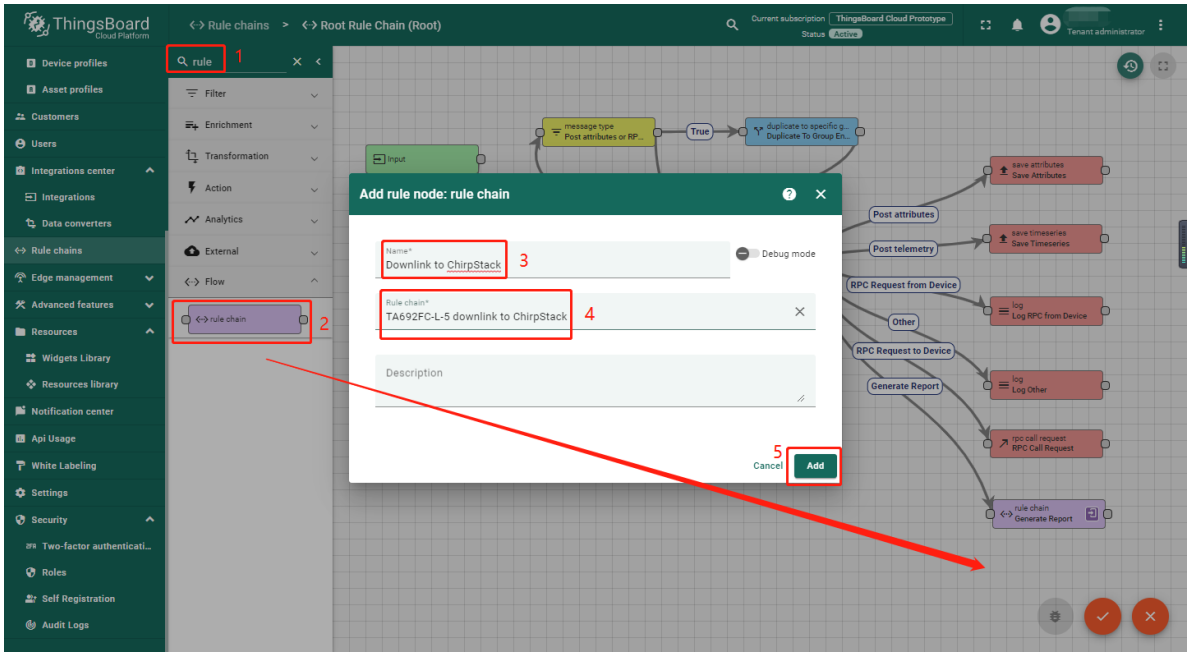


Step 3.3.5 Configure the root rule-chain

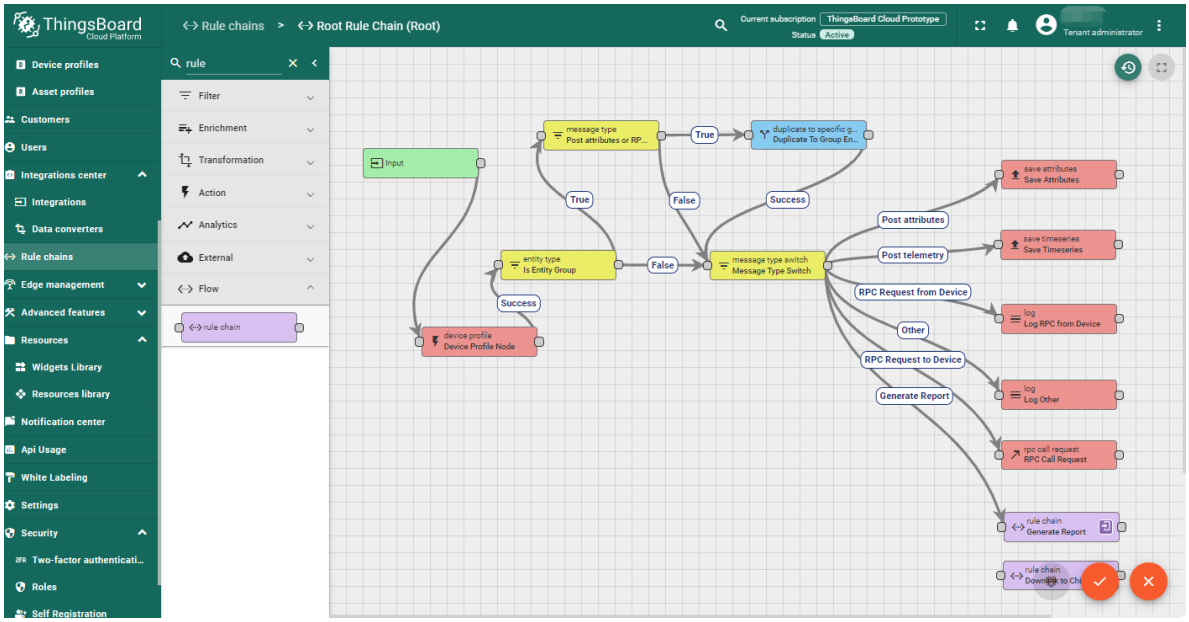
- **Rule chains** –> Click on the row.



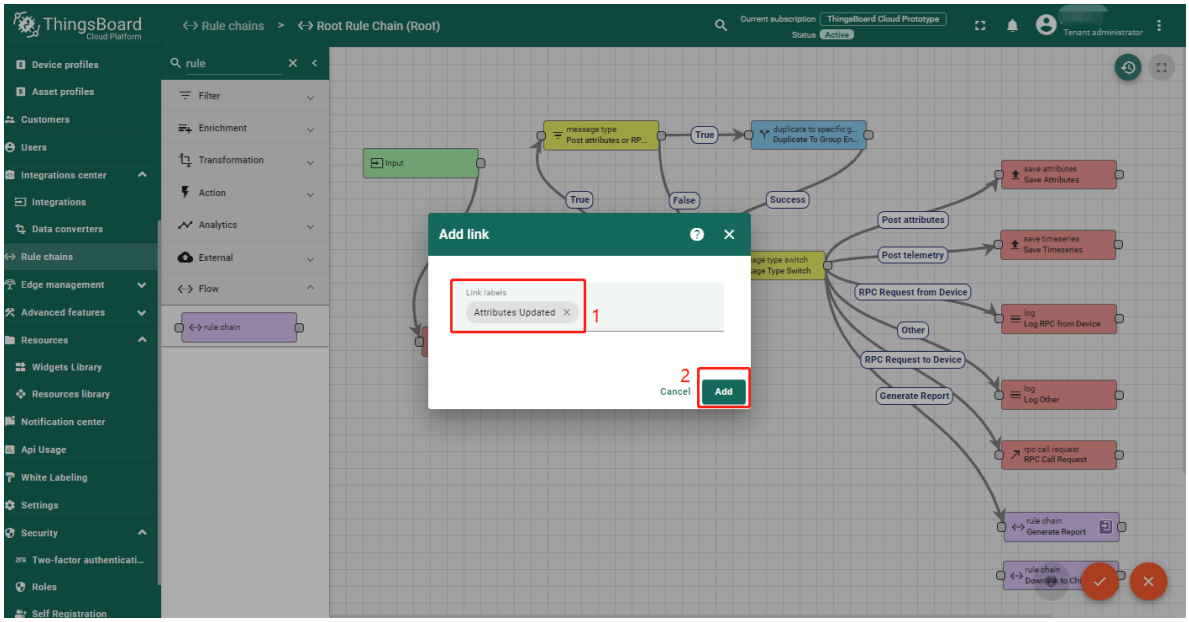
- Drag and drop the **Rule Chain** node –> Popup dialog: **Add rule node: rule chain** –> Input your node name, *eg: Downlin to ChirpStack* –> Select the Rule Chain, *eg: TA695FC-L-5 downlink to ChirpStack* –> **Add**.



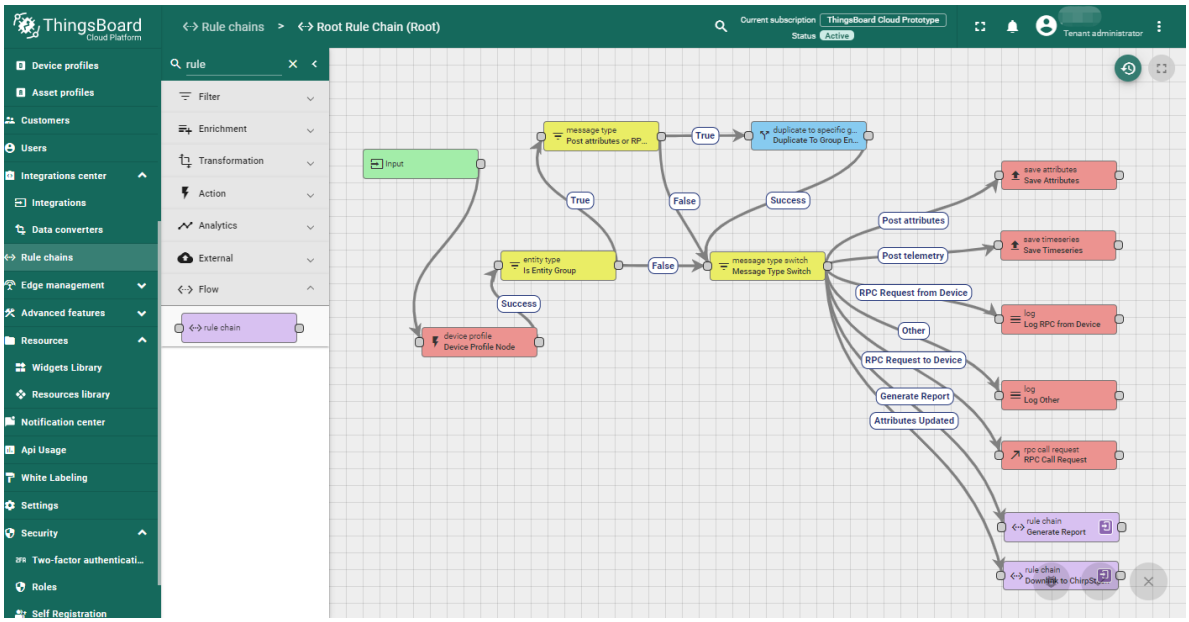
- Now, root rule chain looks like this:



- Add link from **Message Type Switch** to **Downlink to ChirpStack** –> Popup dialog: Select a link label: **Attributes updated** –> **Add**.

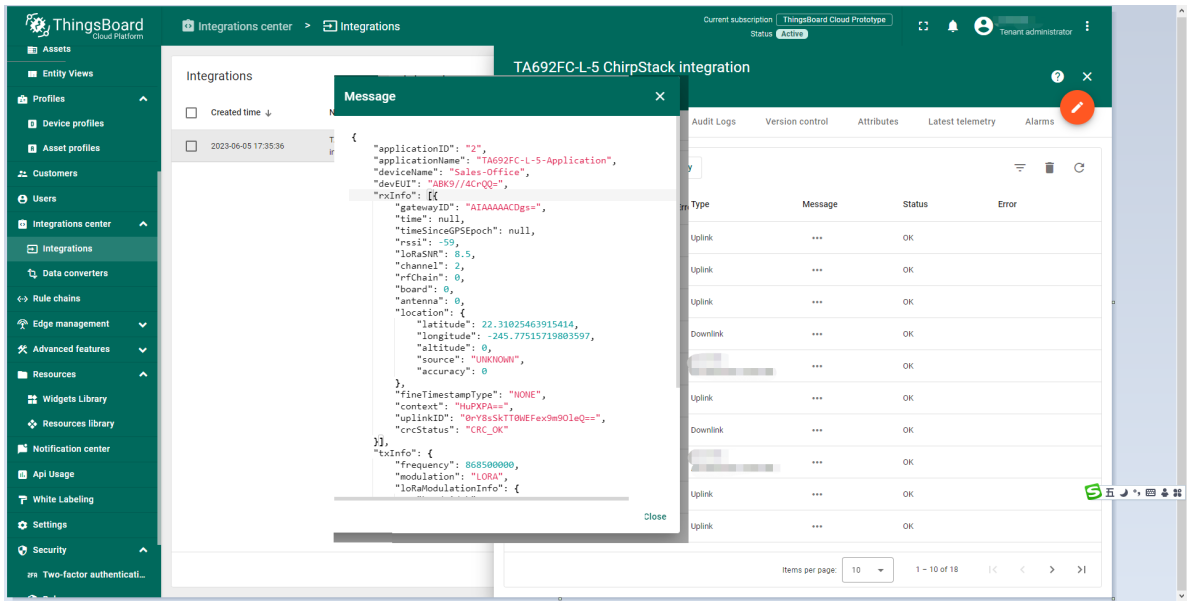


- Save the root rule chain.

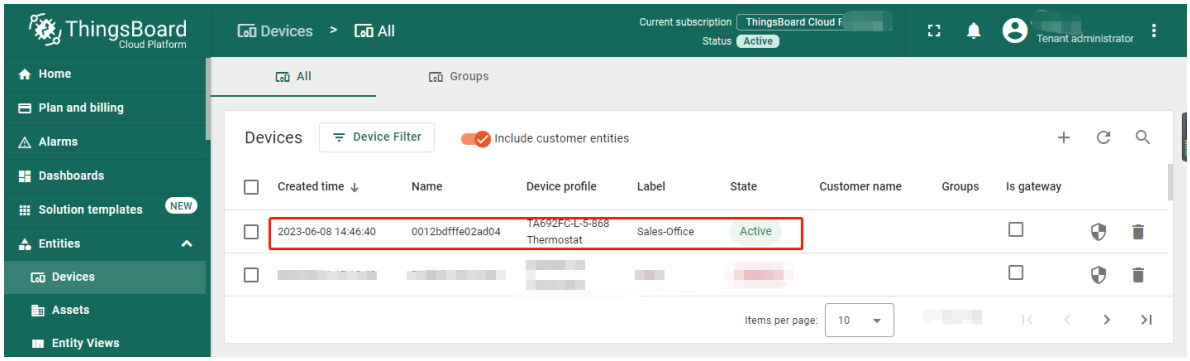


Step 3.4 Processing Uplink message

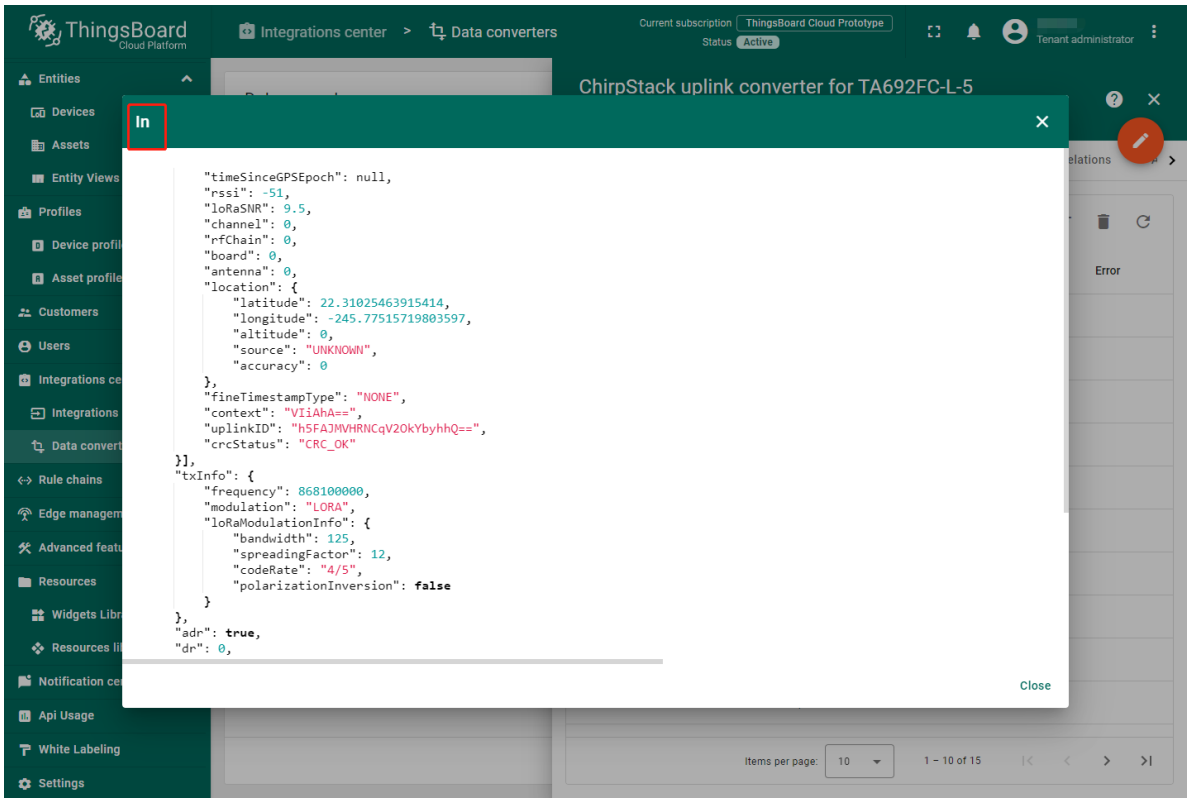
- When device sends uplink message, you will receive an uplink event on integration and data from the device.

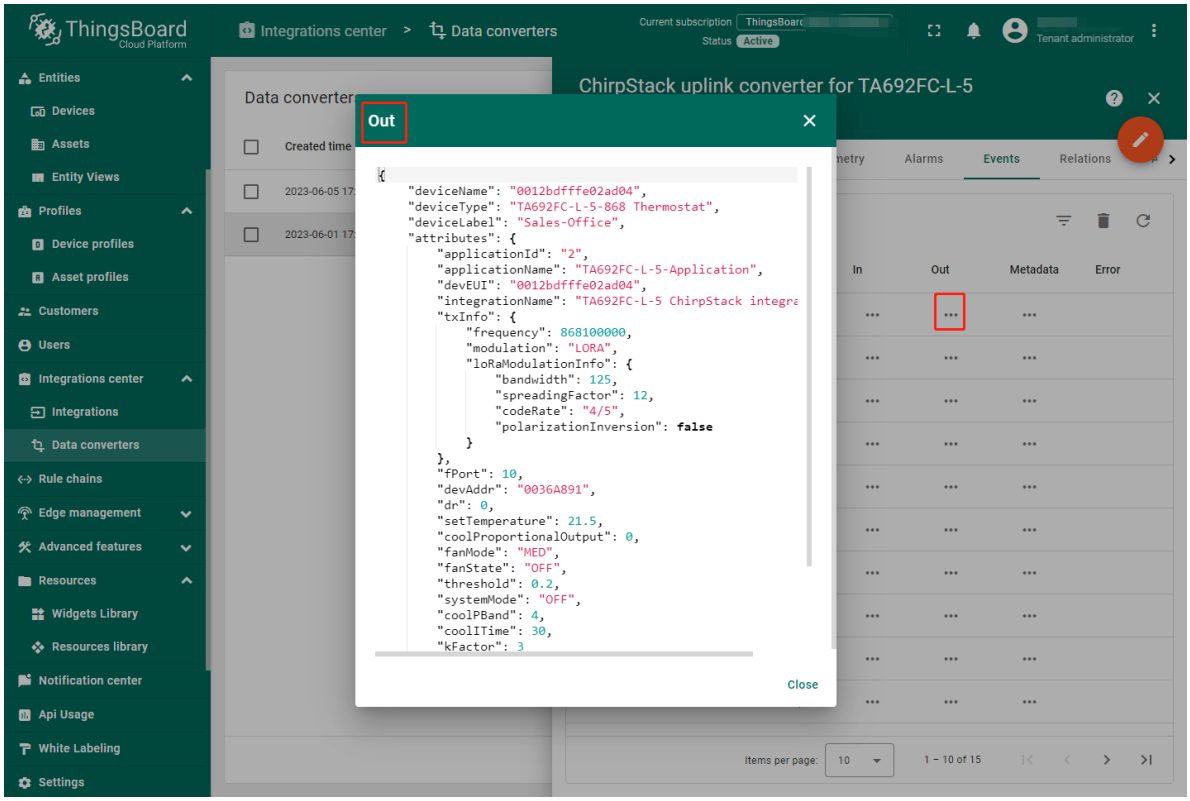


- The created device with data can be seen in the section **Device groups –> All**.



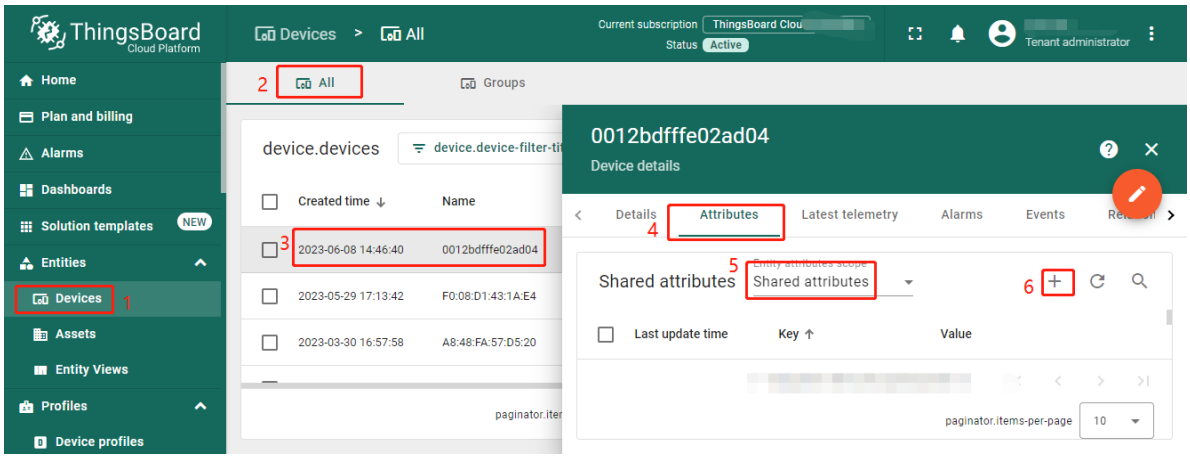
- Received data can be viewed in the Uplink converter. In the “In” and “Out” blocks of the Events tab:

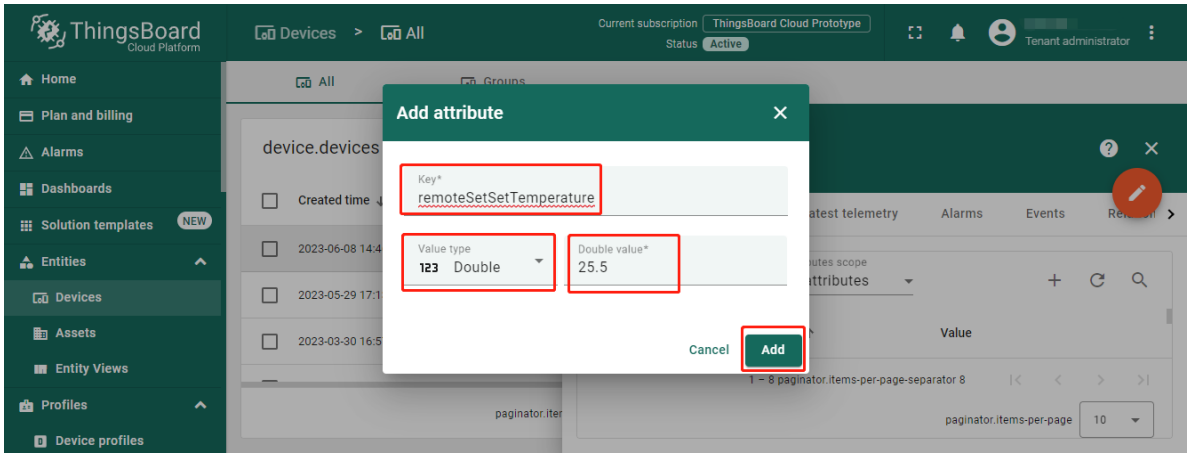




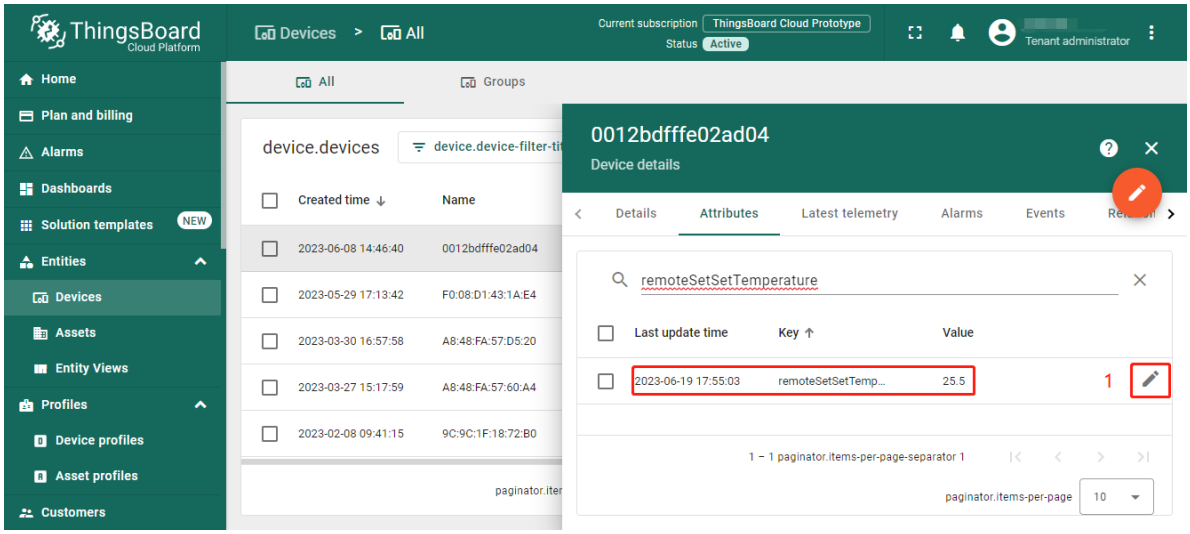
Step 3.5 Processing Downlink message

- We go to the **Device group** section in the **All** folder, to see this with an example. We add a **remoteSetSetTemperature** of the device in the **Shared attributes** (initialize the **remoteSetSetTemperature** to **25.5**).

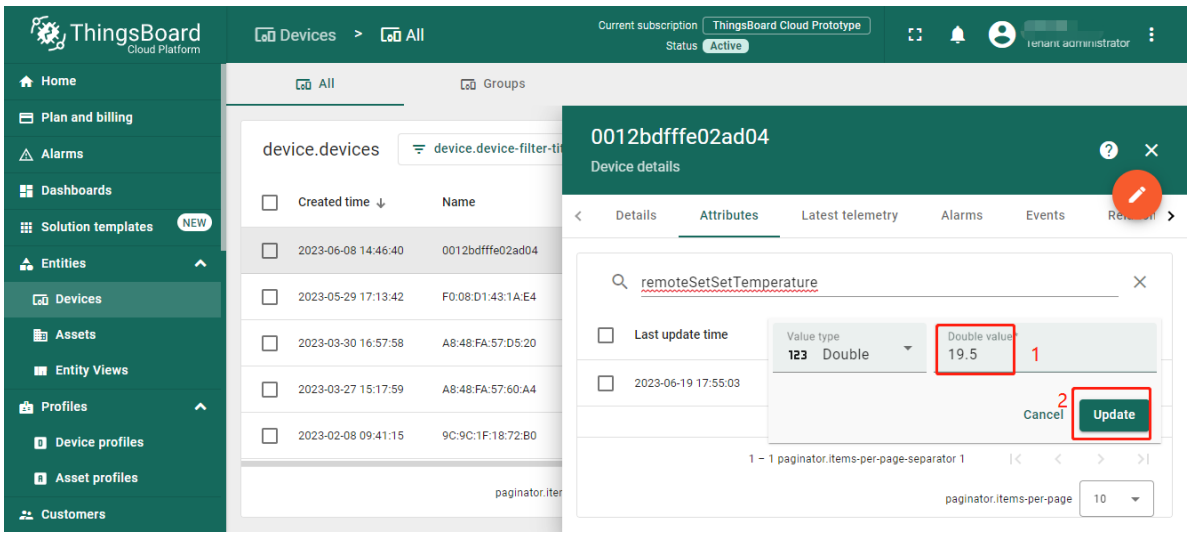




- Now, We have indicated the **remoteSetSetTemperature** of the device in the **Shared attributes**. Now we edit it by clicking on the “pencil” icon.

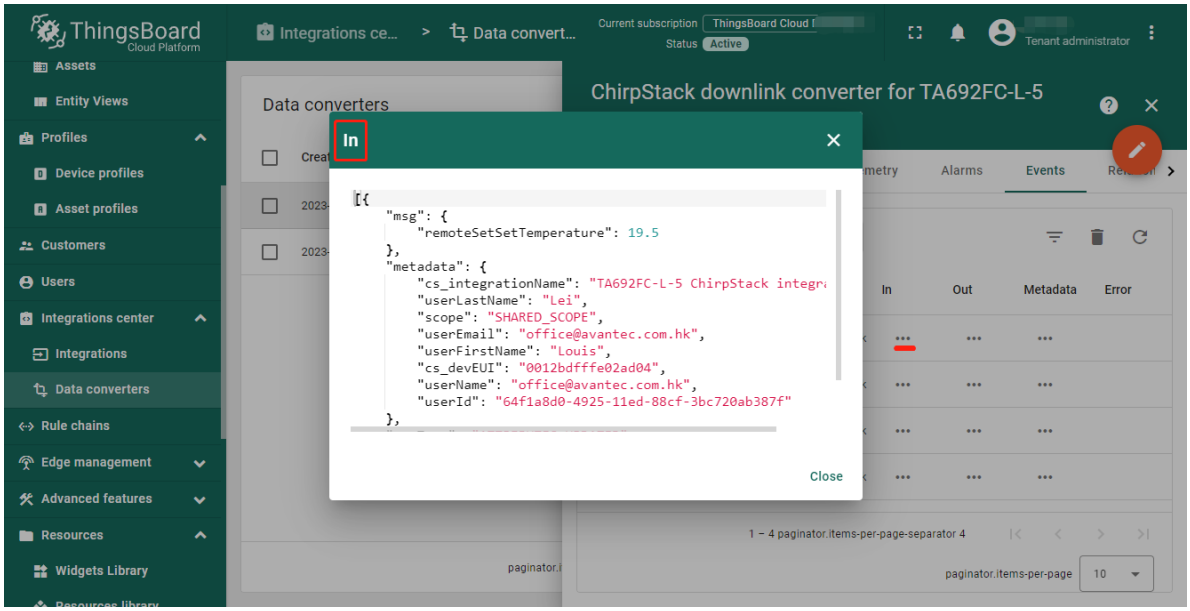


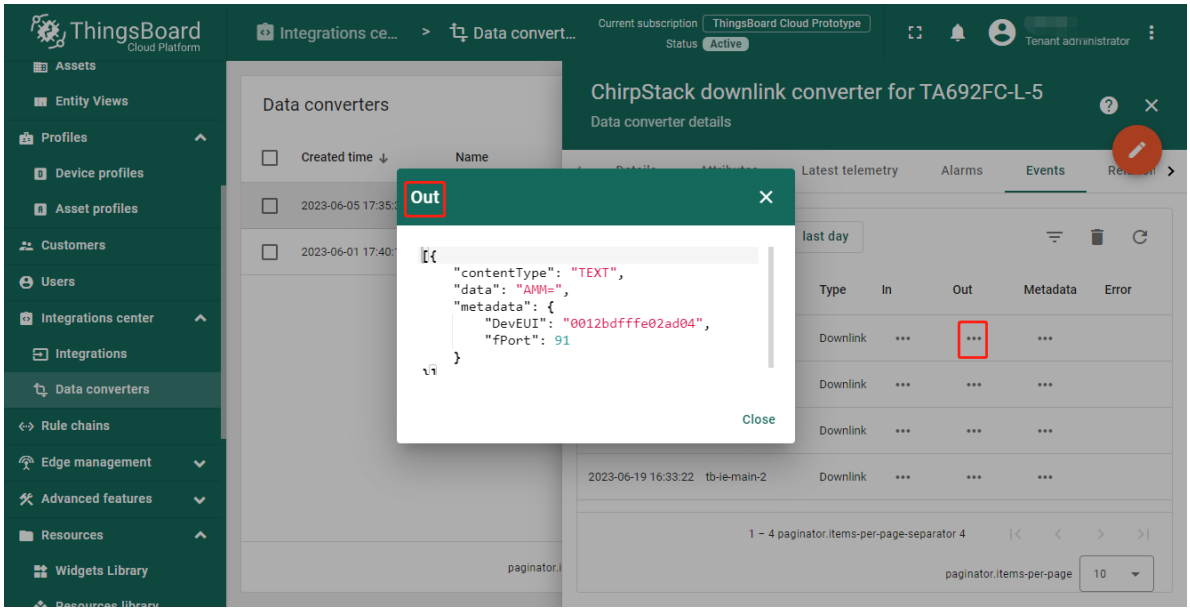
- Then we make changes to the attribute (change the **remoteSetSetTemperature** to **19.5**) and save the data.



- Received data and data that was sent can be viewed in the downlink converter. In the **In** block of the Events tab,

we see what data entered and the **Out** field displays messages to device:





Step 3.6 Visiual Data

Use the Dashboards to work with data. Dashboards are a modern format for collecting and visualizing data sets. Visibility of data presentation is achieved through a variety of widgets.

1. *Update Avantec Widgets*.
2. *Import TA692FC-L-5 Detail Dashboard*.
3. *Import TA692FC-L-5 List Dashboard*.
4. *Modify TA692FC-L-5-868 Thermostat device profile's mobile dashboard*.

For more information about the dashboard, please refer to *here*.

6.3 MultiTech Conduit® MTCAP-868-041A

6.3.1 MTCAP Series

Refer to MultiTech Conduit® AP Access Point for LoRa® Technology (MTCAP Series).

The MultiTech Conduit® AP conveniently provides deep in-building connectivity and improved performance for network operators and enterprises connecting thousands of IoT assets by harnessing the power of the LoRaWAN® protocol.

Easy to deploy, the Conduit AP access point extends LoRa® connectivity in commercial buildings like hotels, convention centers, offices and retail facilities providing coverage in difficult to reach areas cell tower or rooftop deployments may not penetrate.

6.3.2 MTCAP-868-041A

Refer to:

- WebSite: MTCAP-868-041A
- Data Sheet: MultiTech Conduit® AP Access Point for LoRa® Technology (EU868)
- Quick Start Guide: Conduit AP Quick Start Guide
- Application Note: Configuring mDot with Conduit AP using LoRa
- Software Guide: mPowerTM Edge Intelligence Conduit AEP Software Guide

Ethernet Only mPower Programmable Access Point with external LoRa antenna and EU/UK Accessory Kit.

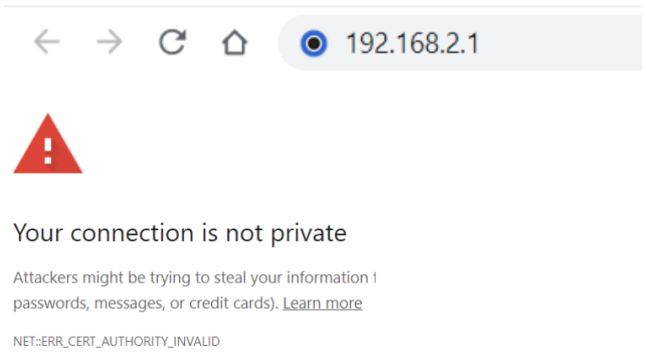
Accessory kit includes power supply and blade(s), LoRa antenna, Ethernet cable, mounting bracket and Quick Start Guide.

First-Time Setup of Gateway

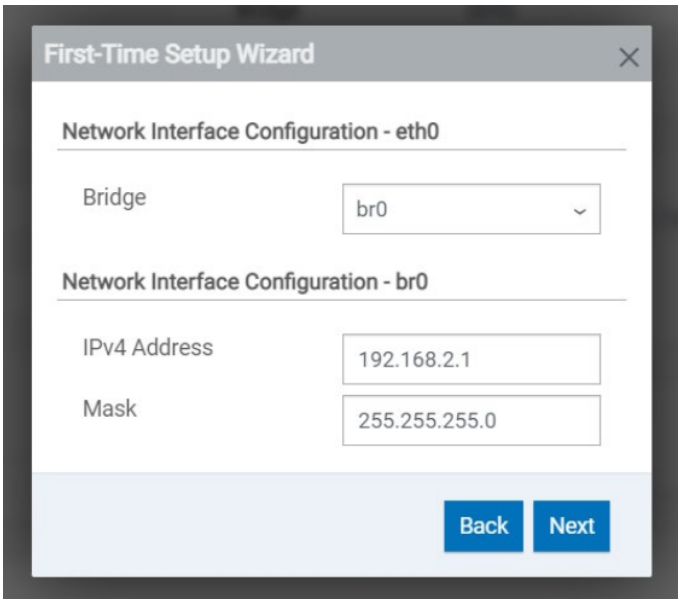
Note: This configuration works with the LoRa packet forwarder. You may choose to use Ethernet with LoRa or Cellular with LoRa (if your model has a cellular radio).

This setup wizard helps you configure the main features of your device for initial setup. In most cases, you can accept the provided defaults. See **First-Time Setup** in the software guide for more details.

1. Go to your browser's address line and enter the default IP address for the gateway to access the UI: 192.168.2.1. Most browsers display a warning about HTTP addresses being unsafe. Click on **Advanced** and continue to 192.168.2.1.

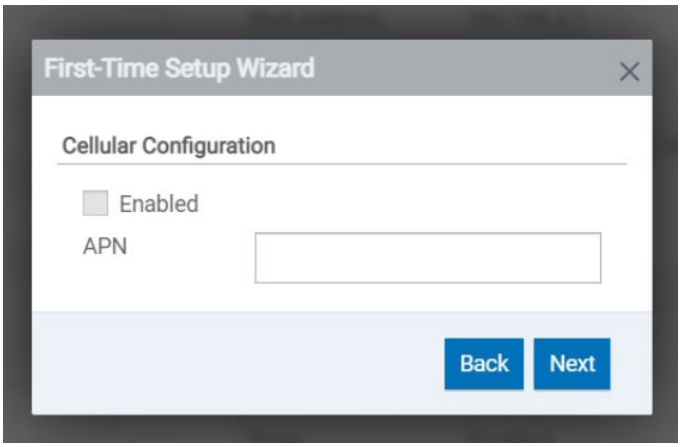


2. Upon power up for the first time, the device will be in commissioning mode. The system requires you to set up an administrative user. Enter your desired username and click **OK**.
3. Enter a desired password for the administrative user and click **OK**. This password must be of sufficient length and strength (with a mix of character classes such as letters, numbers, and symbols). Enter the password again to confirm. Click **OK**.
4. The login page appears. Enter username and password.
5. **First-Time Setup Wizard** appears.
6. **For Call Home,**
    a. Accept all default settings (disabled).
    b. Click **Next**.
7. **Set the date, time, and time zone.**
    a. If the information is correct, accept the default values.
    b. Otherwise, update **Date**, **Time**, and/or **Time Zone**.
    c. Click **Next**.
8. **Configure LAN network interfaces Eth0 and Br0.**
    a. Accept all default settings - **eth0** assigned to the bridge **br0** (with DHCP set automatically). **NOTE**: You will need to make additional configuration changes for Ethernet under Network Interfaces after **First-Time Setup**. See *Using Ethernet with LoRa Packet Forwarder*.
    b. Click Next.



9. **Configure your device's Cellular connection.**
    a. If you have no cellular radio (Ethernet only) in your device or plan to use Ethernet with the LoRa packet forwarder, accept all defaults with **Enabled** deactivated (Cellular is disabled) and APN left blank.
    b. If you have a cellular radio model and plan to use **Cellular** with the LoRa packet forwarder, select **Enabled** (Cellular is enabled).
    c. If required by your network carrier, enter your **APN** (Some carrier networks may set it automatically via OTA registration. Leave it blank in that case).

d. Click **Next**.



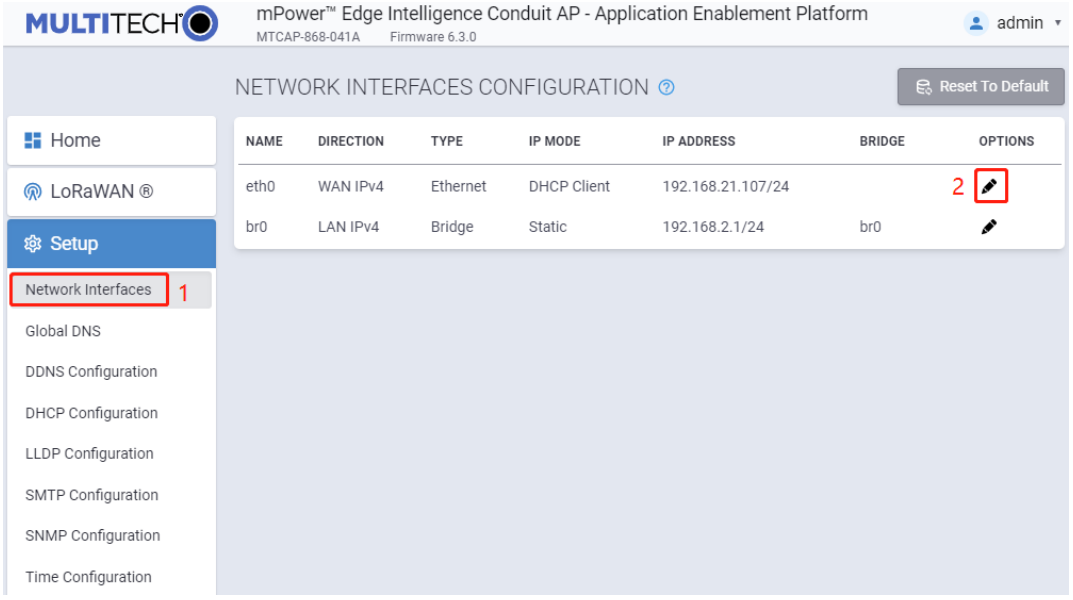
10. **For Cellular Authentication,**
    a. Accept all defaults (NONE).
    b. Click **Next**.
11. **For Remote Management,**
    a. Accept all defaults (disabled).
    b. Click **Next**.
12. **For HTTP/HTTPS Access,**
    a. Accept all defaults (enable HTTP to HTTPS via LAN).
    b. Click **Next**.
13. **For Bootloader Protection (setting a u-boot password),**
    a. Disable Bootloader Protection (defaults vary with firmware version).
    b. Click **Finish**.
14. To save your changes, click **Save and Apply**.

Configuring LoRa Packet Forwarder

Using Ethernet with LoRa Packet Forwarder

If you are planning to use Ethernet with the LoRa Packet Forwarder, then you must make this configuration change below before configuring and running Packet Forwarder. If you are using a Cellular connection with LoRa, you can skip these steps.

1. Go to **Network Interfaces**. Click the pencil for the **eth0** interface.

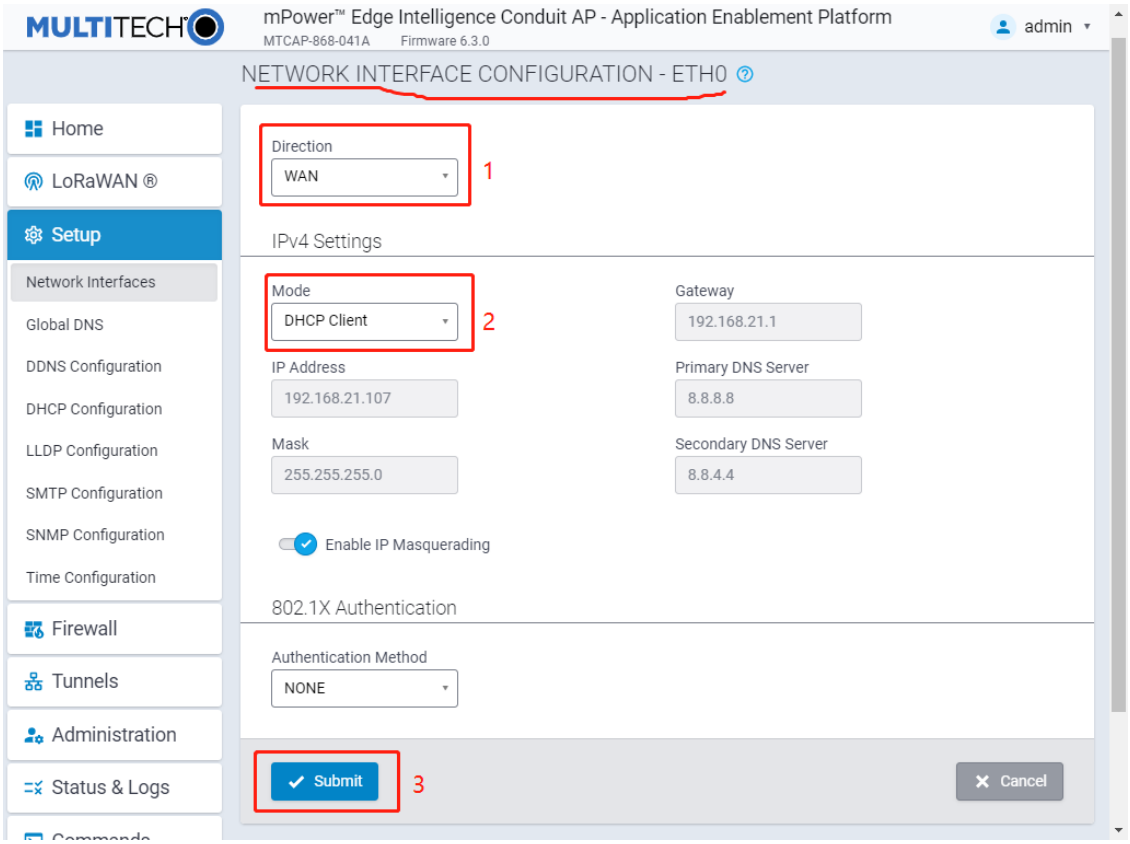


2. **Under Network Interface ETH0,**

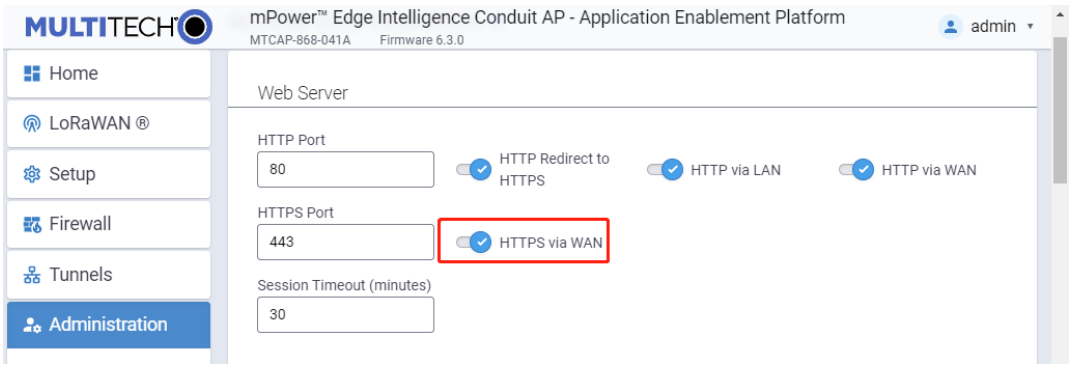
   a. change **Direction** to **WAN**.

   b. Under **Mode**, select **DHCP Client**.

   c. Click **Submit**.



3. Go to **Administration** > **Access Configuration** > **HTTPS**, Enable HTTPS via WAN, then click **Submit**.

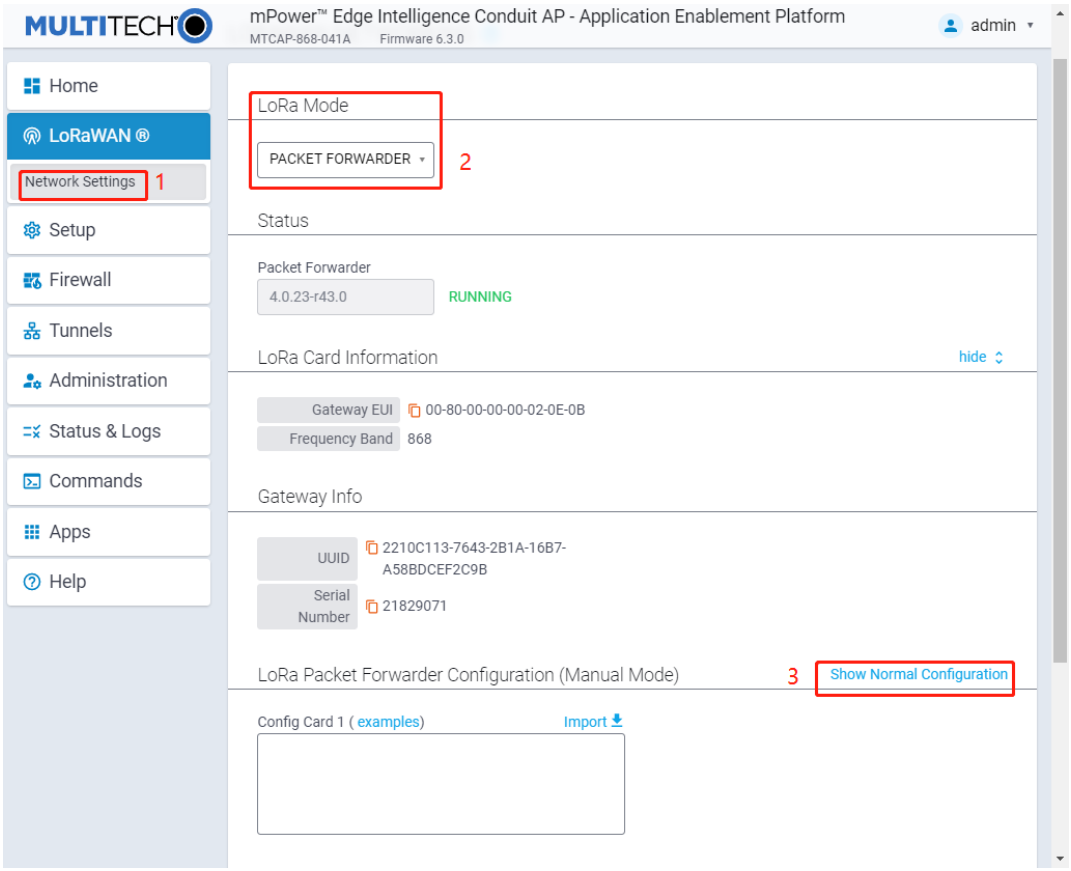


4. Click Save and Apply.

Configuring the Gateway

To activate **LoRa Packet Forwarder** Mode on your device:

1. For **LoRaWAN > Network Settings > LoRa Mode**, select **PACKET FORWARDER** under **Mode**. If **Manual Configuration** is showing, click **Normal Configuration** to switch.



2. **For LoRaWAN > Network Settings > LoRa Packet Forwarder Configuration,**

   a. You should select the network to use from the drop-down under **Network**: **Manual**, **Radio Bridge ChirpStack**, **The Things Network**, **Senet**, or **Loriot**. In this case, select **Manual**.

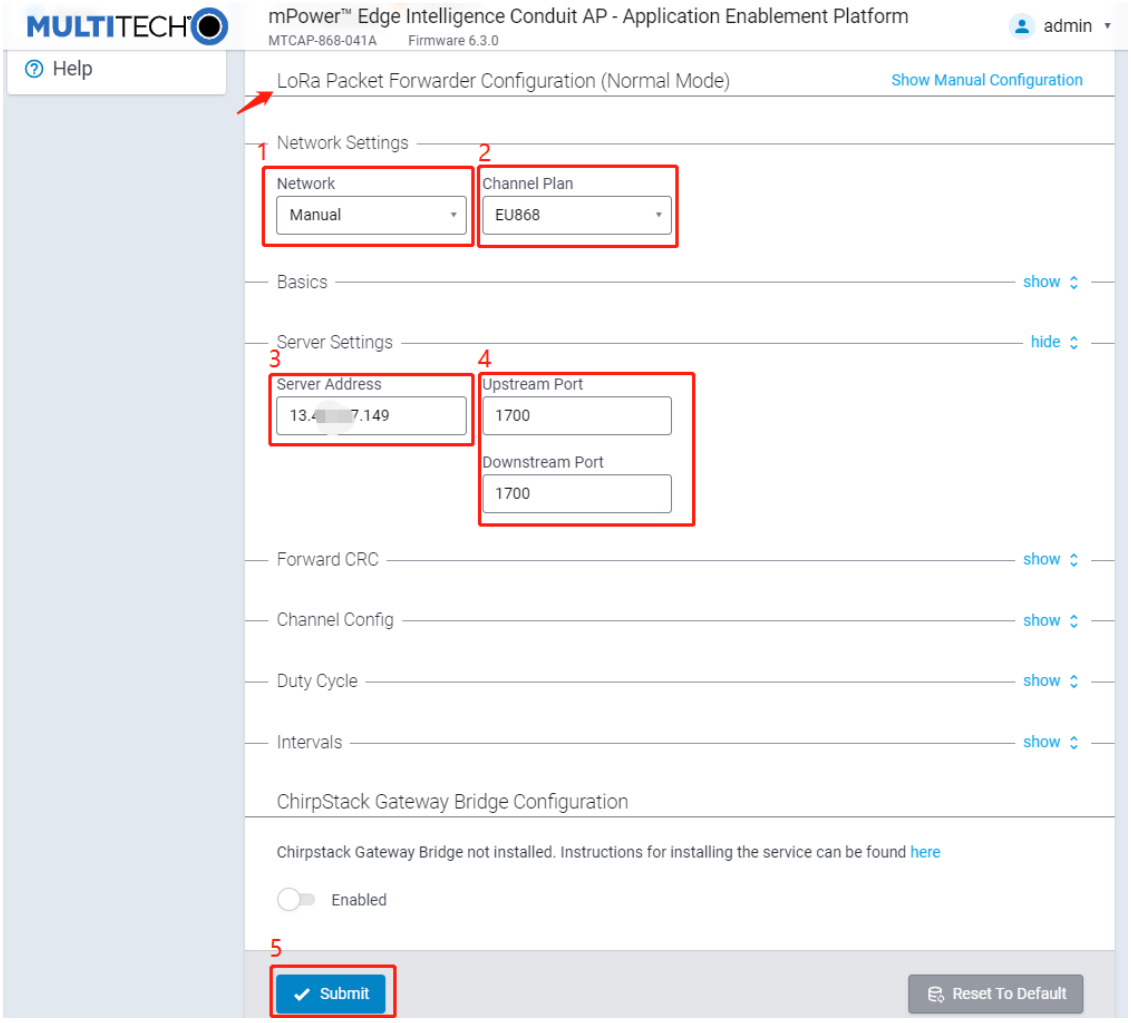
   b. Select the appropriate **Channel Plan** for the Packet Forwarder. Choose from the drop-down menu:

US915: 915, **AU915: 915**, **AS923-1: 915**, **AS923-2: 915**, **AS923-3: 915**, **AS923-4: 915**, **KR920: 915**, **EU868: 868**, **IN865: 868**, **RU864: 868**, or **ISM2400: 2400**. In this case, select **EU868**.

c. Type your LoRaWAN Network **Server address** - your ChirpStack IP.

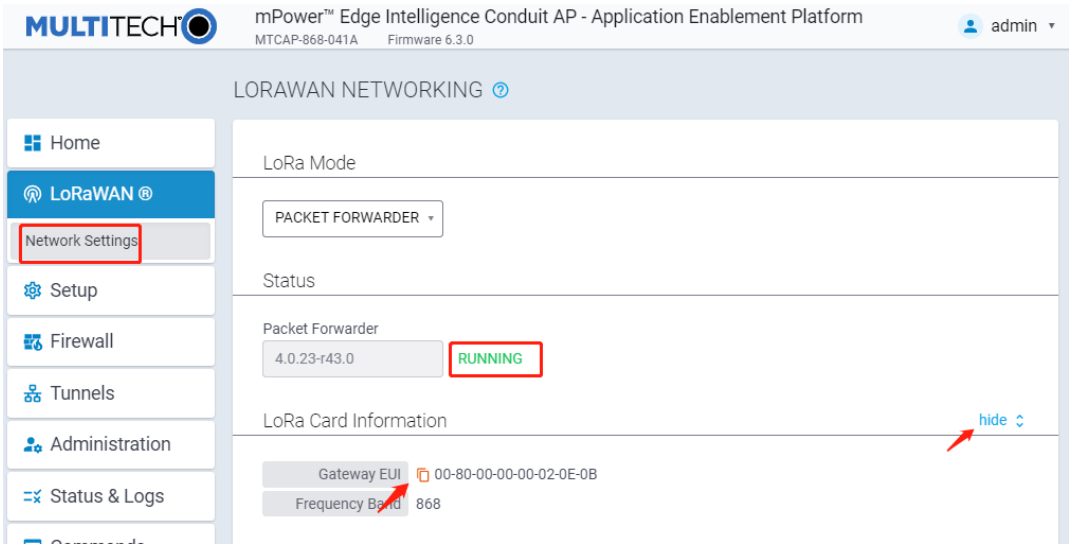
d. Type **upstream port** & **downstream port**: 1700.

e. Click **Submit**.



3. Then, click **Save and Apply**.

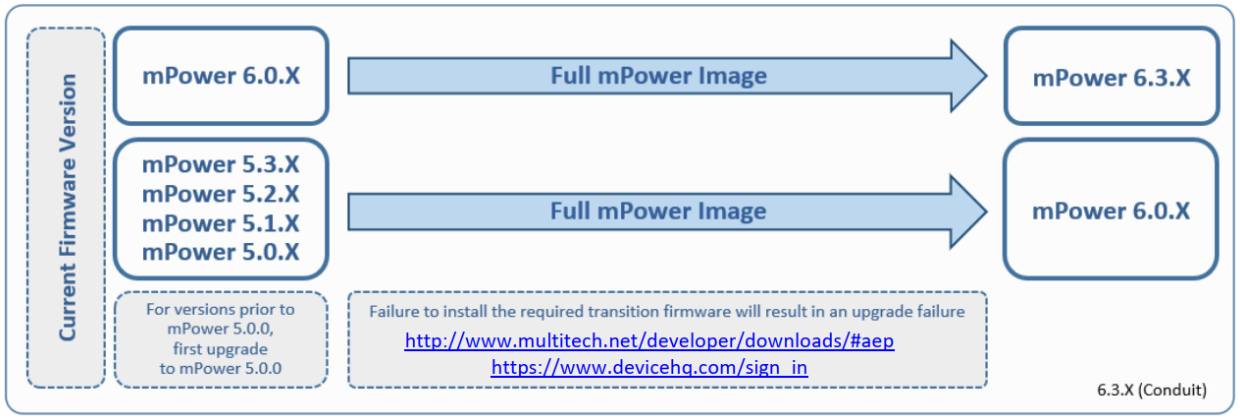
4. Confirm that the Packet Forwarder is now running under **Status**. Show the **LoRa Card Information** and copy the **Gateway EUI** (save for later).



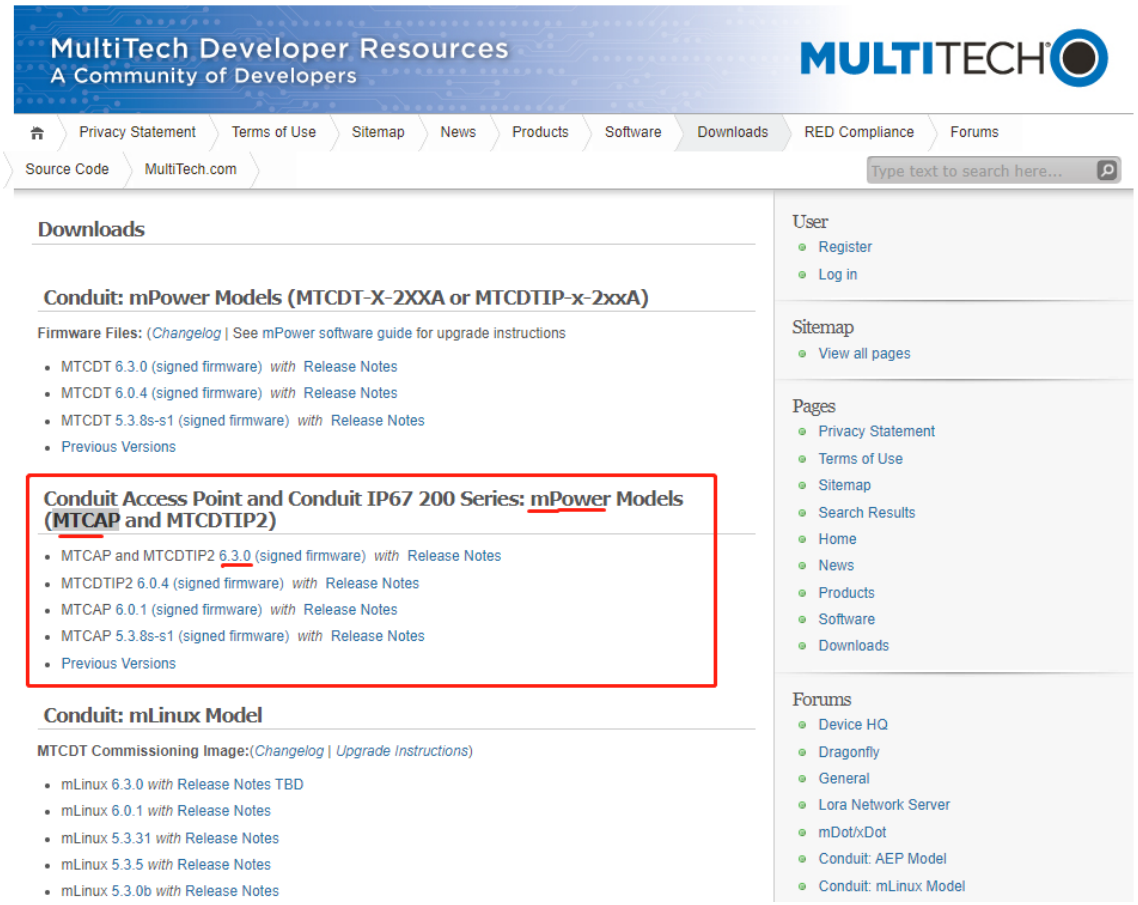
5. Make sure to properly add your gateway and any end devices to the network based on their specific system and instructions. For this example, we will configure the gateway and end device using **Manual**.

Optional: Firmware Upgrade

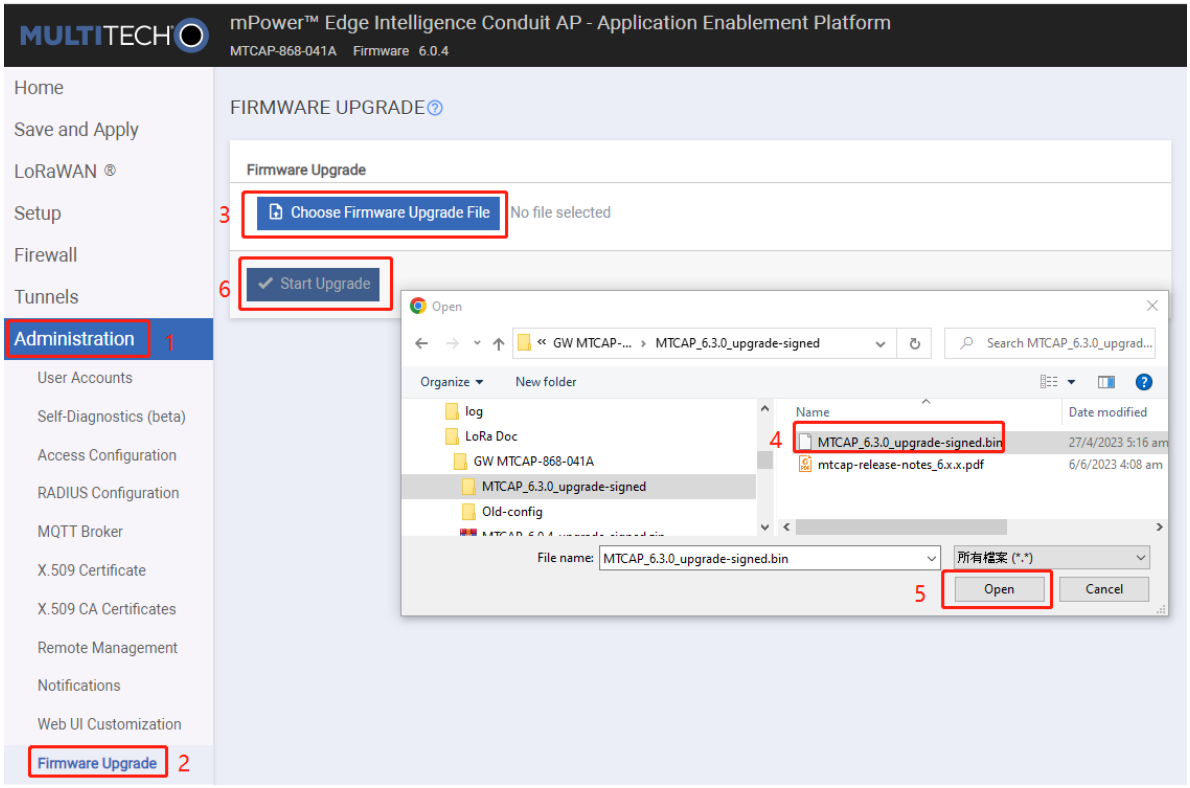
Tip: To install mPower 6.3.0, the Conduit gateway must be upgraded to mPower 6.0.0 or higher. Customers that are running earlier versions of mPower should use the following upgrade process.



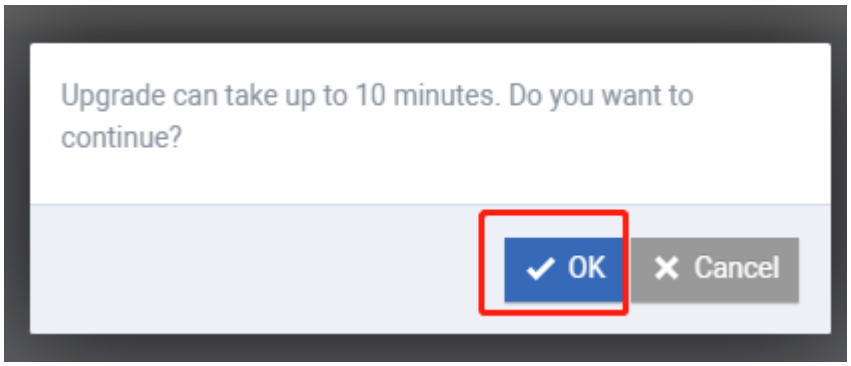
- Download a new firmware form here.



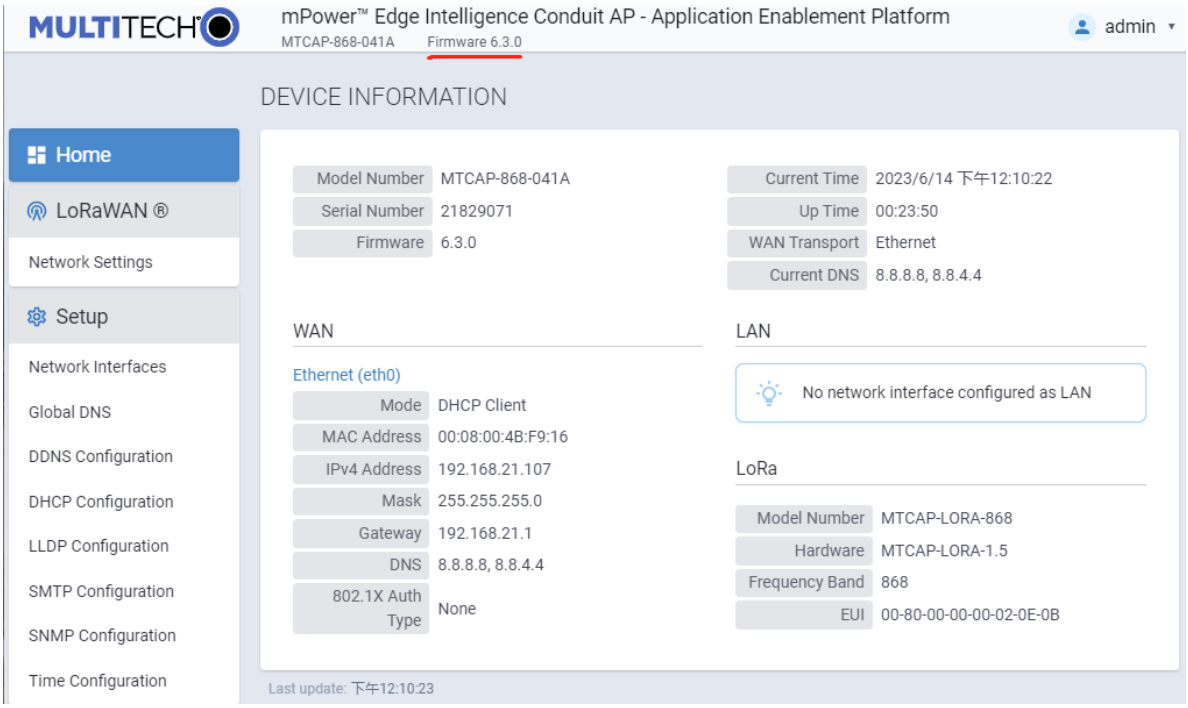
- Updrade: For **Administartion > Firmware Upgrade > Choose Firmware Upgrade File**, select *a new firmware* **> Open > Start Upgrade >**



- Click **OK** in a popup dialog.



- Wait a few minutes. After the firmware upgrade is successful, MTCAP will automatically restart. If the upgrade is successful, you will see the new version number after logging in.



6.4 ChirpStack v3

6.4.1 Quick start Amazon AWS

Refer to Quickstart Debian or Ubuntu.

This section describes the steps needed to setup the ChirpStack stack including all requirements on a single machine. It has been tested on the following distributions (but with non or minimal modifications it will work on other versions too):

- Ubuntu 20.04 LTS

Please refer to the other install pages for more generic installation instructions.

Assumptions

Many configurations of these packages are possible. Dependent software packages could be installed on any number of remote servers, and the packages themselves could be on their own servers. However, in order to simplify the initial installation, we will assume the following deployment architecture:

- All ChirpStack components and their dependencies will be installed on a single server instance.
- The ChirpStack Gateway Bridge component will be installed on the server, but can also be installed on the gateway itself.
- No firewall rules are setup.

Of course, optimizations may need to be made depending on the performance of your systems. You may opt to move the PostgreSQL database to another server. Or you may decide to put your MQTT broker on a different system, or even use a different server than the one recommended in this document. These and other installation changes are beyond the scope of this document. However, you should be able to find the information here that would make these changes relatively straight-forward.

Prerequisites

1. Launch an Amazon EC2 instance:

Item	Description
Software Image (AMI)	Ubuntu Server 20.04 LTS (HVM), SSD Volume Type, 64-bit (x86)
Virtual server type (instance type)	t3.micro, Family: t3, 2 vCPU, 1 GiB Memory, Current generation: true
Firewall (security group)	ssh; https; 8080, tcp, http; 1700, udp, LoRaWAN uplink
Configure storage	1 x 8 GiB, Volume type: gp2, Root volume (Not encrypted)

2. Allocate Elastic IP address.
3. Associate Elastic IP address with the EC2 instance.

Install dependencies

- **MQTT broker** - A publish/subscribe protocol that allows users to publish information under topics that others can subscribe to. A popular implementation of the MQTT protocol is Mosquitto.
- **Redis** - An in-memory database used to store relatively transient data.
- **PostgreSQL** - The long-term storage database used by the open source packages.

Use the package manager apt to install these dependencies:

```
sudo apt update
sudo apt install mosquitto mosquitto-clients redis-server redis-tools postgresql
```

Setup PostgreSQL databases and users

To enter the command line utility for PostgreSQL:

```
sudo -u postgres psql
```

Inside this prompt, execute the following queries to set up the databases that are used by the ChirpStack stack components. It is recommended to change the usernames and passwords. Just remember to use these other values when updating the `chirpstack-network-server.toml` and `chirpstack-application-server.toml` configuration files. Since these two applications both use the same table to track database upgrades, they must have separate databases.

```
-- set up the users and the passwords
-- (note that it is important to use single quotes and a semicolon at the end!)
create role chirpstack_as with login password 'dbpassword';
create role chirpstack_ns with login password 'dbpassword';

-- create the database for the servers
create database chirpstack_as with owner chirpstack_as;
create database chirpstack_ns with owner chirpstack_ns;

-- change to the ChirpStack Application Server database
```

(continues on next page)

(continued from previous page)

```
\c chirpstack_as

-- enable the pq_trgm and hstore extensions
-- (this is needed to facilitate the search feature)
create extension pg_trgm;
-- (this is needed to store additional k/v meta-data)
create extension hstore;

-- exit psql
\q
```

Setup ChirpStack software repository

ChirpStack provides a repository that is compatible with the Ubuntu apt package system. First make sure that both `dirmngr` and `apt-transport-https` are installed:

```
sudo apt install apt-transport-https dirmngr
```

Set up the key for this new repository:

```
sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys 1CE2AFD36DBCCA00
```

Add the repository to the repository list by creating a new file:

```
sudo echo "deb https://artifacts.chirpstack.io/packages/3.x/deb stable main" | sudo tee /
↪etc/apt/sources.list.d/chirpstack.list
```

Update the apt package cache:

```
sudo apt update
```

Install ChirpStack Gateway Bridge

Note: If you intend to run the ChirpStack Gateway Bridge only on gateway(s) themselves, you can skip this step.

Install the package using `apt`:

```
sudo apt install chirpstack-gateway-bridge
```

log output:

```
-----------------------------------------------------------
The configuration file is located at:
/etc/chirpstack-gateway-bridge/chirpstack-gateway-bridge.toml

Some helpful commands for chirpstack-gateway-bridge:
Start:
$ sudo systemctl start chirpstack-gateway-bridge

Restart:
$ sudo systemctl restart chirpstack-gateway-bridge
```

(continues on next page)

(continued from previous page)

```
Stop:
$ sudo systemctl stop chirpstack-gateway-bridge

Display logs:
$ sudo journalctl -f -n 100 -u chirpstack-gateway-bridge
-----------------------------------------------------------
```

The configuration file is located at `/etc/chirpstack-gateway-bridge/chirpstack-gateway-bridge.toml`. The default configuration is sufficient for this guide.

Start the ChirpStack Gateway Bridge service:

```
# start chirpstack-gateway-bridge
sudo systemctl start chirpstack-gateway-bridge

# start chirpstack-gateway-bridge on boot
sudo systemctl enable chirpstack-gateway-bridge
```

Install ChirpStack Network Server

Install the package using apt:

```
sudo apt install chirpstack-network-server
```

log output:

```
-----------------------------------------------------
The configuration file is located at:
/etc/chirpstack-network-server/chirpstack-network-server.toml

Some helpful commands for chirpstack-network-server:
Start:
$ sudo systemctl start chirpstack-network-server

Restart:
$ sudo systemctl restart chirpstack-network-server

Stop:
$ sudo systemctl stop chirpstack-network-server

Display logs:
$ sudo journalctl -f -n 100 -u chirpstack-network-server
-----------------------------------------------------
```

The configuration file is located at `/etc/chirpstack-network-server/chirpstack-network-server.toml` and must be updated to match the database and band configuration. See below two examples for the **EU868** and **US915** band. For more information about all the ChirpStack Network Server configuration options, see here or ChirpStack Network Server configuration.

After updating the configuration, you need to restart the ChirpStack Network Server and validate that there are no errors.

Start the ChirpStack Network Server service:

```
# start chirpstack-network-server
sudo systemctl start chirpstack-network-server

# start chirpstack-network-server on boot
sudo systemctl enable chirpstack-network-server
```

Print the ChirpStack Network Server log-output:

```
sudo journalctl -f -n 100 -u chirpstack-network-server
```

EU868 configuration example

```
[general]
log_level=4

[postgresql]
dsn="postgres://chirpstack_ns:dbpassword@localhost/chirpstack_ns?sslmode=disable"

[network_server]
net_id="000000"

  [network_server.band]
  # name="EU_863_870"
  name="EU868"

  [[network_server.network_settings.extra_channels]]
  frequency=867100000
  min_dr=0
  max_dr=5

  [[network_server.network_settings.extra_channels]]
  frequency=867300000
  min_dr=0
  max_dr=5

  [[network_server.network_settings.extra_channels]]
  frequency=867500000
  min_dr=0
  max_dr=5

  [[network_server.network_settings.extra_channels]]
  frequency=867700000
  min_dr=0
  max_dr=5

  [[network_server.network_settings.extra_channels]]
  frequency=867900000
  min_dr=0
  max_dr=5
```

US915 configuration example sub-band 1 (125kHz channels 0 - 7 & 500kHz channel 64)

```
[general]
log_level=4

[postgresql]
dsn="postgres://chirpstack_ns:dbpassword@localhost/chirpstack_ns?sslmode=disable"

[network_server]
net_id="000000"

[network_server.band]
# name="US_902_928"
name="US915"

[network_server.network_settings]
enabled_uplink_channels=[0, 1, 2, 3, 4, 5, 6, 7, 64]
```

US915 configuration example sub-band 2 (125kHz channels 8 - 15 & 500kHz channel 65)

This is the same channel-plan as used by The Things Network.

```
[general]
log_level=4

[postgresql]
dsn="postgres://chirpstack_ns:dbpassword@localhost/chirpstack_ns?sslmode=disable"

[network_server]
net_id="000000"

[network_server.band]
# name="US_902_928"
name="US915"

[network_server.network_settings]
enabled_uplink_channels=[8, 9, 10, 11, 12, 13, 14, 15, 65]
```

Install ChirpStack Application Server

Install the package using apt:

```
sudo apt install chirpstack-application-server
```

log output:

```
-----------------------------------------------------
The configuration file is located at:
/etc/chirpstack-application-server/chirpstack-application-server.toml
```

(continues on next page)

(continued from previous page)

```
Some helpful commands for chirpstack-application-server:
Start:
$ sudo systemctl start chirpstack-application-server

Restart:
$ sudo systemctl restart chirpstack-application-server

Stop:
$ sudo systemctl stop chirpstack-application-server

Display logs:
$ sudo journalctl -f -n 100 -u chirpstack-application-server
-----------------------------------------------------
```

The configuration file is located at `/etc/chirpstack-application-server/chirpstack-application-server.toml` and must be updated to match the database configuration. See below a configuration example which matches the database which we have created in one of the previous steps. For more information about the ChirpStack Application Server configuration options, see ChirpStack Application Server configuration.

```
[general]
log_level=4

[postgresql]
dsn="postgres://chirpstack_as:dbpassword@localhost/chirpstack_as?sslmode=disable"

  [application_server.external_api]
  jwt_secret="M9LoHX3wPQlcB2ziakV6qs/F2vLOvkAtrRv1yTu5Kks="
```

Note: you must replace the `jwt_secret` with a secure secret! You could use the command `openssl rand -base64 32` to generate a random secret.

Start the ChirpStack Application Server service:

```
# start chirpstack-application-server
sudo systemctl start chirpstack-application-server

# start chirpstack-application-server on boot
sudo systemctl enable chirpstack-application-server
```

Print the ChirpStack Application Server log-output:

```
sudo journalctl -f -n 100 -u chirpstack-application-server
```

6.4.2 Connecting a gateway

Login into the ChirpStack Application Server web-interface. The default credentials are:

- Username: admin
- Password: admin

Optional: Adding a Network Server

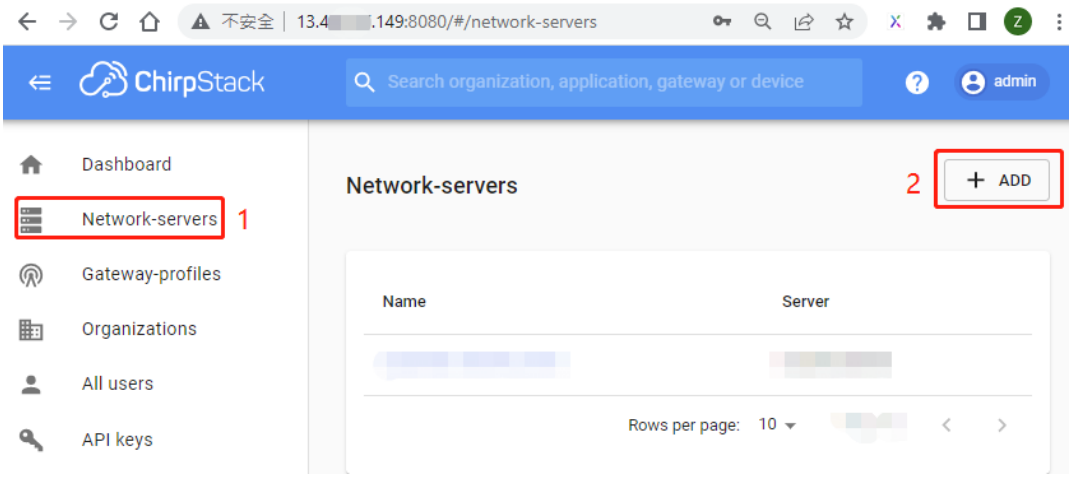
Refer to Network servers.

ChirpStack Application Server is able to connect to one or multiple ChirpStack Network Server instances. Global admin users are able to add new Network Servers to the ChirpStack Application Server installation.

Note: once a Network Server is assigned to a Service Profile or Device Profile, a Network Server can't be removed before deleting these entities, it will return an error.

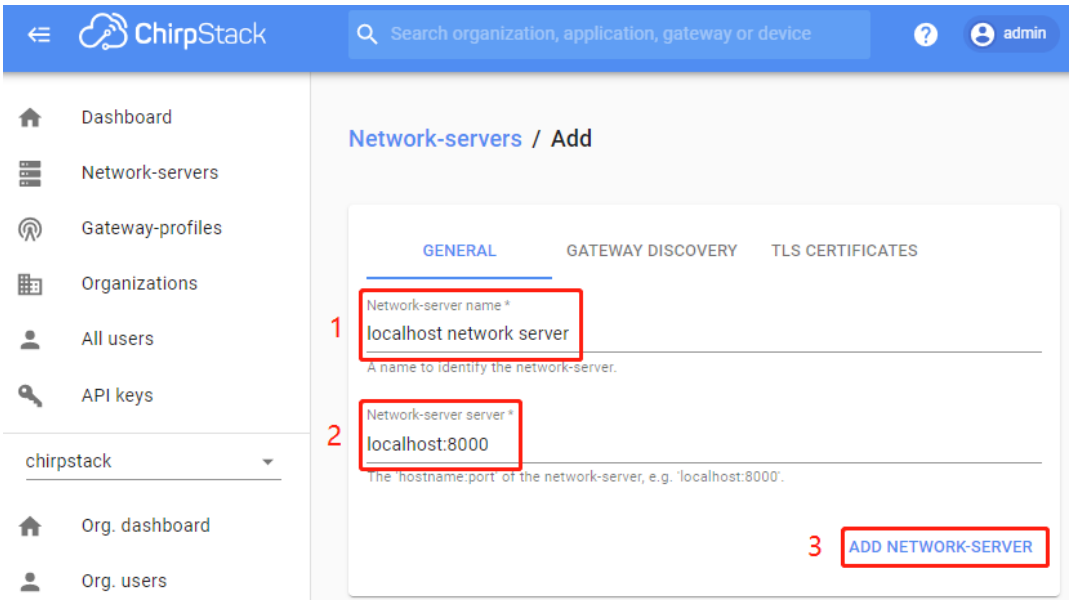
When creating a new Network Server, ChirpStack Application Server will create a Routing Profile on the given Network Server, containing the `hostname:ip` of the ChirpStack Application Server installation. In case your ChirpStack Application Server installation is not reachable on `localhost`, make sure this `hostname:ip` is configured correctly in your ChirpStack Application Server Configuration. This Routing Profile is updated on Network Server updates and deleted on Network Server deletes.

1. Go to **Network-servers** –> **+Add**.

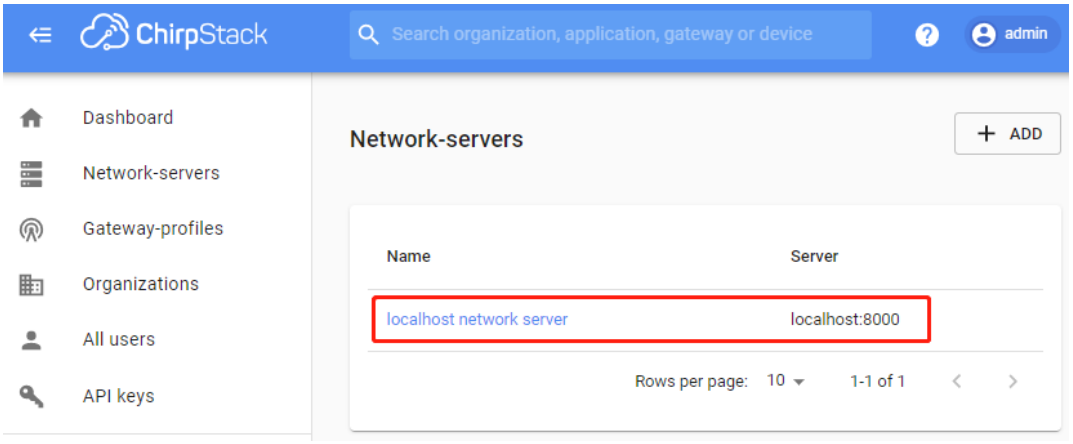


2. Type some parameters –> **ADD NETWORK-SERVER**.

Item	Description
Network-server name	localhost network server
Network-server server	llocalhost:8000



3. Show Network servers.



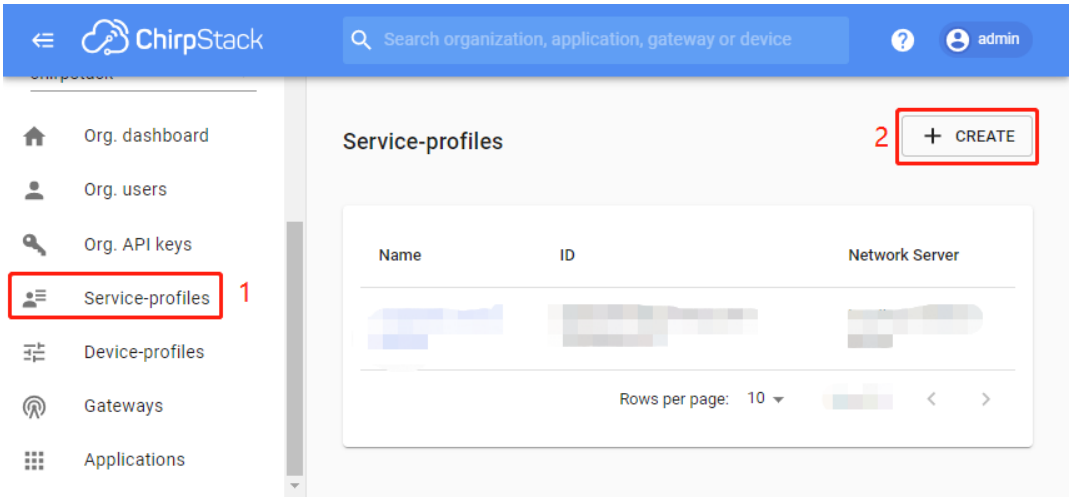
Optional: Creating a Service-profile

Refer to Service profiles.

The Service Profile can be seen as the "contract" between an user and the network. It describes the features that are enabled for the user(s) of the Service Profile and the rate of messages that can be sent over the network.

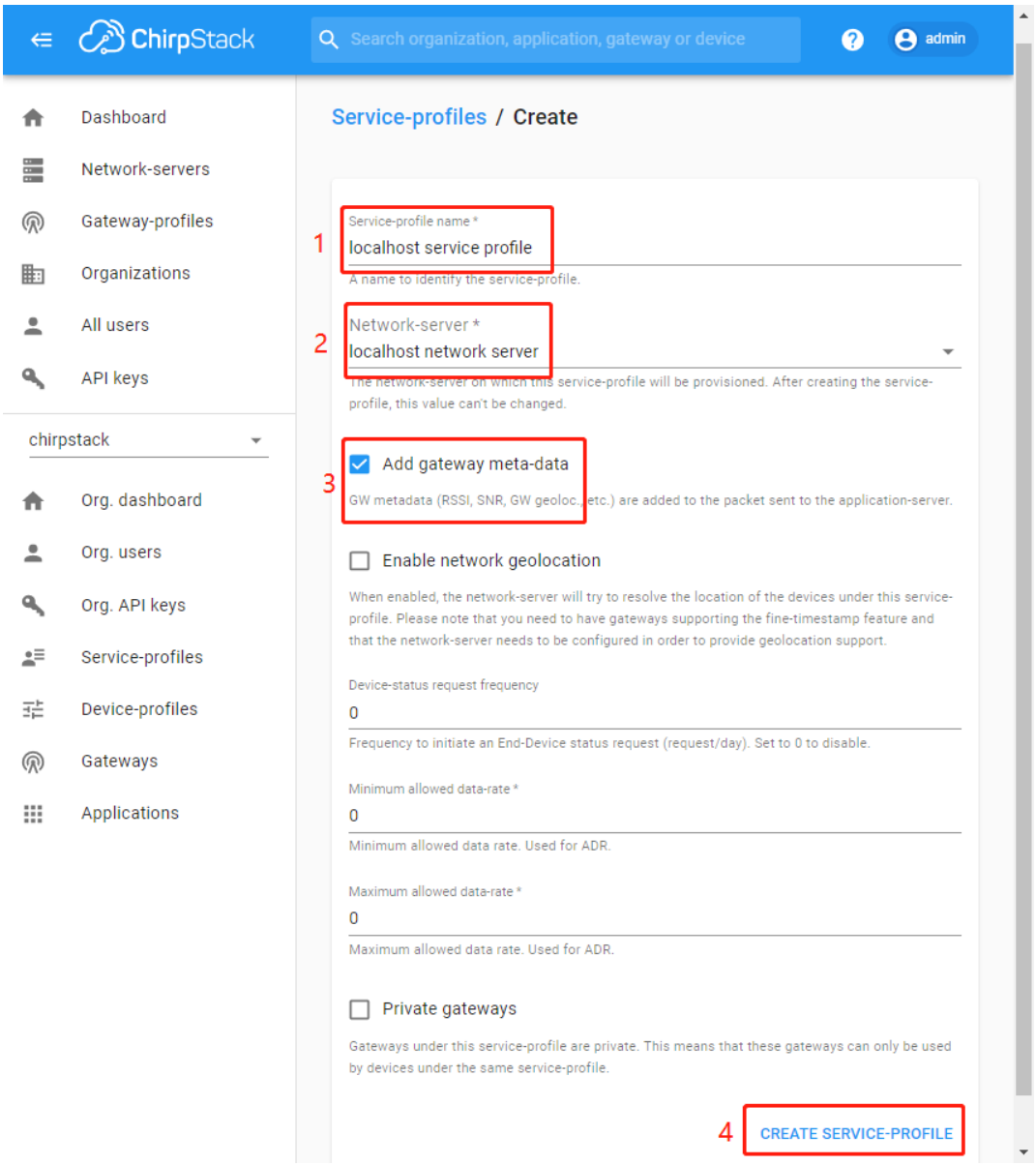
When creating a Service Profile, ChirpStack Application Server will create the actual profile on the selected Network Server, and will keep a reference record so it knows to which organization it belongs.

1. Go to **Service-profiles** –> **+Create**.

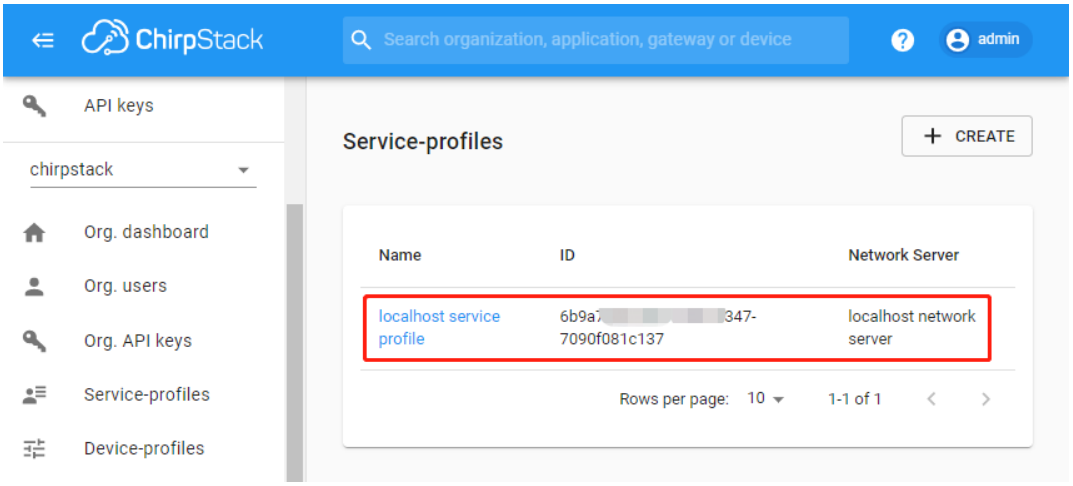


2. Type some parameters –> **CREATE SERVICE-PROFILE**

Item	Description
Service-profile name	localhost service profile
Network-server name	localhost network server
Add gateway meta-data	Enable



3. Show Service profiles.



Adding a gateway

Refer to Connecting gateway.

This guide describes how to connect your gateway to ChirpStack and how to validate that it is successfully communicating with the ChirpStack Network Server. At this point it is expected that you have the ChirpStack Application Server and ChirpStack Network Server components up and running.

Requirements

Before continuing, please make sure that you have installed both a packet-forwarder and the ChirpStack Gateway Bridge. The packet-forwarder that is installed on your gateway and the steps needed to install the ChirpStack Gateway Bridge vary per gateway vendor and model. In some cases you must also install the ChirpStack Gateway Bridge on the gateway. Please refer to the ChirpStack Gateway Bridge Gateway installation documentation, which contains instructions for various gateway models.

Packet-forwarders

There are different packet-forwarder implementations. The packet-forwarder that is installed on your gateway depends on the gateway vendor and model. The packet-forwarders that are compatible with ChirpStack:

- ChirpStack Concentratord
- Semtech UDP Packet Forwarder
- Semtech BasicStation

Configuration

Packet-forwarder

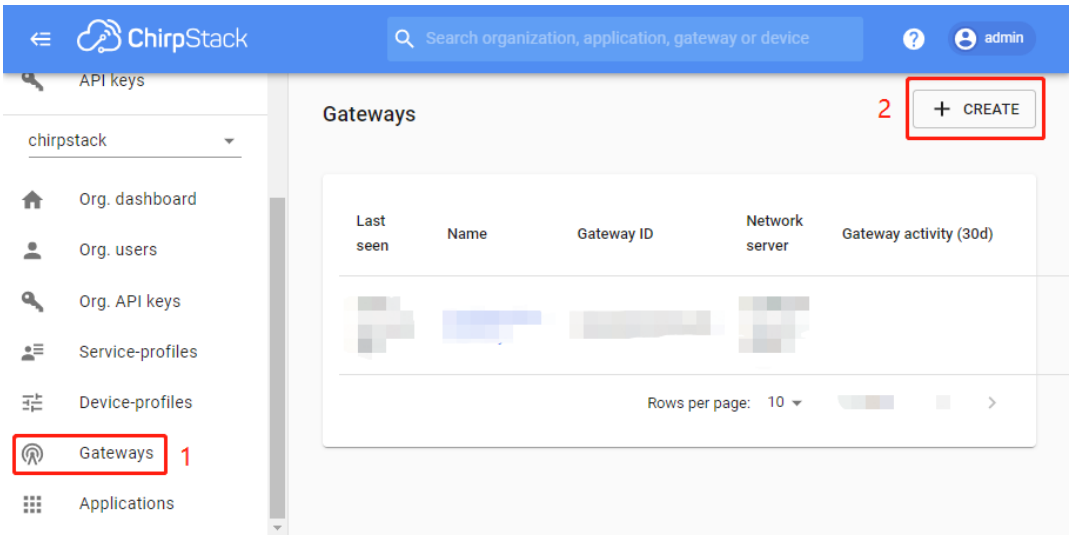
The packet-forwarder that is configured on your gateway must forward its data to the ChirpStack Gateway Bridge. As it controls the LoRa® chipset of the gateway, it also must be configured for the correct frequencies. A mismatch in frequencies means that the gateway will not receive uplinks sent by a device and / or is unable to send downlink payloads when the downlink frequency is outside the configured frequency range. Usually gateway vendors provide configuration examples for various bands. Please validate that the configuration matches the band and channels in the ChirpStack Network Server Configuration.

Add gateway

Tip: If you have not yet connected your ChirpStack Application Server instance with a ChirpStack Network Server instance, you must do this first. See *Optional: Adding a Network Server*. Also you must connect the organization with the network-server by *Optional: Creating a Service-profile*.

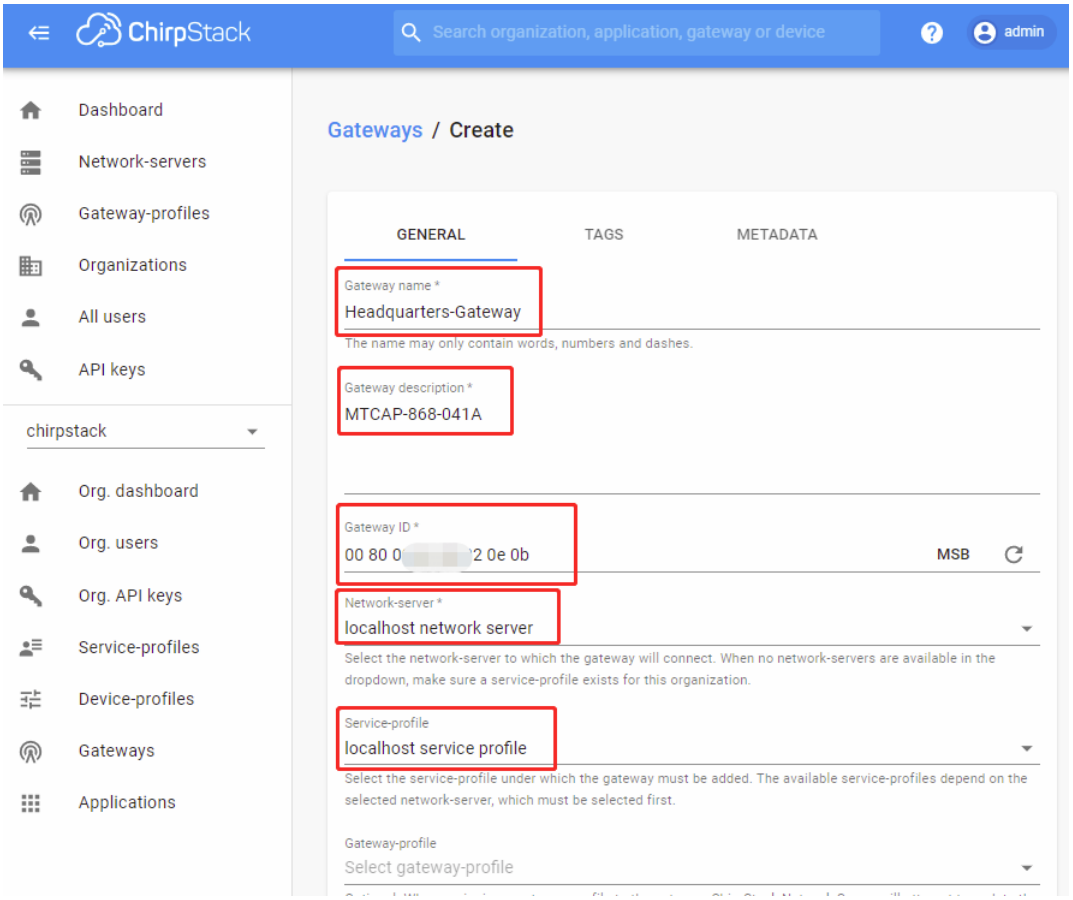
---

1. Go to **Gateways** in the web-interface, and click **+Create**.

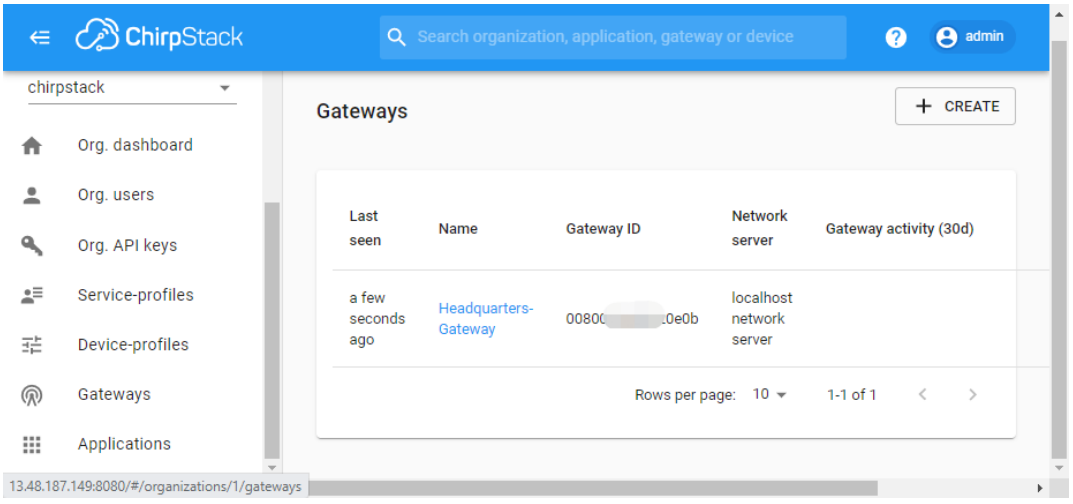


2. Complete the form. Make sure that the **Gateway ID** field is equal to the Gateway ID of your gateway. If this value is incorrectly configured, data received by your gateway will be rejected. Then click **Create Gateway**.

Item	Description
Name	Headquarters-Gateway
Description	MTCAP-868-041A<
Gateway ID (EUI64)	*YOUR_GATEWAY_ID*, *eg:0080000000020e0b*
Network-server name	localhost network server
Service-profile name	localhost service profile



3. Show Gateways.



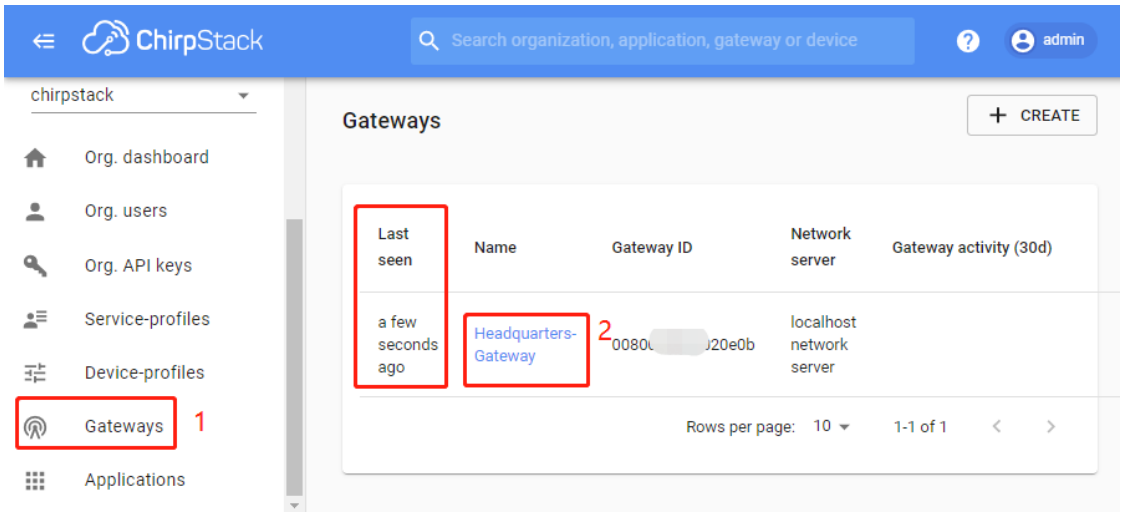
Validate

There are a few ways to validate if your gateway is correctly configured.

Last seen at

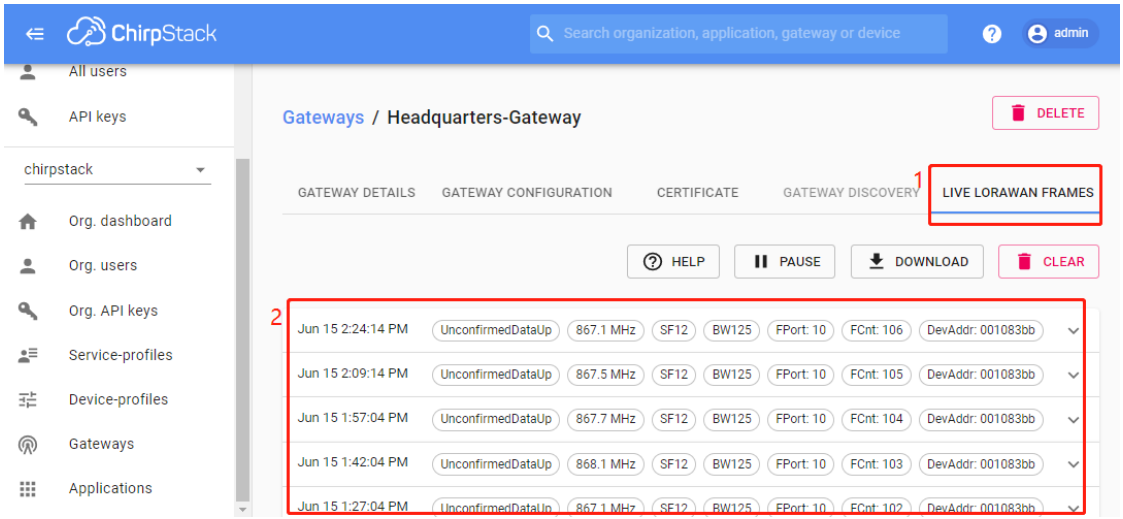
Event when no LoRa(WAN) data is received by the gateway, it will send gateway statistics periodically. Usually this stats interval is configured to 30 seconds. As ChirpStack Application Server will update the gateway **Last seen at** timestamp when it receives statistics, this is the easiest way to validate that the gateway is correctly configured.

Note: it might take a short while before statistics are sent by your gateway. You must refresh the page in order to see the (new) **Last seen at** value.



LoRaWAN frames

After opening the overview page of your gateway, you will see a **LoRaWAN frames** tab. This will show all LoRaWAN frames that are received and sent by your gateway. In case of received frames, this means that you will also see received frames from devices that are not yours and / or that are not yet configured. Therefore this screen is useful to validate if your gateway is able to receive LoRaWAN frames and forward these to ChirpStack.



Troubleshooting

See Troubleshooting gateway.

6.4.3 Connecting a device

Refer to Connecting device.

This guide describes how to connect your LoRaWAN device with ChirpStack and how to validate that it can successfully activate. At this point it is expected that you have the ChirpStack Network Server and ChirpStack Application Server components installed and that you have successfully connected a LoRa gateway to it.

Requirements

Before continuing, there are a couple things you need to know about your device. This information is usually provided by the device vendor.

- DevEUI
- LoRaWAN MAC version implemented by the device
- Regional Parameters revision implemented by the device
- OTAA: Device root-keys (when no external join-server is used)

Login

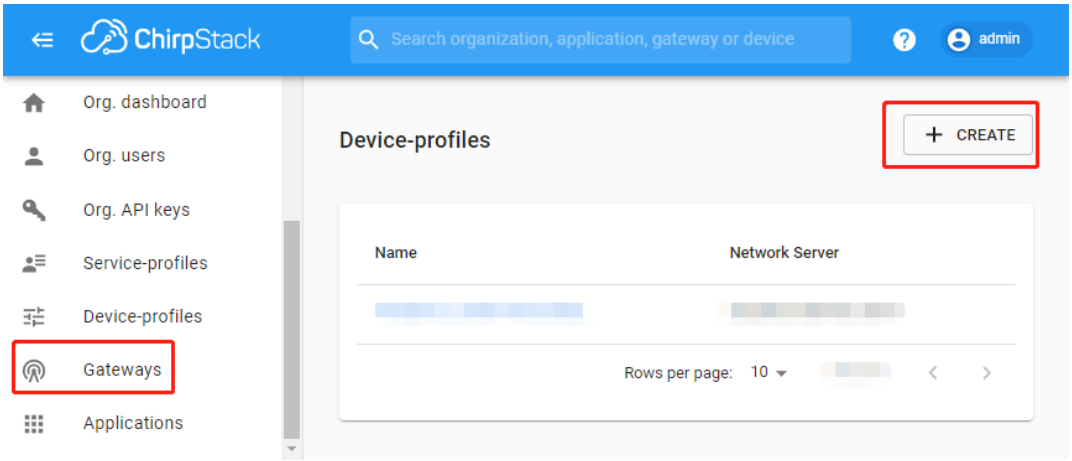
Login into the ChirpStack Application Server web-interface. The default credentials are:

- Username: admin
- Password: admin

Optional: Creating a Device profile

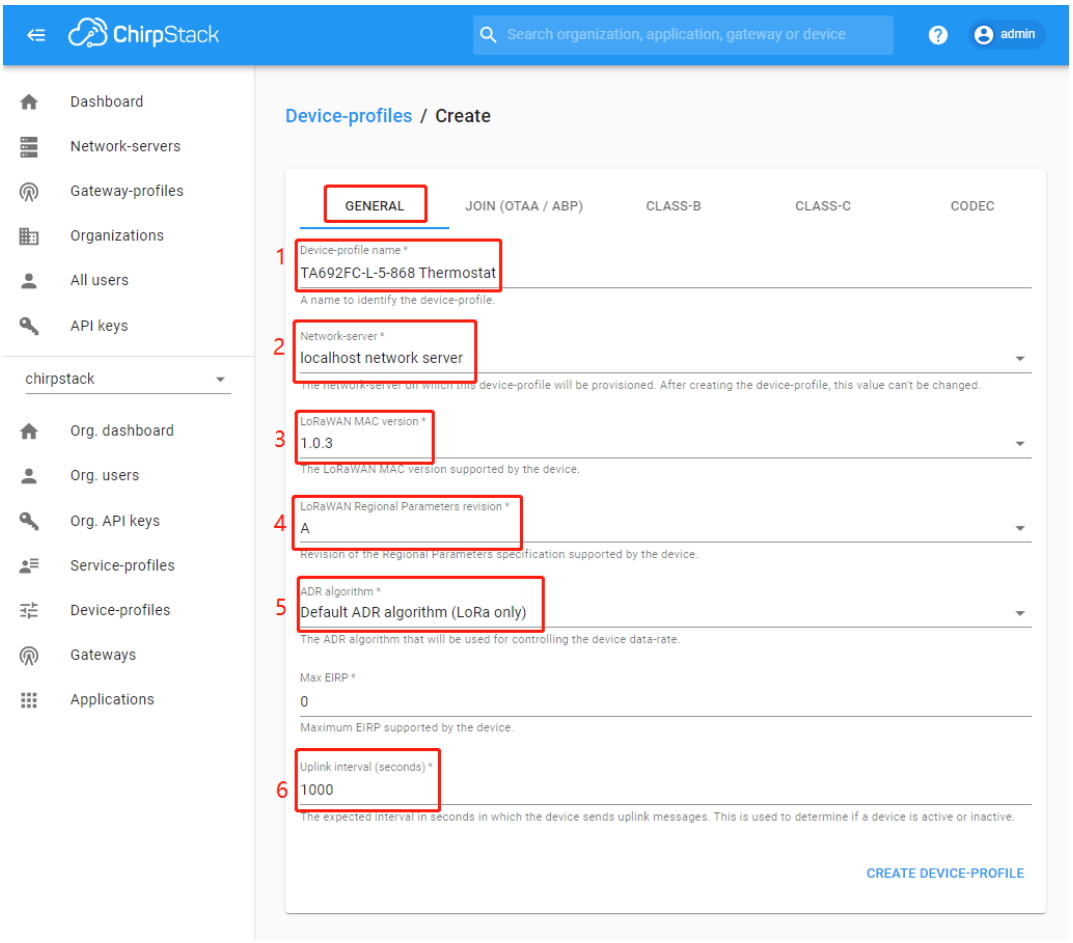
Before you can add the device to ChirpStack, you have to create a Device-profile if you haven't done this already. In general it is a good practice to create separate device-profiles for different types of devices. A device-profile contains the capabilities of your device. For example if it uses ABP or OTAA for activation, which LoRaWAN version and Regional Parameters revision is implemented by the device, etc… It can also be configured with a function to decode the payloads sent by the devices using the device-profile.

1. Within the ChirpStack Application Server web-interface, click **Gateways** and then **Create**.



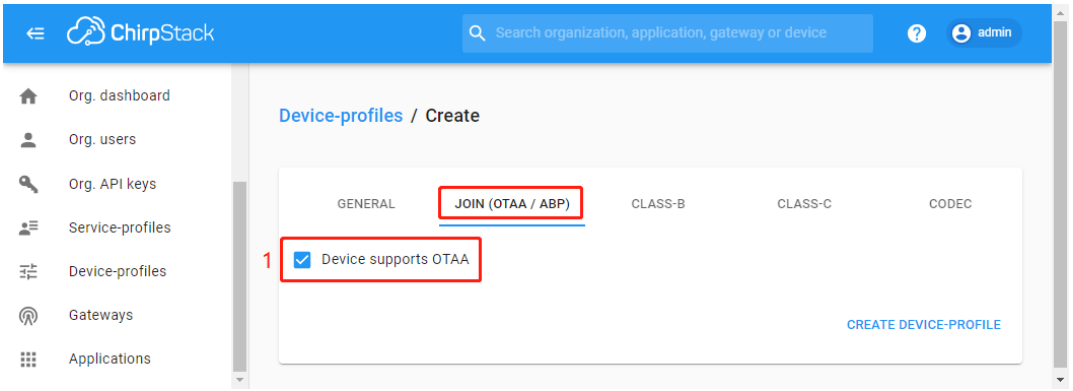
2. Under the **General** tab, fill in the required fields.

Item	Description
Name	TA692FC-L-5-868 Thermostat
Network-server	localhost network server
Region	EU868
LoRaWAN MAC version	LoRaWAN 1.0.3
LoRaWAN Regional parameters revision	A
ADR algorithm	Default ADR algorithm (LoRa only)
Uplink interval (seconds)	1000
Device-status request frequency (req/day)	1



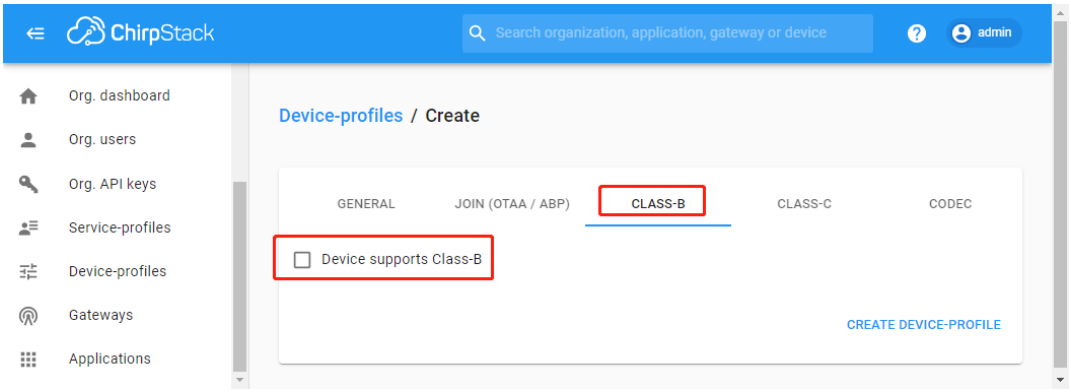
3. Under the **Join (OTTA/ABP)** tab, fill in the required fields.

Item	Description
Join (OTAA / ABP)	yes, Device supports OTAA



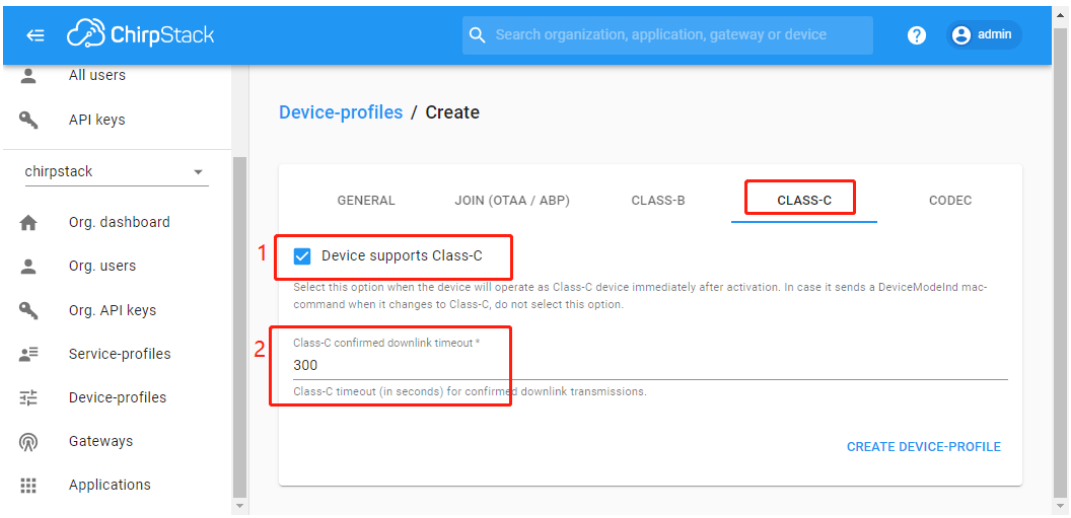
4. Under the **Class-B** tab, fill in the required fields.

Item	Description
Supports Class-B	no



5. Under the **Class-C** tab, fill in the required fields.

Item	Description
Supports Class-C	yes
Class-C confirmed downlink timeout (seconds)	300



6. Under the **Codec** tab, fill in the required fields. Then click **create device-profile**.

   Note: The data here may not be decoded. It's here just for debugging convenience.

Item	Description
Payload codec	Custom JavaScript codec functions

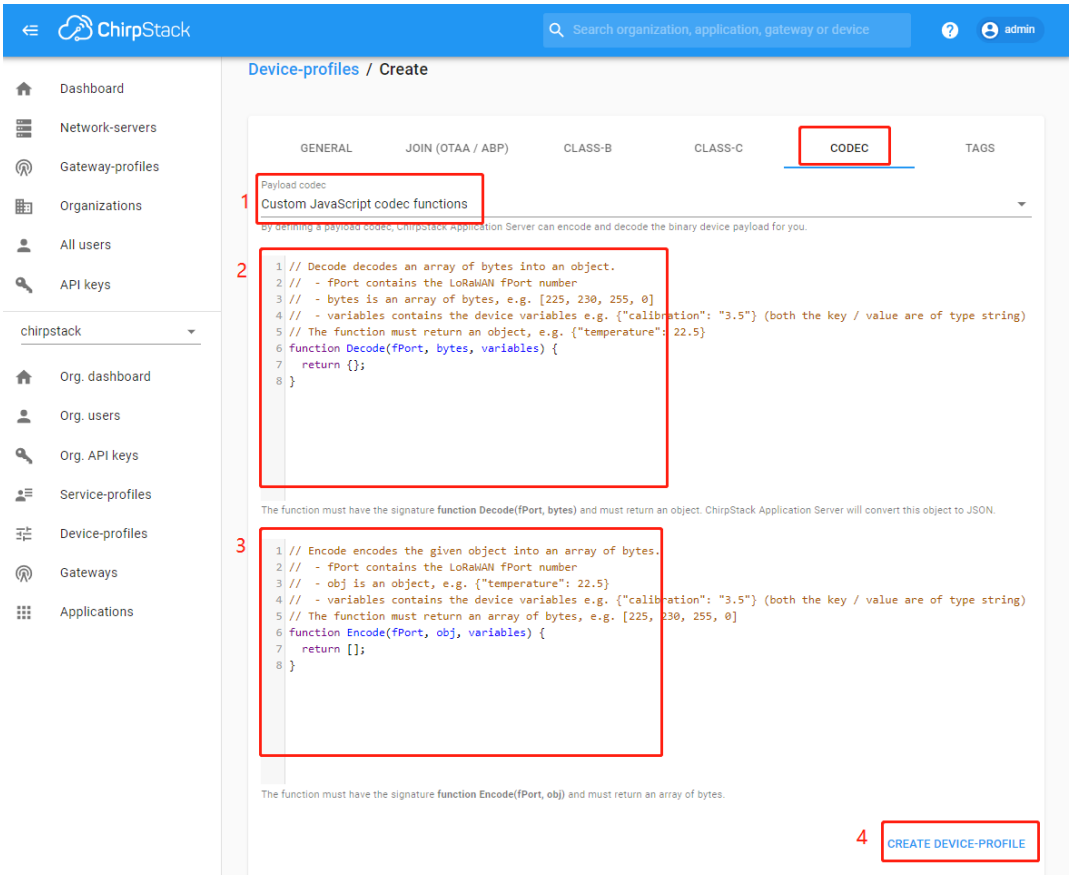
```
// Decode decodes an array of bytes into an object.
//  - fPort contains the LoRaWAN fPort number
//  - bytes is an array of bytes, e.g. [225, 230, 255, 0]
//  - variables contains the device variables e.g. {"calibration": "3.5"}␣
↪(both the key / value are of type string)
// The function must return an object, e.g. {"temperature": 22.5}
function Decode(fPort, bytes, variables) {
    var dataX = {};
```

(continues on next page)

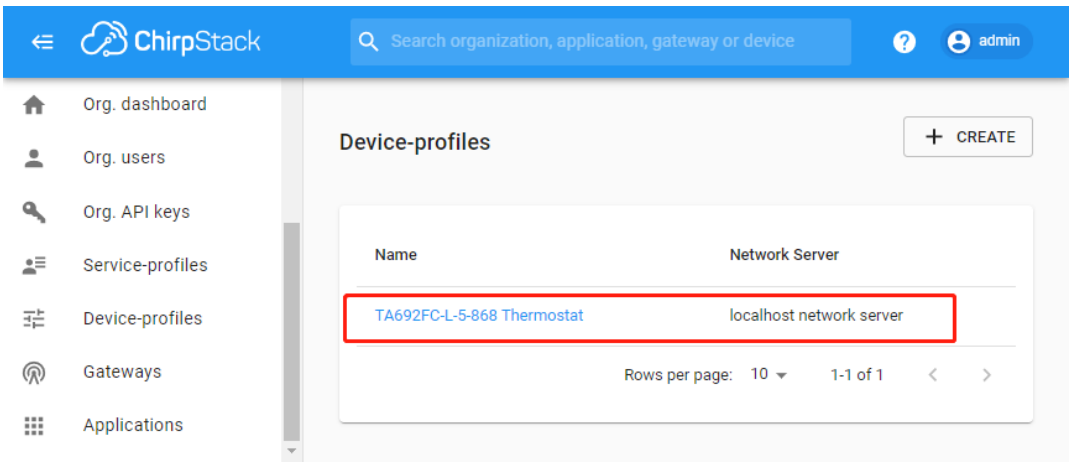
(continued from previous page)

```
    var fanModeStateMeta = {
    0: "OFF",
    1: "LOW",
    2: "MED",
    3: "HIGH",
    4: "AUTO"
    };
    var systemModeMeta = {
    0: "OFF",
    1: "COOL",
    2: "FAN-ONLY"
    };
    if(fPort==10){
    dataX.roomTemperature = ((bytes[0] << 8) + bytes[1])/10;
    dataX.setTemperature = ((bytes[2] << 8) + bytes[3])/10;
    dataX.coolProportionalOutput = bytes[4]/100;
    dataX.fanMode = fanModeStateMeta[bytes[5]];
    dataX.fanState = fanModeStateMeta[bytes[6]];
    dataX.threshold = bytes[7]/10;
    dataX.systemMode = systemModeMeta[bytes[8]];
    dataX.coolPBand = bytes[9]/10;
    dataX.coolItime = (bytes[10] << 8) + bytes[11];
    dataX.kFactor = bytes[12];
    return {
        data: {
        roomTemperature: dataX.roomTemperature,
        setTemperature: dataX.setTemperature,
        coolProportionalOutput: dataX.coolProportionalOutput,
        fanMode: dataX.fanMode,
        fanState: dataX.fanState,
        threshold: dataX.threshold,
        systemMode: dataX.systemMode,
        coolPBand: dataX.coolPBand,
        coolItime: dataX.coolItime,
        kFactor: dataX.kFactor
        }
    };
    }
}
```

```
// Encode encodes the given object into an array of bytes.
//  - fPort contains the LoRaWAN fPort number
//  - obj is an object, e.g. {"temperature": 22.5}
//  - variables contains the device variables e.g. {"calibration": "3.5"}
↪(both the key / value are of type string)
// The function must return an array of bytes, e.g. [225, 230, 255, 0]
function Encode(fPort, obj, variables) {
return [];
}
```



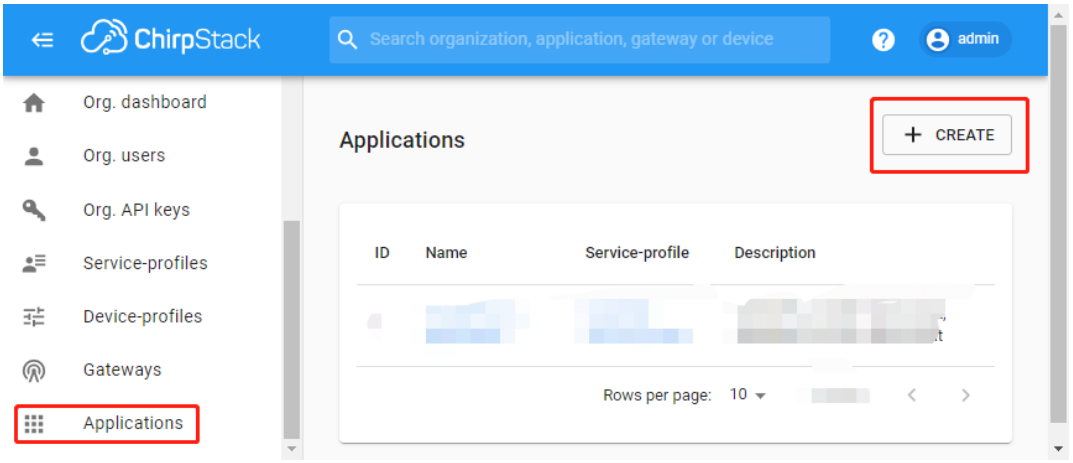
7. Show Device profiles.



Optional: Adding an Application

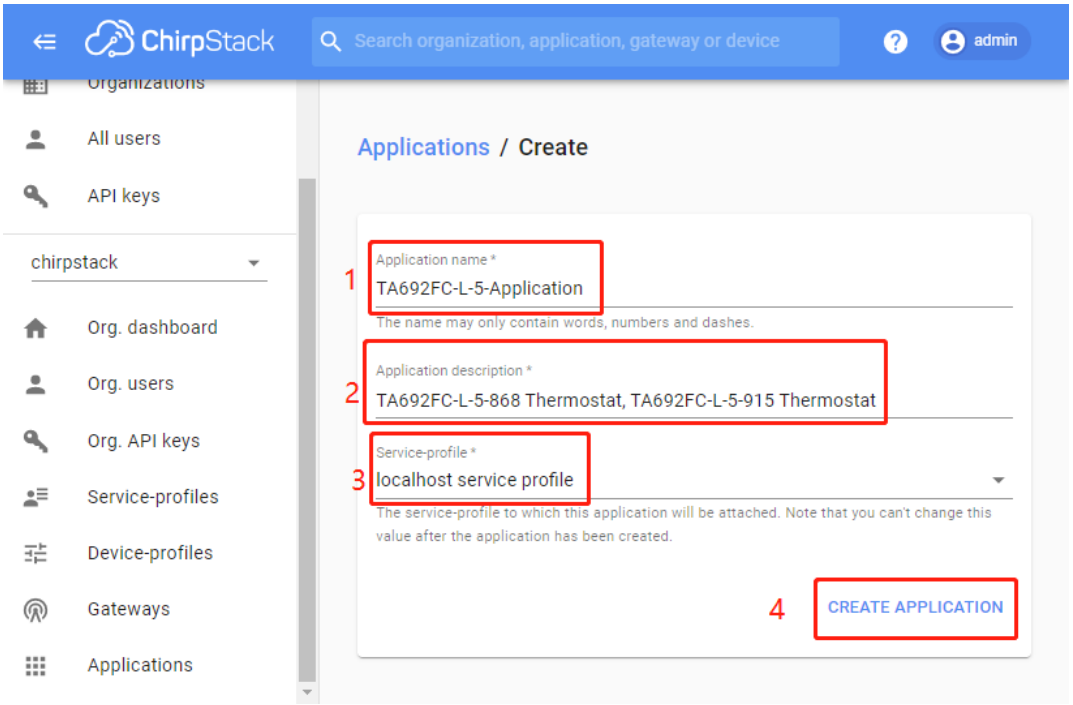
Devices are grouped by applications. For example you could group your temperature sensors under one application and weather stations under an other application.

1. If you haven't created an application yet to which you want to add the device, click **Applications**, then click **Create**.

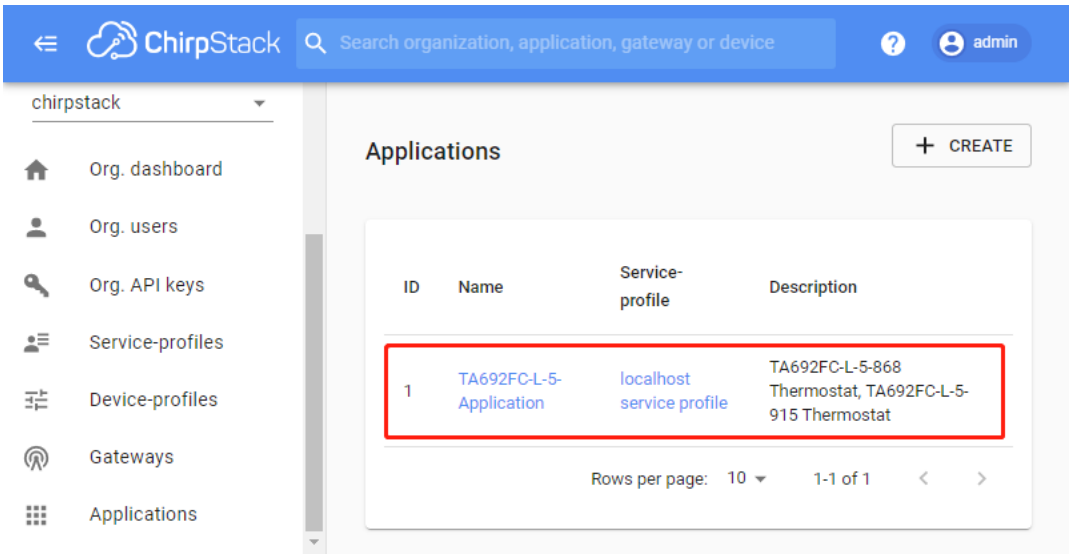


2. Fill in the required fields and **Create Application**.

Item	Description
Name	TA692FC-L-5-Application
Description	TA692FC-L-5-868 Thermostat, TA692FC-L-5-915 Thermostat
Service-profile name	localhost service profile

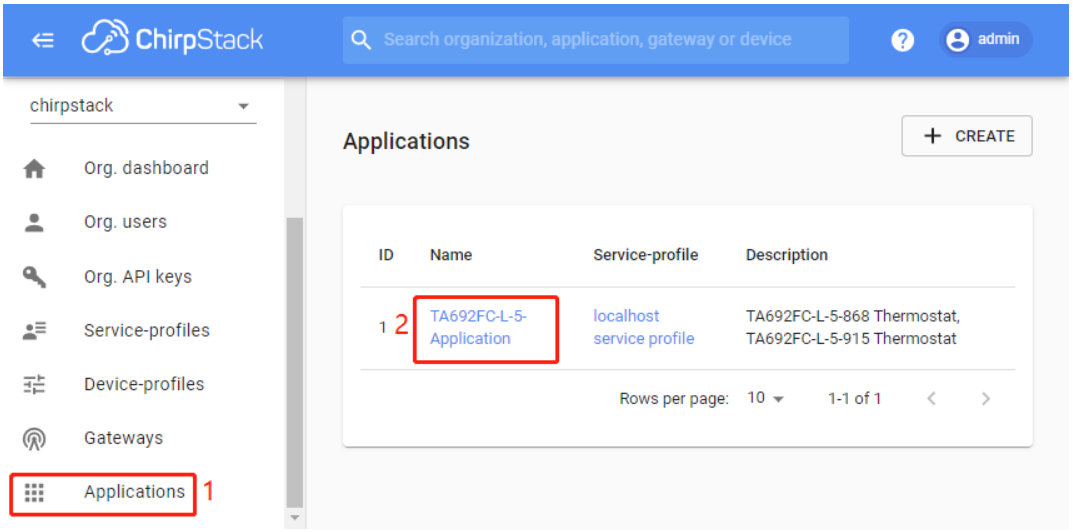


3. Show Applications.

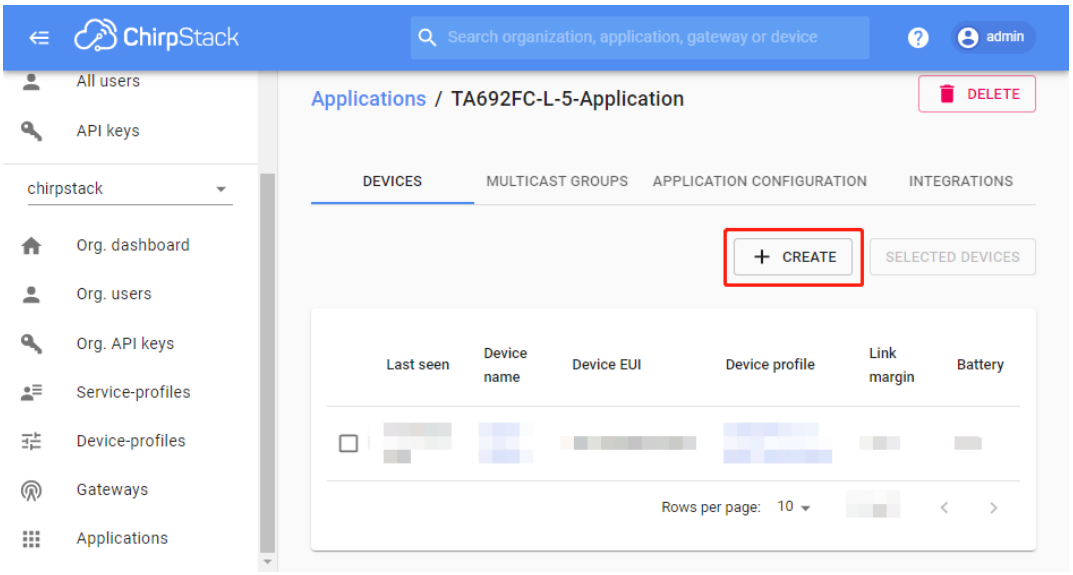


Creating a device

1. Click the (newly created) **application** to which you want to add your device.

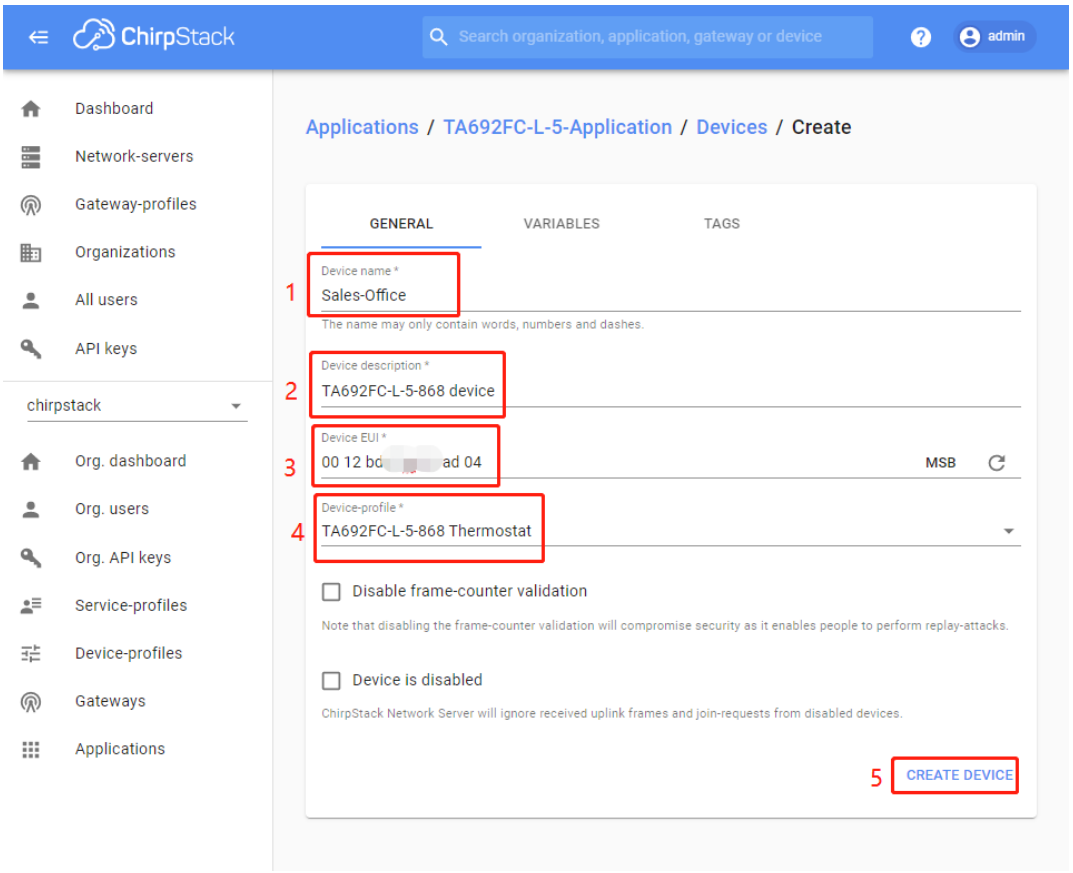


2. Under the **Devices** tab, click **Create**.



3. Fill in the required fields and select the device-profile that you want to associate with your device and save the device.

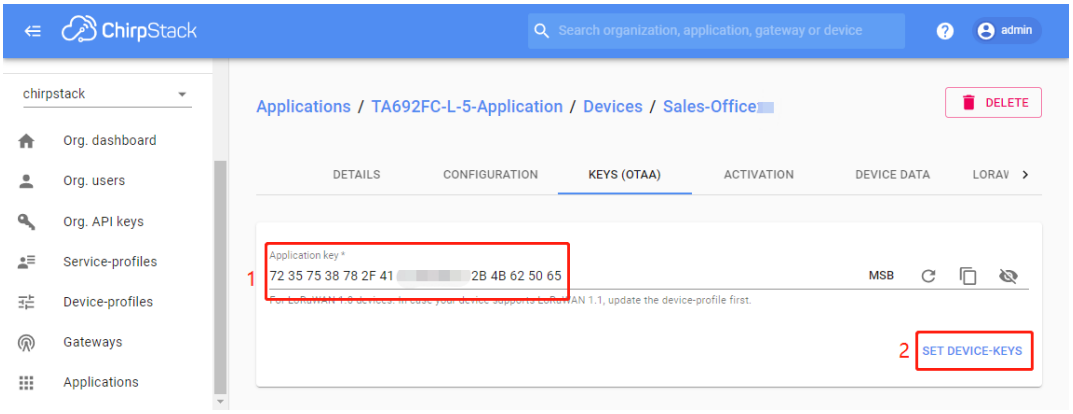
Item	Description
Name	Sales-Office
Description	TA692FC-L-5-868 device
Device EUI (EUI64)	*YOUR_DEVICE_EUI*, *eg:0012bdfffe02ad04*
Device profile	TA692FC-L-5-868 Thermostat



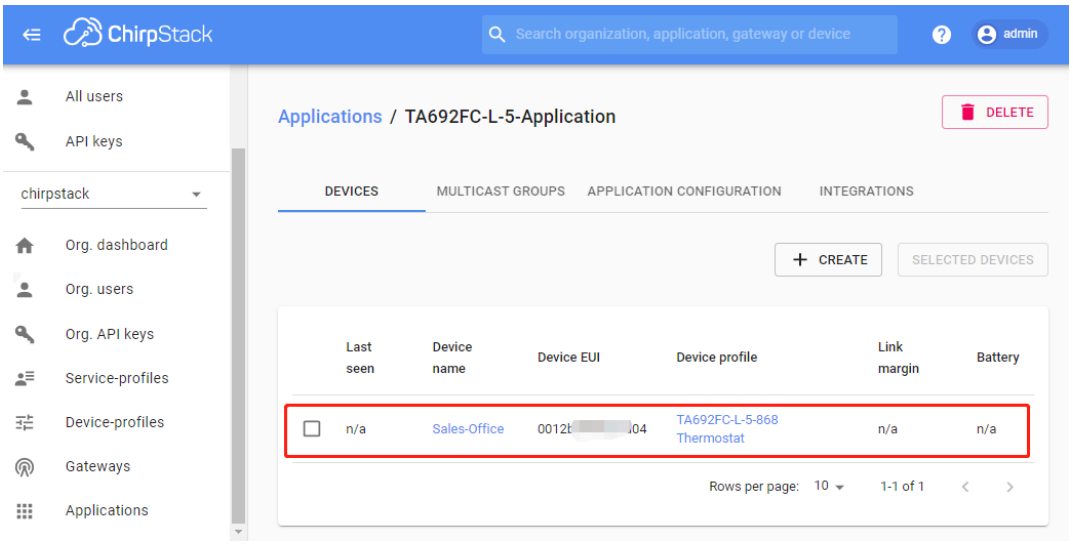
4. Depending the device-profile is configured for OTAA or ABP, the next page will ask you to enter the device root-keys (OTAA) or device session-keys (ABP).

   In case your ChirpStack Network Server is configured with a join-server and your (OTAA) device will use this join-server for activation, then there is no need to enter the root-keys.

Item	Description
Application key	*YOUR_DEVICE_EUI, eg:72357538782F413F4428472B4B625065*

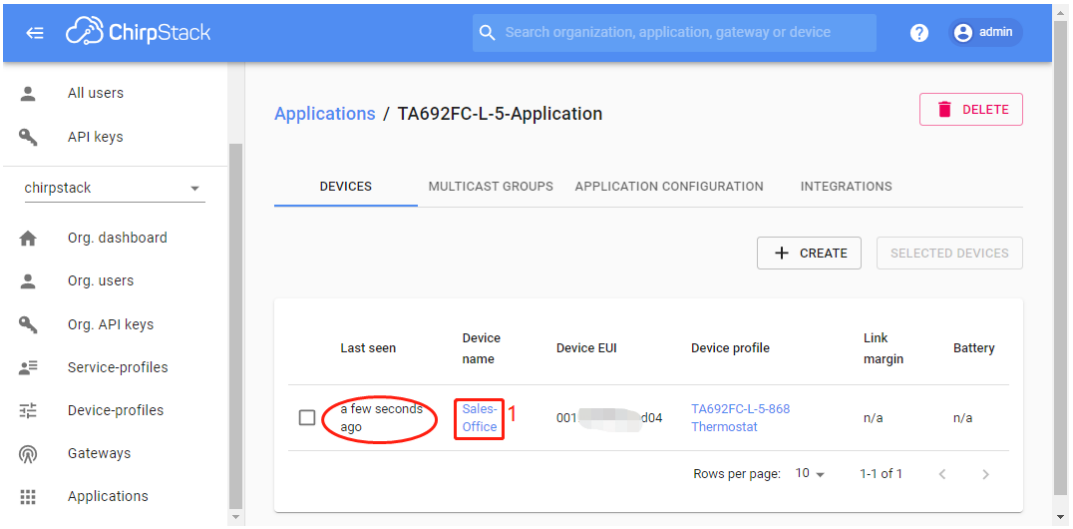


5. Show **Devices**.

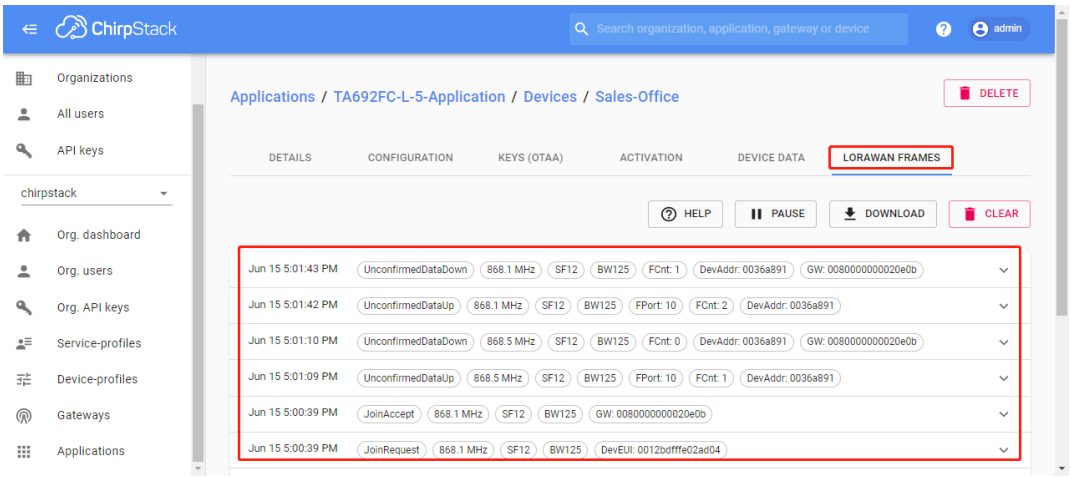


Validate

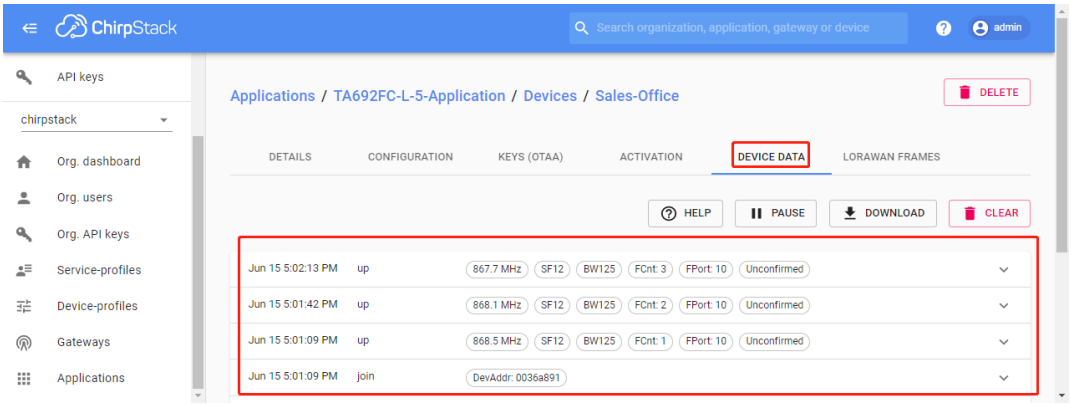
1. After adding your LoRaWAN device to ChirpStack, validate that your device is able activate (in case of OTAA) and send data. Clicking the device in the ChirpStack Application Server web-interface.



2. Open in one window the **Device data** and in an other window the **LoRaWAN frames** tab. Then turn on your device or trigger an uplink transmission. In case of an OTAA device you should first see a JoinRequest followed by a JoinAccept message in the **LoRaWAN frames** tab.



3. When the device sends its first data payload, you should also see a Join and Up event in the **Device data** tab.



Troubleshooting

See Troubleshooting device.

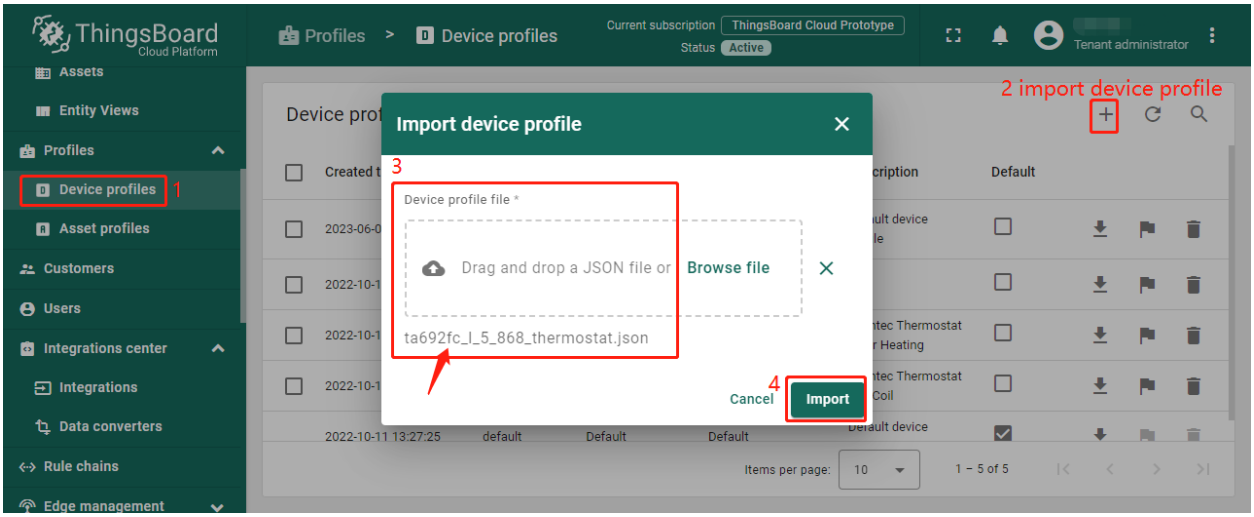
6.5 TA692FC-L-5-868 Thermostat – Demo device profile usage

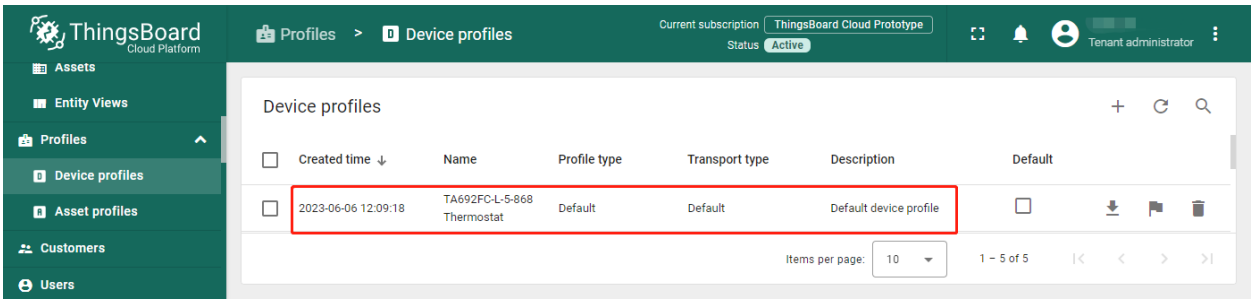
6.5.1 Import device profile

Tip: *A Device Profile file* can only be imported once. If you have already imported it, you do not need and cannot repeat the import.

If you have already imported it, you can skip this step.

- Download `ta692fc_l_5_868_thermostat.json`.
- **Profiles** –> **Device profiles** –> **+** –> **Popup dialog: Import device profile** –> Drag and drop *my device profile File* –> **Import**.

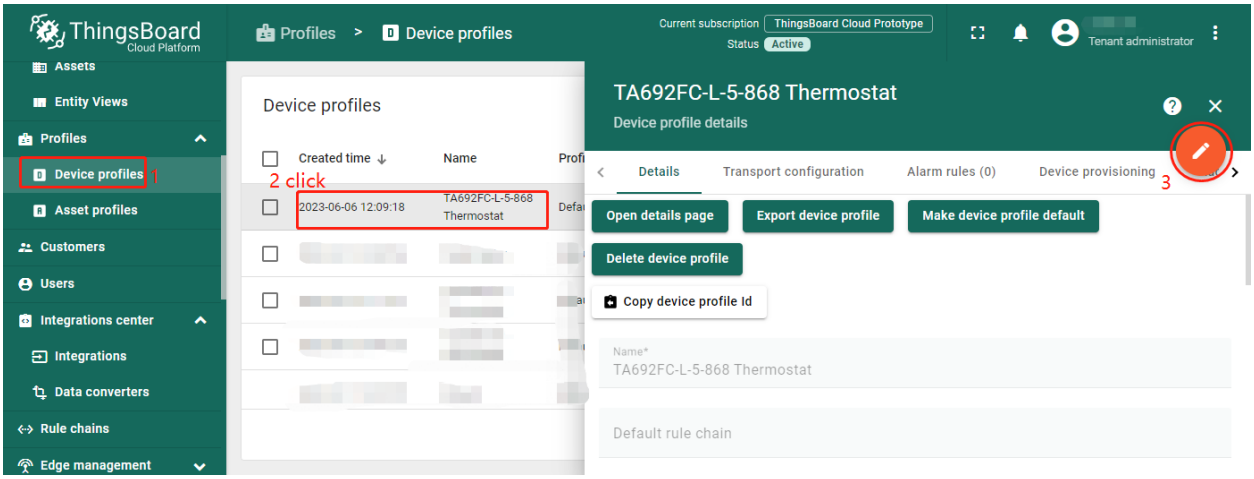




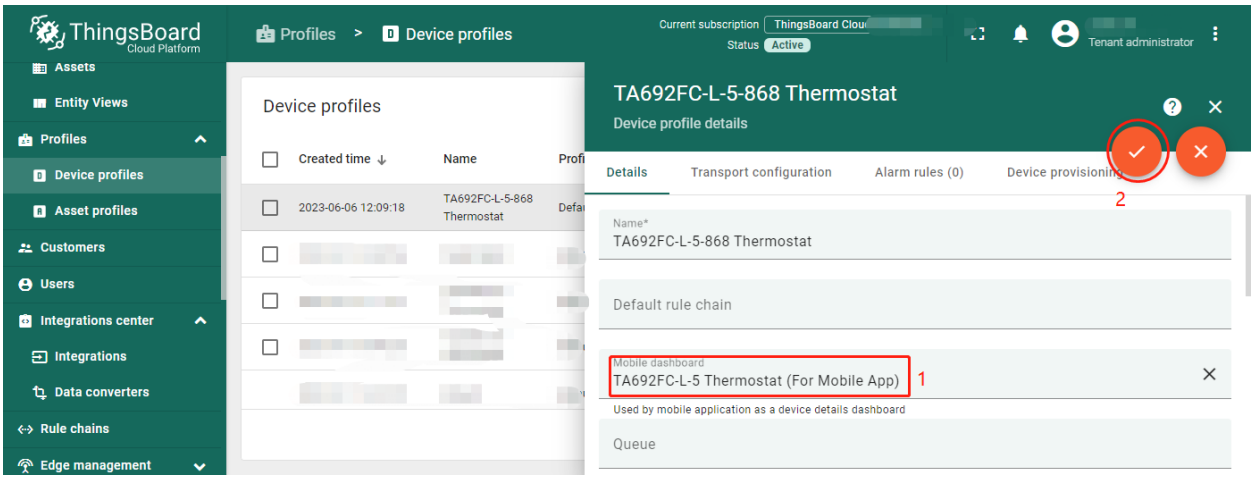
6.5.2 Modify device profile's mobile dashboard

Device profile's mobile dashboard is for `ThingsBoard Mobile Application` or `ThingsBoard PE Mobile Application`.

- **Profiles** –> **Device profiles** –> click *my device profile* –> **Toggle edit mode** (red icon)



- Modify *Mobile dashboard* –> **Apply changes** (red icon)



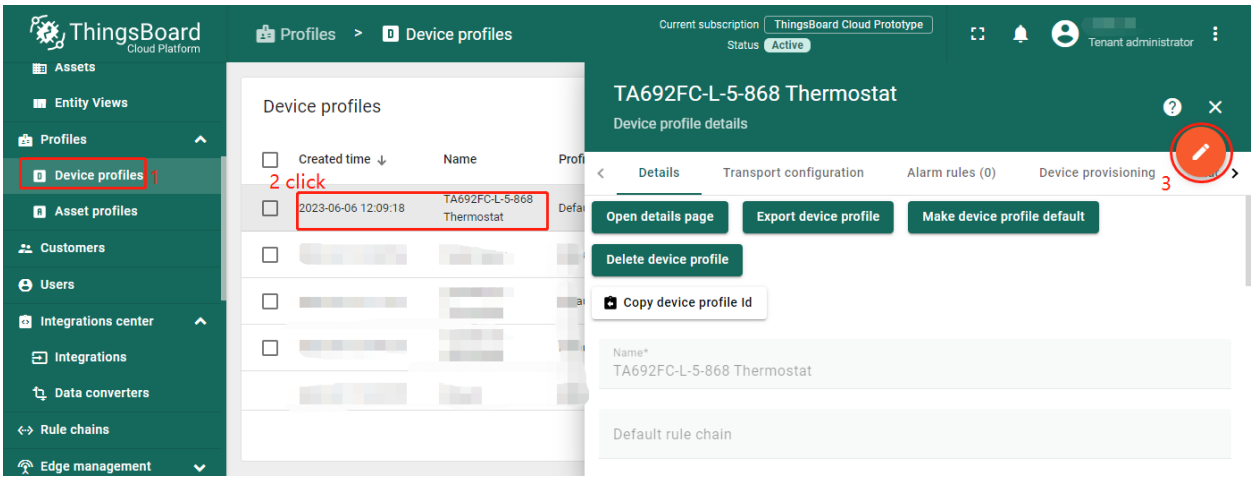
These values are shown in the following table:

Field	Value
Mobile dashboard	TA692FC-L-5 Thermostat (For Mobile App)

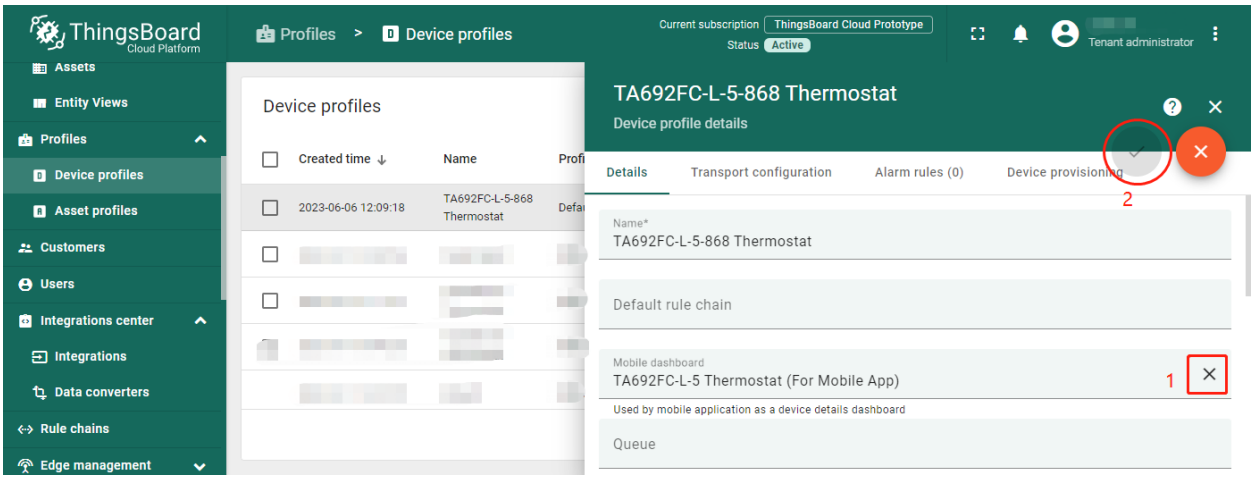
6.5.3 Clear device profile's mobile dashboard

Sometimes if `TA692FC-L-5-868 Thermostat device profile`'s mobile dashboard is cleared, `TA692FC-L-5 Thermostat (For Mobile App)` can only be deleted.

- **Profiles** –> **Device profiles** –> click *my device profile* –> **Toggle edit mode** (red icon)



- Clear *Mobile dashboard* –> **Apply changes** (red icon)



6.6 TA692FC-L-5 Demo Dashboards Usage

6.6.1 Overview

There are two dashboards related to TA692FC-L-5, namely `TA692FC-L-5 Thermostat List` and `TA692FC-L-5 Thermostat (For Mobile App)`. We open the former to start operating TA692FC-L-5.

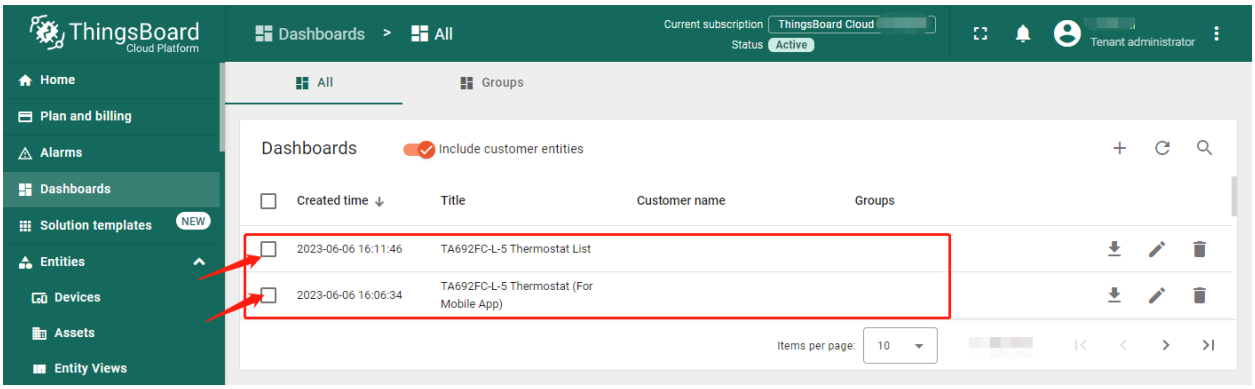


Table 2: TA692FC-L-5 Demo Dashboards

Dashboard	Description	For Web UI	For Mobile App	Entry*
TA692FC-L-5 Thermostat List	list	Yes	No	Yes
TA692FC-L-5 Thermostat (For Mobile App)	details	Yes	Yes	No

Hint:

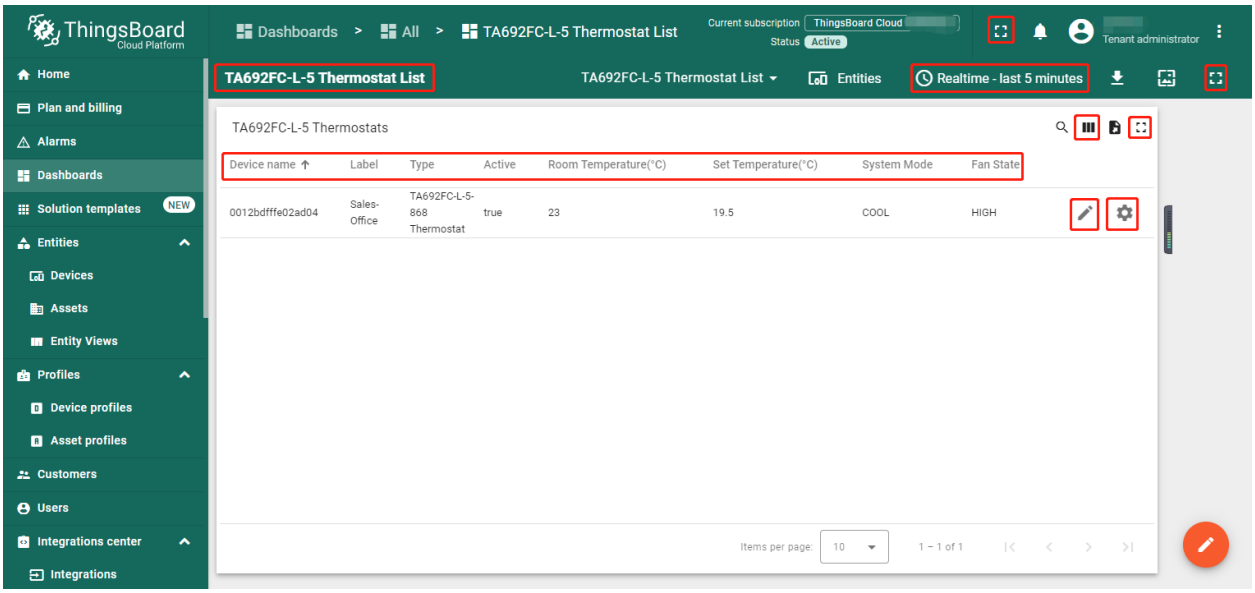
- If *Entry* is *Yes*, then directly enter the Dashboard and there will be data displayed.
- If *Entry* is *No*, there will be no data display when entering this Dashboard directly, and you need to jump to this Dashboard from other Dashboards.

6.6.2 TA692FC-L-5 Thermostat List

Dashboard states

Default state

`Default state` is root state.



- **Dashboard bar:**
  - TA692FC-L-5 Thermostat List : Click here to skip to **root state**. Since **default state** is *root state*, click here and there is no response.
  - : Click the two ICONS in the upper left corner to display the page in full screen.
  - Realtime - last 5 minutes : Edit time window.
- **Thermostats widgets:**
  - **Fields:**
    - Device name, Label, Type, active.
    - Room temperature, Set Temperature, System Mode, Fan status: Refer to *Monitor state*.
  - **Actions:**
    - : skip to *TA692FC-L-5 Thermostat (For Mobile App)*.
    - : Popup dialog to editing a device's label.

Import List Dashboard

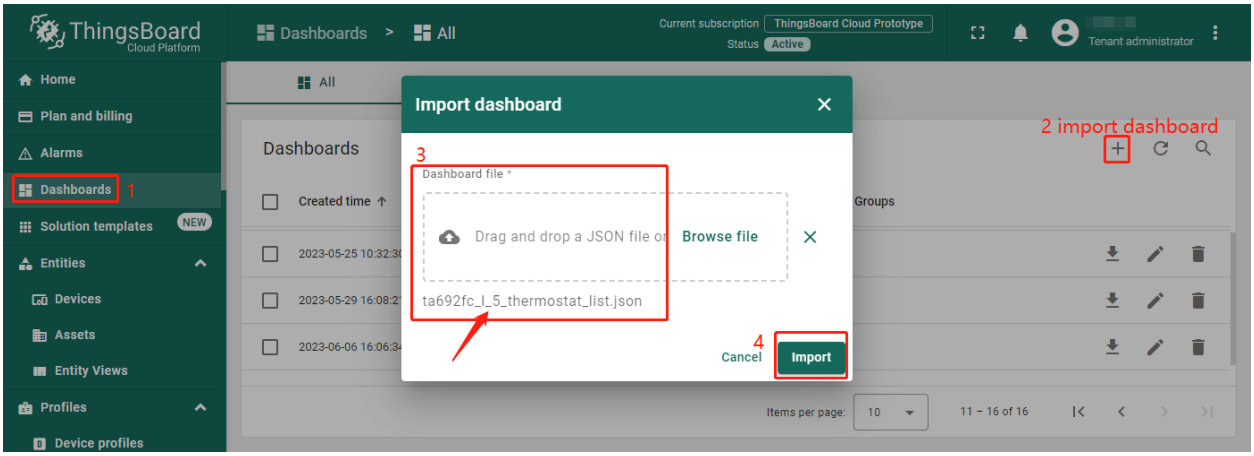
Tip: *A Dashboard file* can only be imported once. If you have already imported it, you do not need and cannot repeat the import.

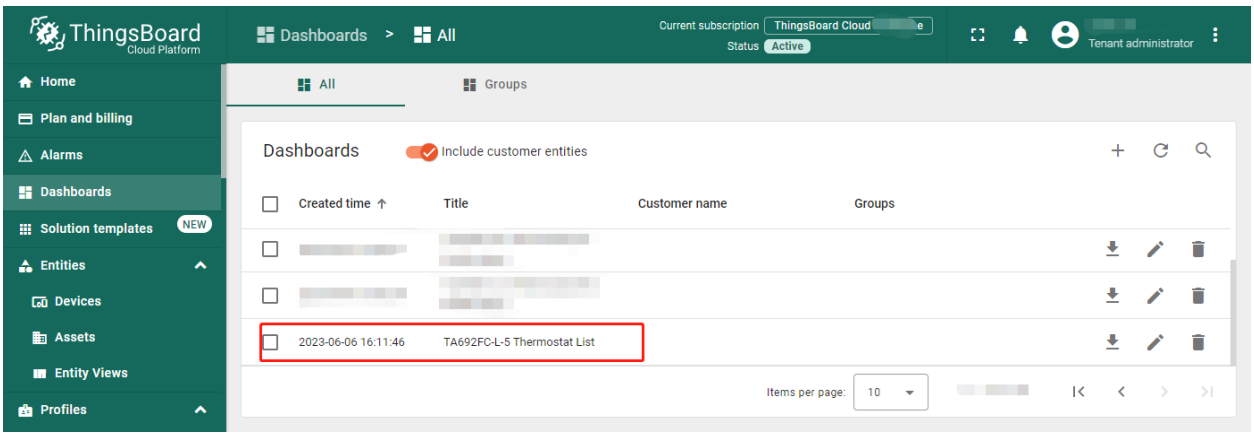
If you have already imported it, you can skip this step.

In order to use this dashboard, you must to create `TA692FC-L-5 Thermostat Device Profile` and `TA692FC-L-5 Thermostat (For Mobile App)`. If they don't exist, you can import them. See *Import Device Profile of TA692FC-L-5 Thermostat* or *Import TA692FC-L-5 Detail Dashboard*.

First, you can import this dashboard.

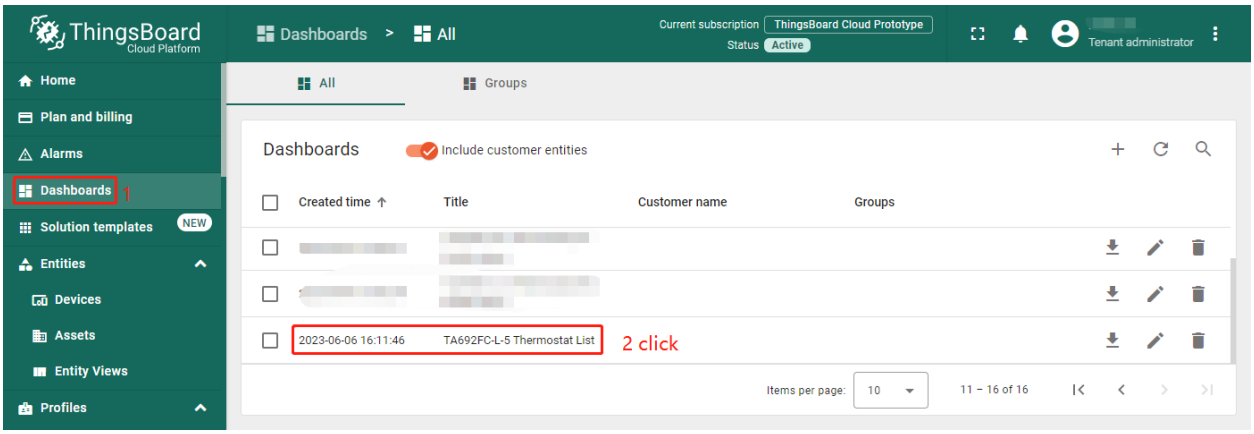
- Download `ta692fc_l_5_thermostat_list.json`.
- **Dashboards** –> **+** –> **Popup dialog: Import dashboard** –> Drag and drop *list dashboard File* –> **Import**.



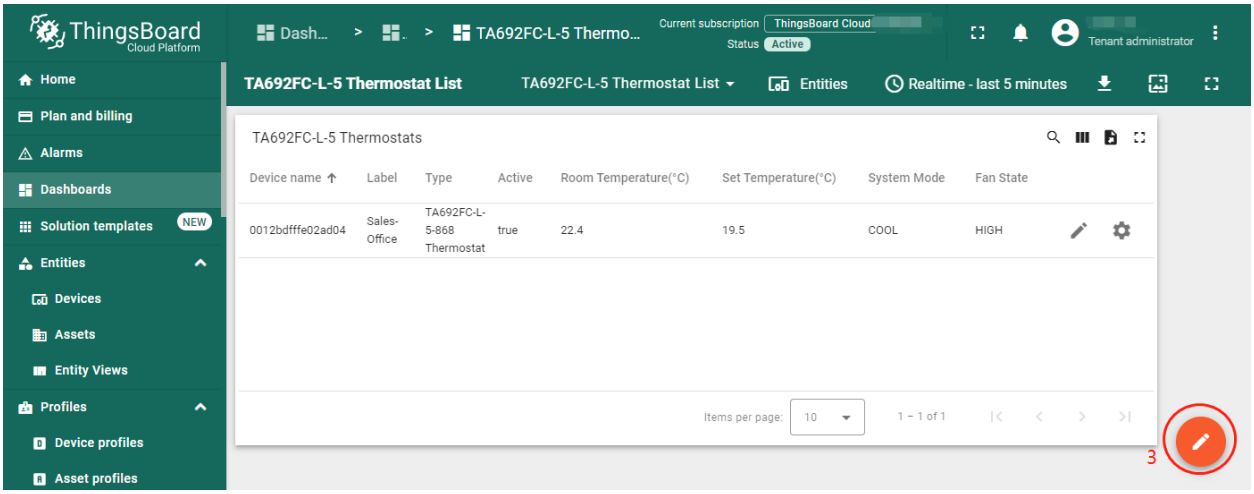


Next, modify a action's target dashboard and target dashboard state.

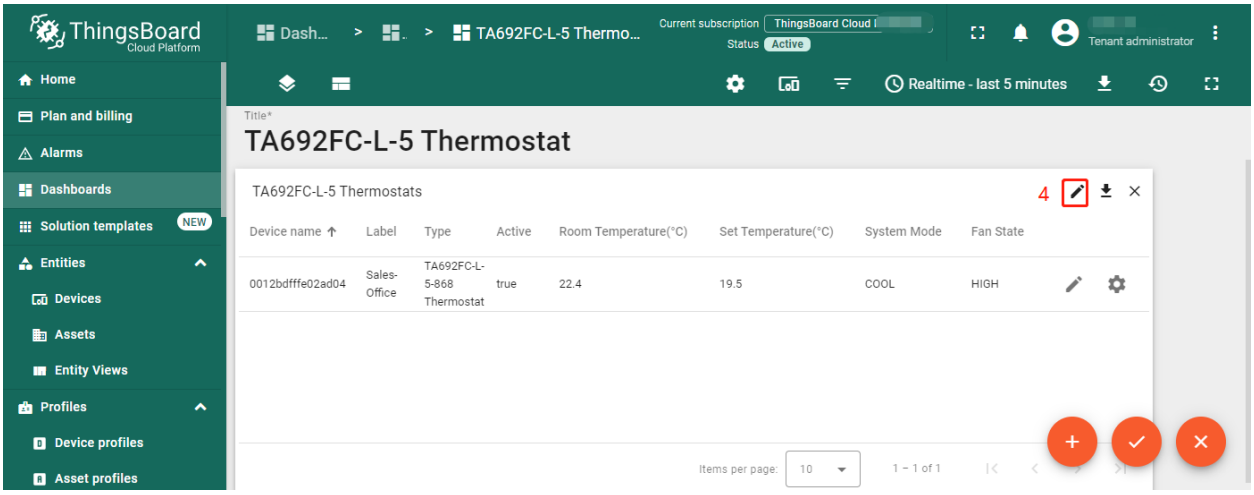
- **Dashboards** –> Click *my list dashboard*



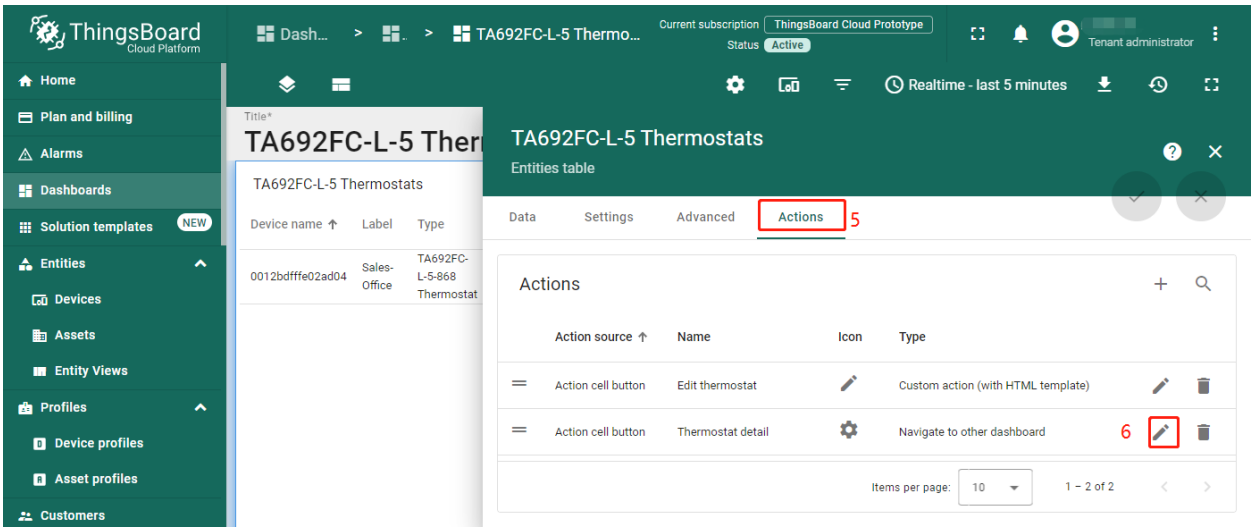
- **Edit** (red icon on the bottom and right)



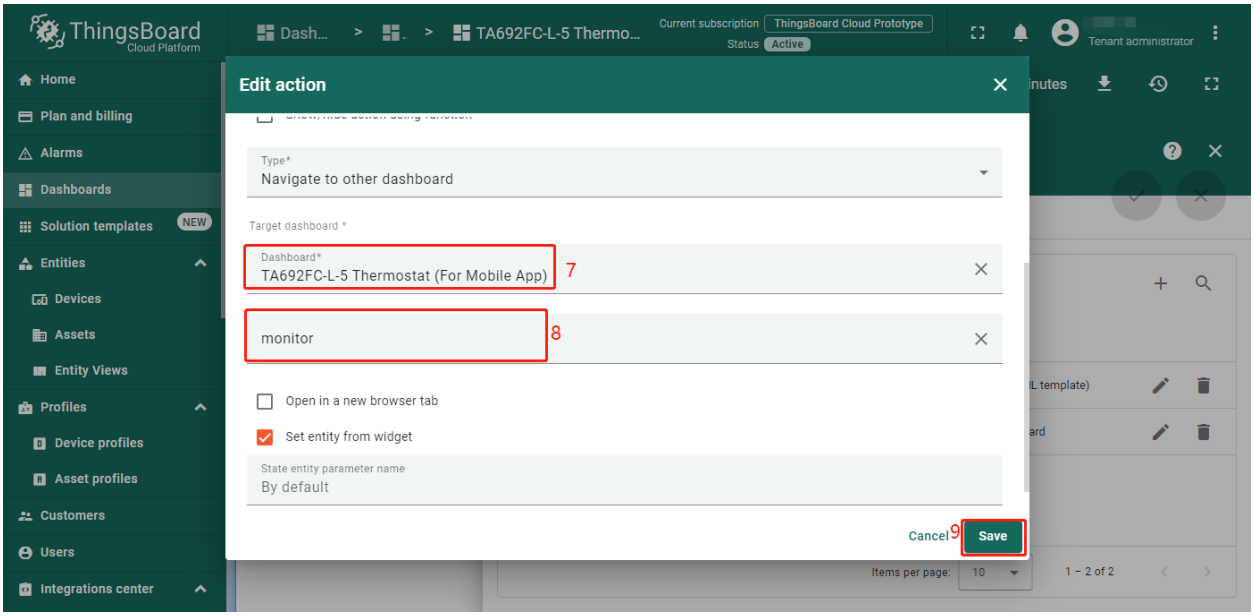
- Enter *Edit Dashboard Mode* –> **Edit Widget** (icon)



- **Action** –> **Edit Action** (icon)



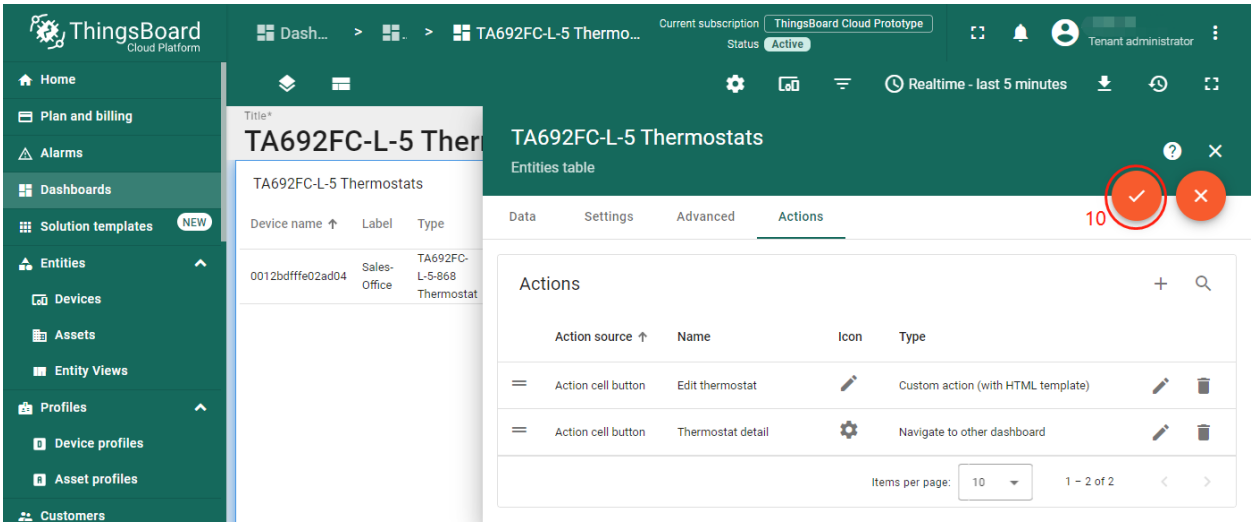
- Modify **Target dashboard** –> modify **Target dashboard state** –> **Save**



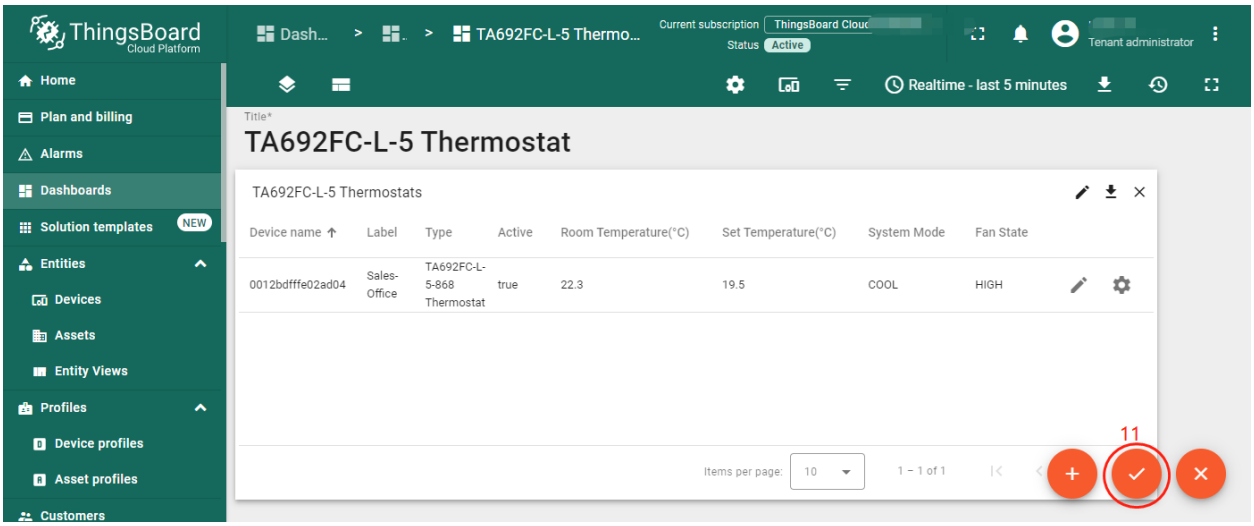
These values are shown in the following table:

Field	Value
Target dashboard	TA692FC-L-5 Thermostat (For Mobile App)
Target dashboard state	monitor

- **Apply changes** (red icon)

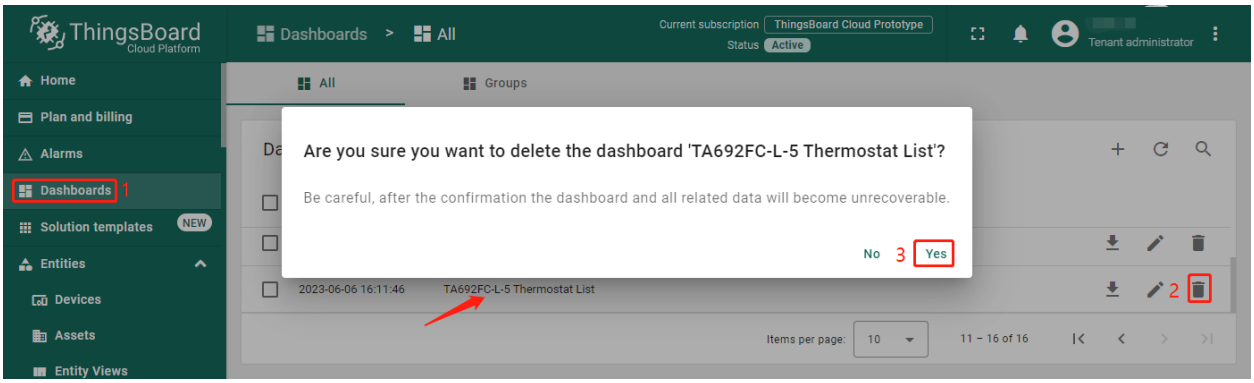


- **Apply changes** (red icon on the bottom and right)



Update List Dashboard

- First, delete this dashboard: **Dashboards** –> Click  in the row of `TA692FC-l-5 Thermostat List` –> **Popup dialog: Are you sure you want to delete …? –> Yes**.



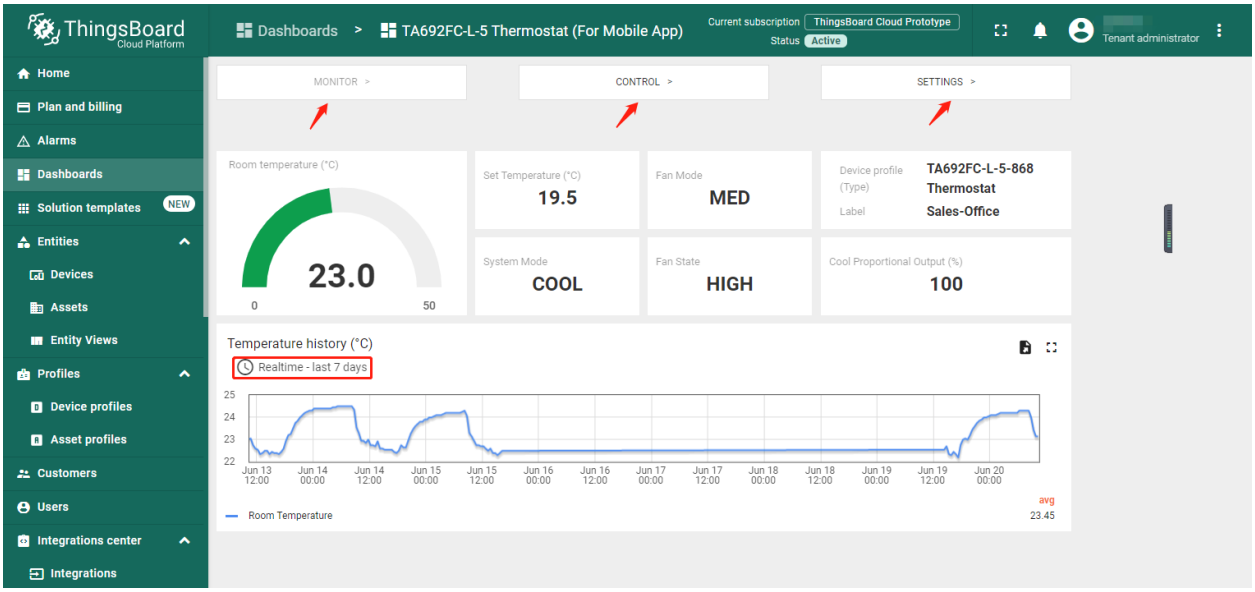
- Next, *import TA692FC-l-5 List Dashboard*.

6.6.3 TA692FC-L-5 Thermostat (For Mobile App)

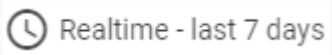
Dashboard states

Monitor state

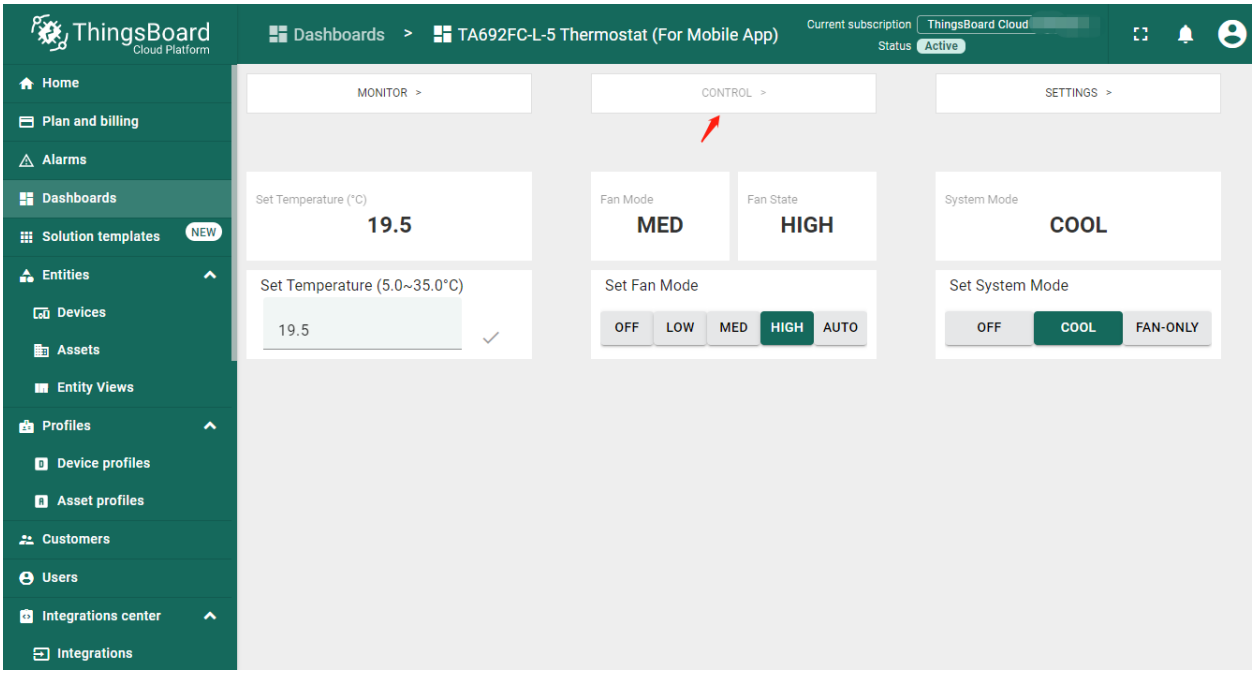
`Monitor state` is root state.



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
MONITOR	skip to *Monitor state*
CONTROL	skip to *Control state*
SETTINGS	skip to *Settings state*
Room Temperature	room temperature
Set Temperature	current setpoint value
System Mode	“OFF”, “OFF”, “COOL” or “FAN-ONLY”
Fan Mode	“OFF”, “LOW”, “MED”, “HIGH” or “AUTO”
Fan Status	“OFF”, “LOW”, “MED” or “HIGH”
Cool Proportional Output	0 ~ 100%
Temperature history	Room temperature history. Click  to edit this timewindow. Refer to *Default state*

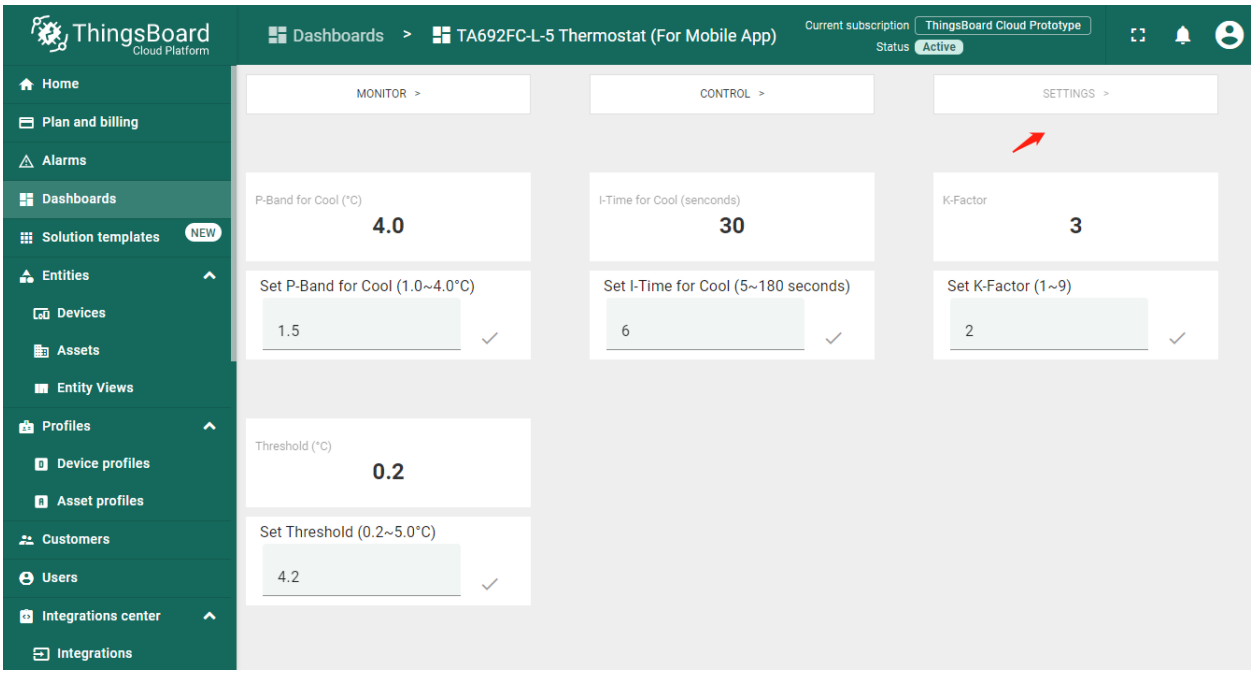
Control state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
Set Temperature	current setpoint value
Set Fan Mode	change fan mode
Set System Mode	change system mode

Settings state



- **Dashboard bar:**
  Hidden. Refer to *Default state*.
- **Widgets:**

Widget	Description
Set P-Band for Cool	1.0 ~ 4.0 °C
Set I-Time for Cool	5 ~ 180 seconds
Set K-Factor	1 ~ 9
Set Threshold	0.2 ~ 5.0 °C

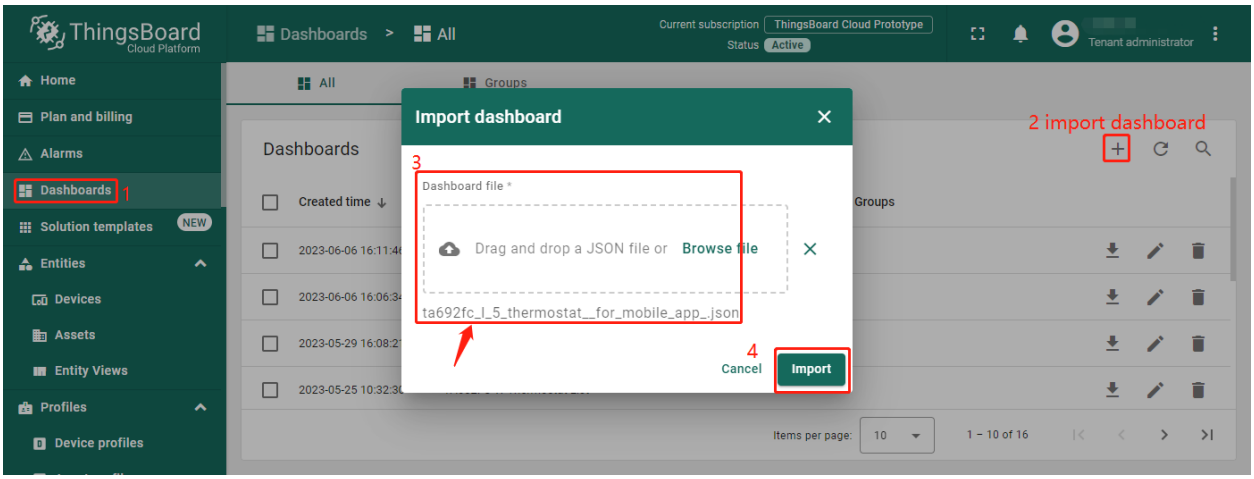
Import Detail Dashboard

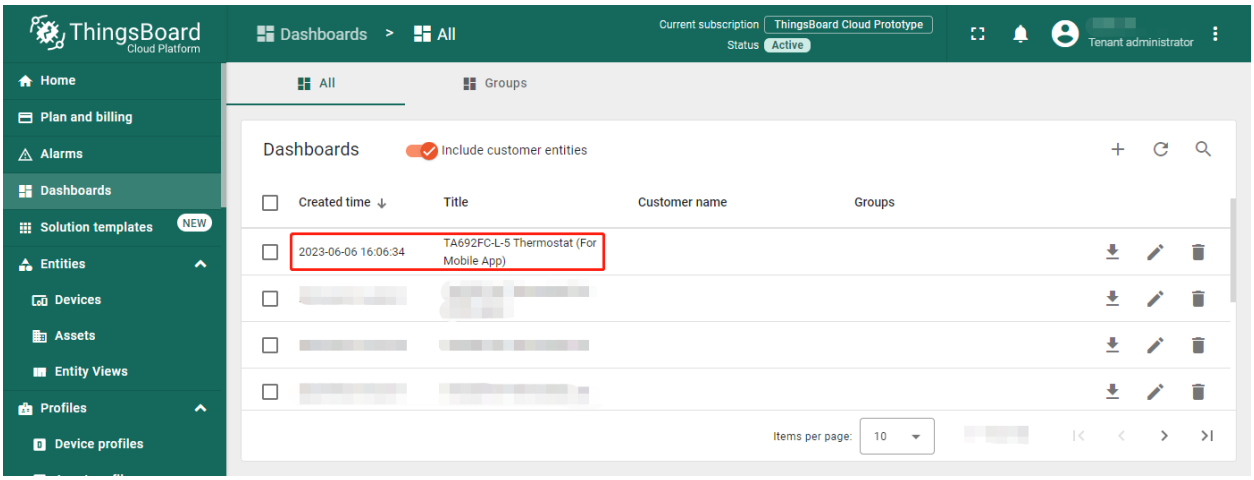
Tip: *A Dashboard file* can only be imported once. If you have already imported it, you don't need and cannot repeat the import.

If you have already imported it, you can skip this step.

In order to use this dashboard, you must to create `ta692fc-l-5 Thermostat Device Profile`. If it doesn't exist, you can import it. See *Import Device Profile of ta692fc-l-5 Thermostat*.

- Download `ta692fc_l_5_thermostat__for_mobile_app_.json`.
- **Dashboards** –> **+** –> **Popup dialog: Import dashboard** –> Drag and drop *detail dashboard File* –> **Import**.

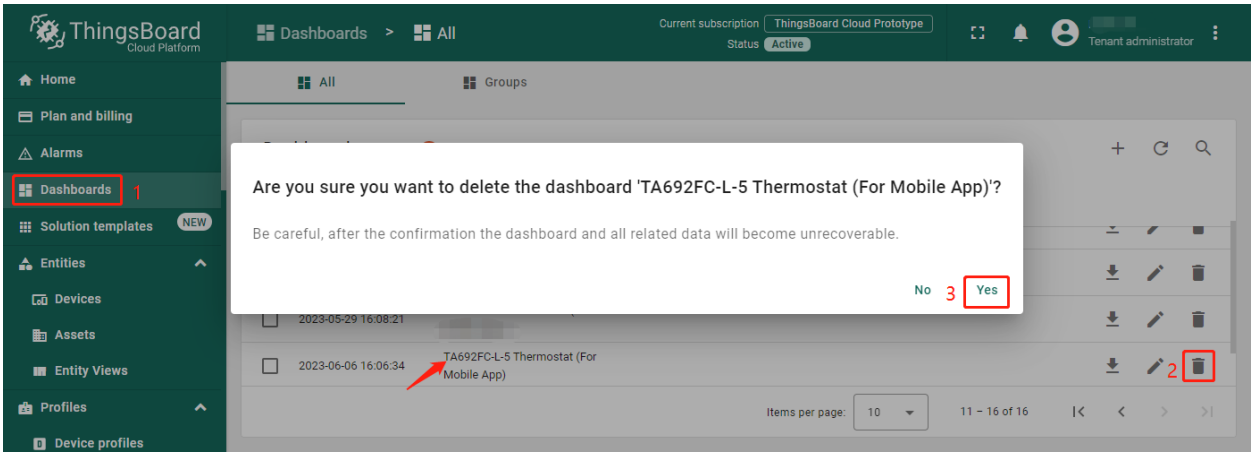




- Optional, This dashboard can be set as `ta692fc-l-5 Thermostat Device Profile`'s mobile dashboard. See *Modify ta692fc-l-5 Thermostat device profile's mobile dashboard*.

Update Detail Dashboard

- First, *clear TA692FC-L-5-868 Thermostat device profile's mobile dashboard*.
- Next, delete this dashboard: **Dashboards** –> Click  in the row of `TA692FC-L-5 Thermostat (For Mobile App)` –> **Popup dialog: Are you sure you want to delete ...?** –> **Yes**.



- Then *import TA692FC-L-5 Detail Dashboard*.

6.7 TA692FC-L-5 LoRaWAN API

Tip:

- This section applies to `TA692FC-L-5`.

6.7.1 Overview

6.7.2 Payload format in LoRA packet used by TA692FC-L-5

Uplink | port 10

Byte	Data	Content	Range
0	data.RoomTemperature (High Byte)	Room Temperature(°C) = D_Room_Temperature/10	0 ~ 400
1	data.RoomTemperature (Low Byte)		
2	data.SetTemperature (High Byte)	Set Temperature(°C) = D_Set_Temperature/10	50 ~ 350
3	data.SetTemperature (Low Byte)		
4	data.CoolProportionalOutput	Cool Proportional Output : 0-100%	0 ~ 100
5	data.FanMode	0:OFF 1:LOW 2:MED 3:HIGH 4: AUTO	0 ~ 4
6	data.FanState	0:OFF 1:LOW 2:MED 3:HIGH	0 ~ 3
7	data.threshold (*)	Temperature change: 0.2°C ~ 5.0°C	2 ~ 50
8	data.SystemMode	0:OFF 1:COOL 2:FAN-ONLY	0 ~ 2
9	Data.CoolPBand	P-Band for Cool : 1.0°C ~ 4.0°C	10 ~ 40
10	Data.CoolItime (High Byte)	I-Time for Cool : 5 ~ 180	5 ~ 180
11	Data.CoolItime (Low Byte)		
12	Data.Kfactor	K-Factor : 1 ~ 9	1 ~ 9

Downlink | port 90

Byte	Data	Content	Range
0	data.SetTemperature (High Byte)	Set Temperature(°C) = D_Set_Temperature/10	50 ~ 350
1	data.SetTemperature (Low Byte)		
2	data.FanMode	0:OFF 1:LOW 2:MED 3:HIGH 4:AUTO	0 ~ 4
3	data.threshold[1]	Temperature change: 0.2°C ~ 5.0°C	2 ~ 50
4	data.SystemMode	0:OFF 1:COOL 2:FAN-ONLY	0 ~ 2
5	Data.CoolPBand	P-Band for Cool : 1.0°C ~ 4.0°C	10 ~ 40
6	Data.CoolItime (High Byte)	I-Time for Cool : 5 ~ 180	5 ~ 180
7	Data.CoolItime (Low Byte)		
8	Data.Kfactor	K-Factor : 1 ~ 9	1 ~ 9

Downlink | port 91

Byte	Data	Content	Range
0	data.SetTemperature (High Byte)	Set Temperature(°C) = D_Set_Temperature/10	50 ~ 350
1	data.SetTemperature (Low Byte)		

Downlink | port 92

Byte	Data	Content	Range
0	data.FanMode	0:OFF 1:LOW 2:MED 3:HIGH 4:AUTO	0 ~ 4

Downlink | port 93

Byte	Data	Content	Range
0	data.threshold[2]	Temperature change: 0.2°C ~ 5.0°C	2 ~ 50

[1] D_update_threshold determines the minimum change in ambient room temp required to trigger a send event i.e. uplink. The range is from 0.2 to 5 centigrade. However, this parameter is limited by another named, “sending interval”, hardcoded 15 seconds.
e.g. if change in temp > 0.2°C, or, fan status change, or user press a button etc., sends uplink immediately

[2] D_update_threshold determines the minimum change in ambient room temp required to trigger a send event i.e. uplink. The range is from 0.2 to 5 centigrade. However, this parameter is limited by another named, “sending interval”, hardcoded 15 seconds.
e.g. if change in temp > 0.2°C, or, fan status change, or user press a button etc., sends uplink immediately

Downlink | port 94

Byte	Data	Content	Range
0	data.SystemMode	0:OFF 1:COOL 2:FAN-ONLY	0 ~ 2

Downlink | port 95

Byte	Data	Content	Range
0	Data.CoolPBand	P-Band for Cool : 1.0°C ~ 4.0°C	10 ~ 40

Downlink | port 97

Byte	Data	Content	Range
0	Data.CoolItime (High Byte)	I-Time for Cool : 5 ~ 180	5 ~ 180
1	Data.CoolItime (Low Byte)		

Downlink | port 95

Byte	Data	Content	Range
0	Data.Kfactor	K-Factor : 1 ~ 9	1 ~ 9

CHAPTER

SEVEN

AVAN-STATS APP

Release notes about documents, MQTT protocol, widgets, dashboard, etc.

Thermostat / Humidistat Wi-Fi Setup Guide – *iOS* | *Android*

User Guide

FAQ

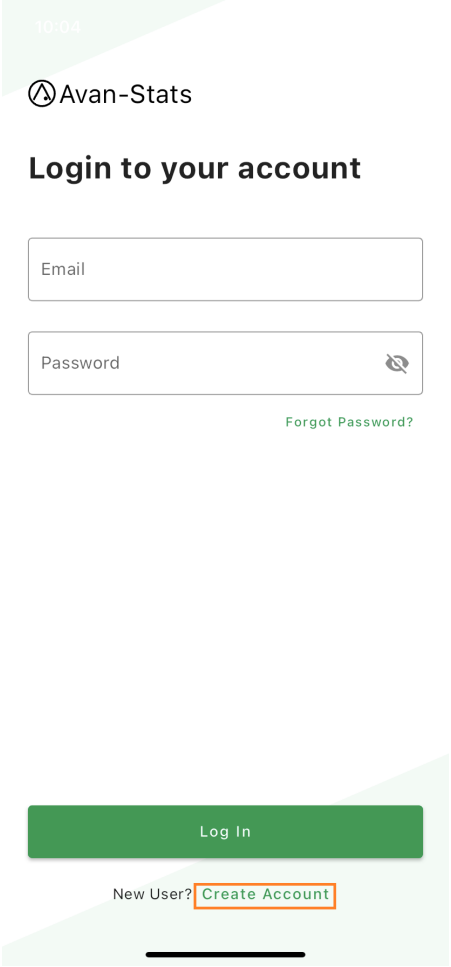
7.1 Avan-Stats Thermostat / Humidistat Wi-Fi Setup Guide (iOS)

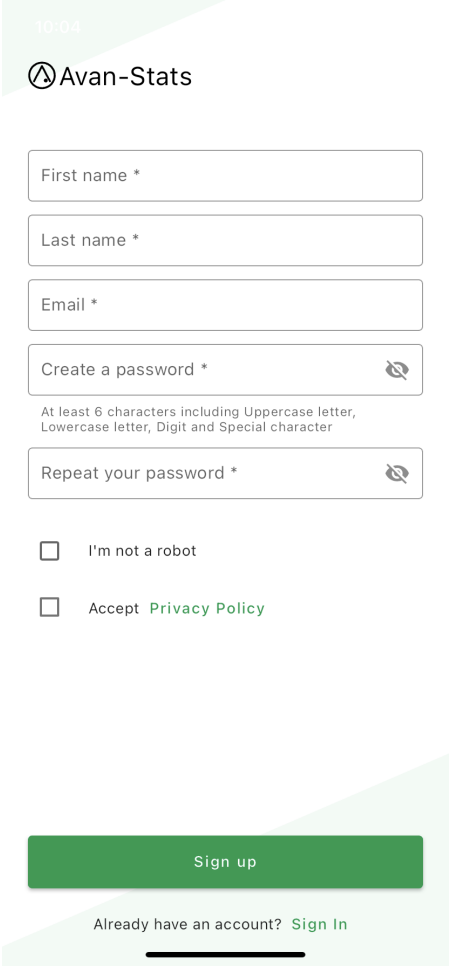
Download on the App Store

Avan-Stats (App Store)

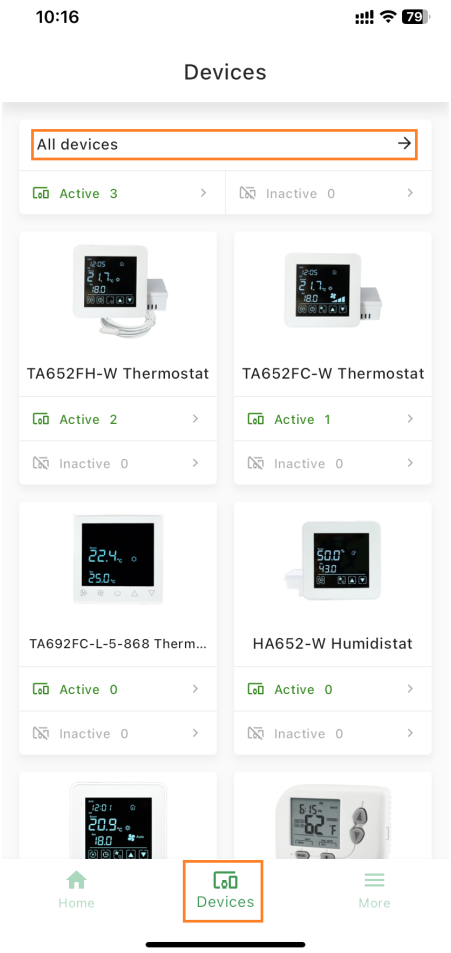
1. Press *Create Account* to Create an account for first-time users. *Sign up* by Email and Login.

   Password must be at least **6** characters, including **Uppercase** letter, **Lowercase** letter, **Digit** and **Special** character.

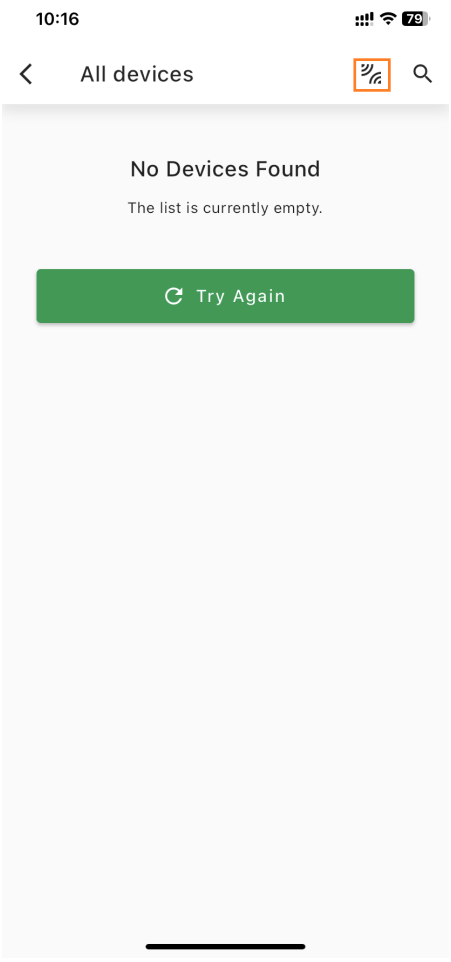

10:04
Avan-Stats
Login to your account
Email
Password
Forgot Password?
Log In
New User? Create Account

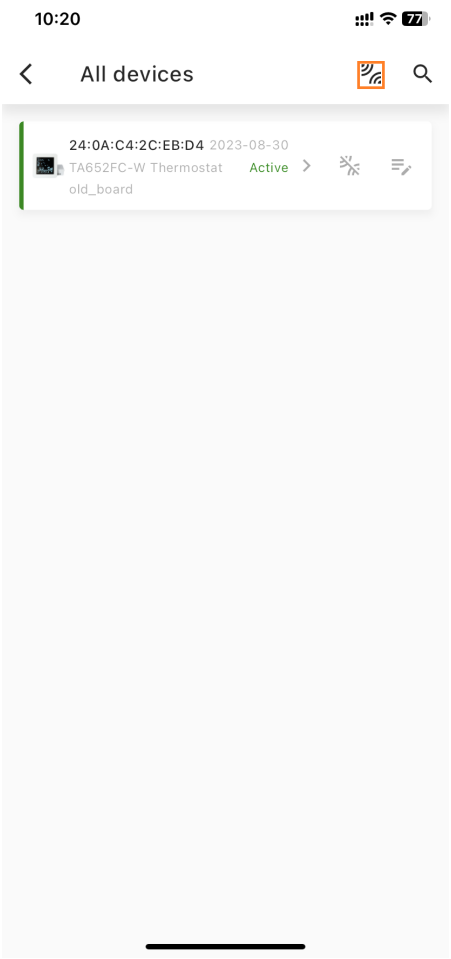


2. Press  and *All devices* ->.

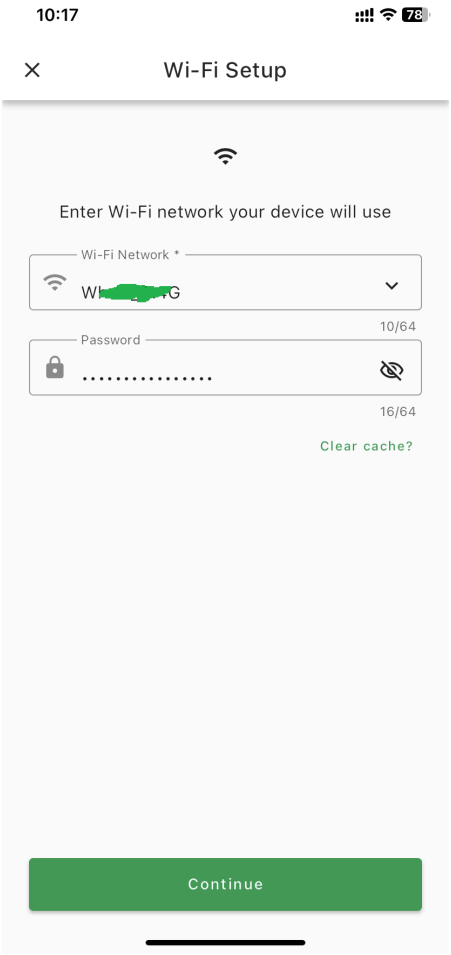


3. Press  to Claim and add new device.

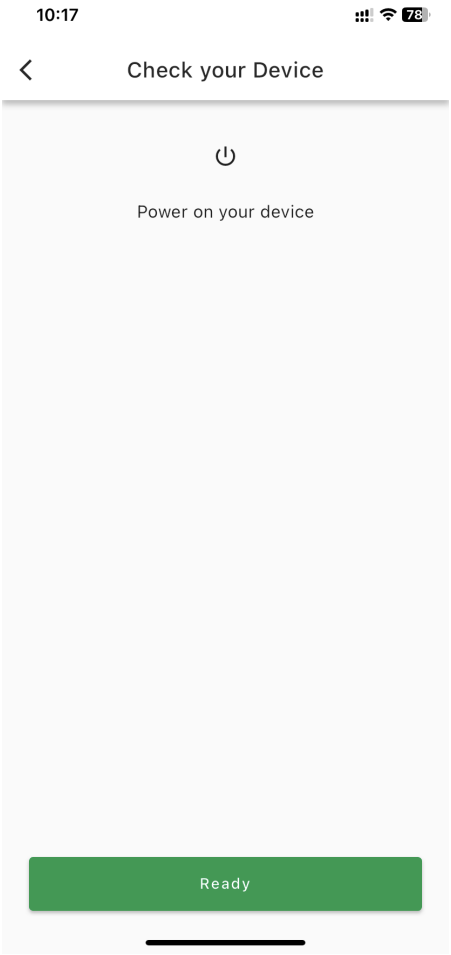

10:16
All devices
No Devices Found
The list is currently empty.
Try Again



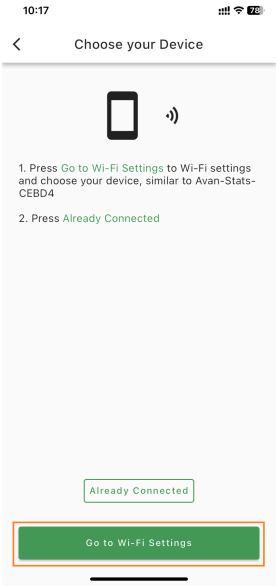
4. Enter Wi-Fi network and Press *Continue*.

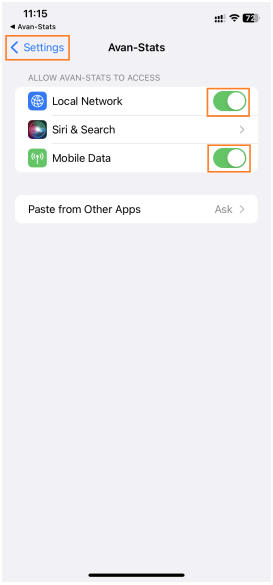


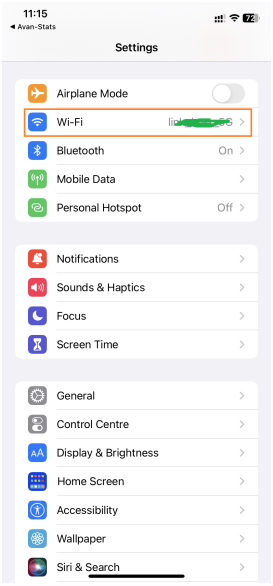
5. Power on your device and Press *Ready*.

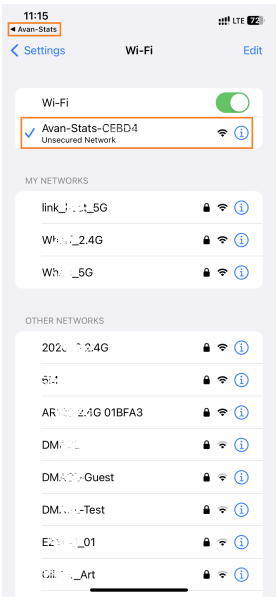


6. Press *Go to Wi-Fi Settings*, Switch to Wi-Fi settings and Find your Device, e.g. **Avan-Status-CEBD4**

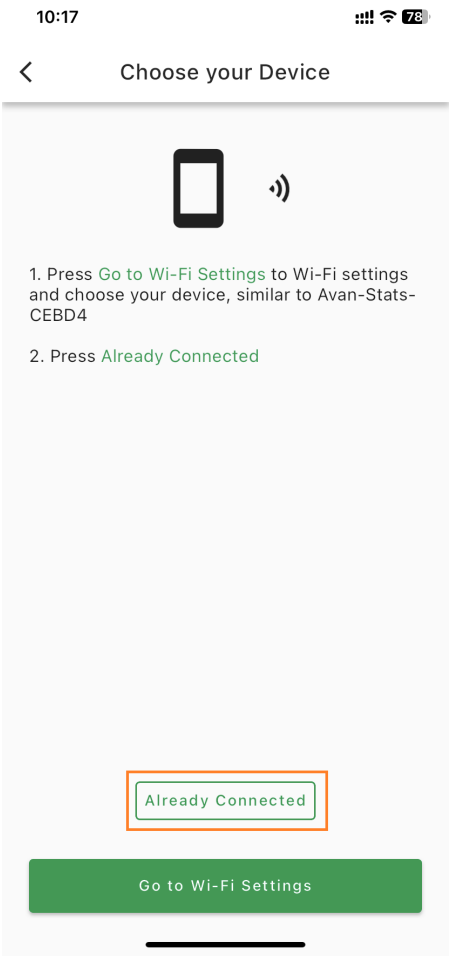



11:15
Avan-Stats
Settings
Avan-Stats
ALLOW AVAN-STATS TO ACCESS
Local Network
Siri & Search
Mobile Data
Paste from Other Apps
Ask

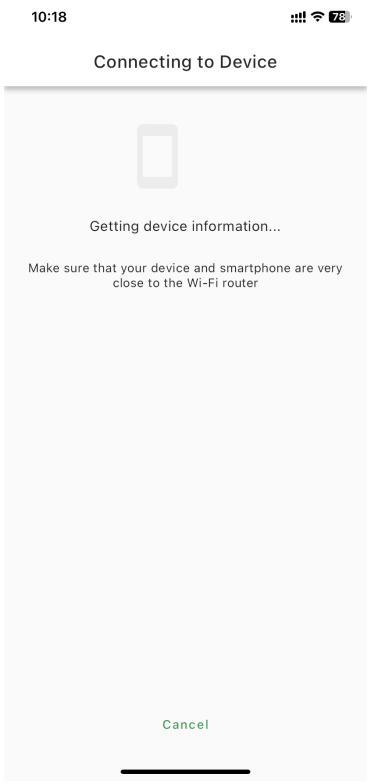

11:15
Avan-Stats
Settings
Airplane Mode
Wi-Fi
Bluetooth
On
Mobile Data
Personal Hotspot
Off
Notifications
Sounds & Haptics
Focus
Screen Time
General
Control Centre
Display & Brightness
Home Screen
Accessibility
Wallpaper
Siri & Search

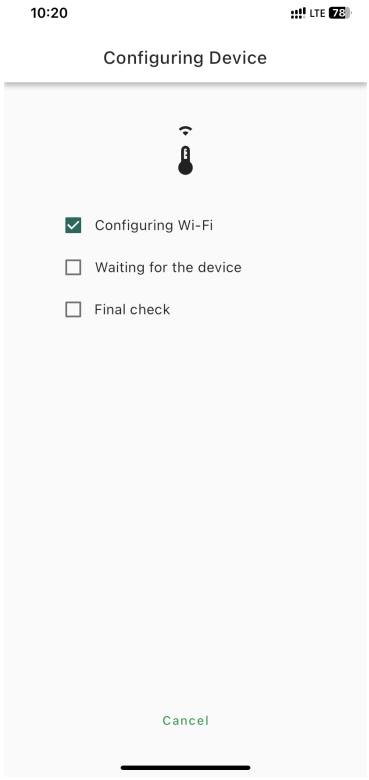


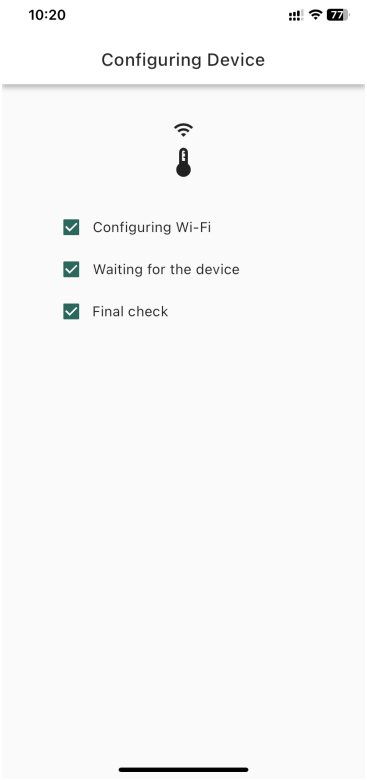
7. Go back and Press *Already Connected*.



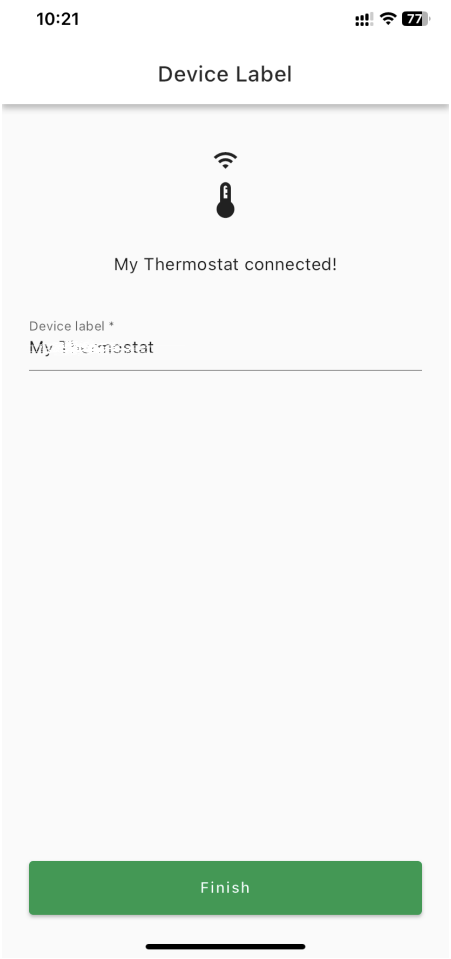
8. Wait for connection.


10:18
Connecting to Device
Getting device information...
Make sure that your device and smartphone are very close to the Wi-Fi router
Cancel

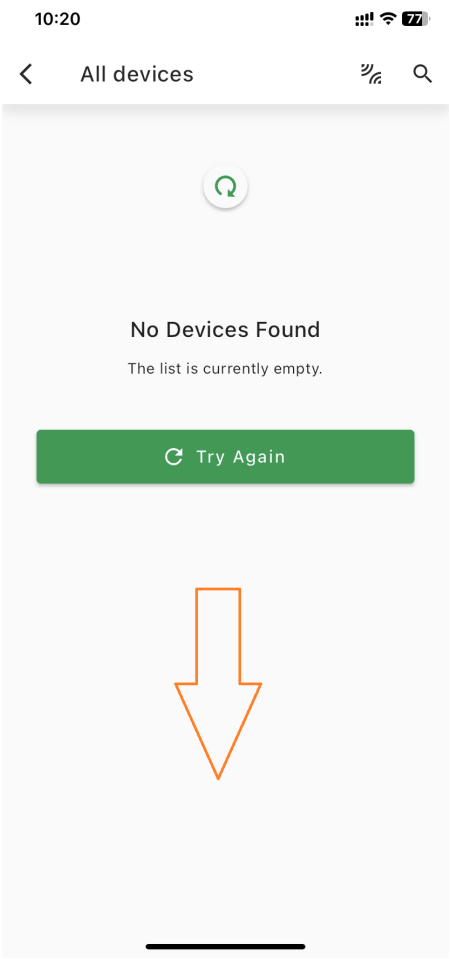

10:20
Configuring Device
Configuring Wi-Fi
Waiting for the device
Final check
Cancel

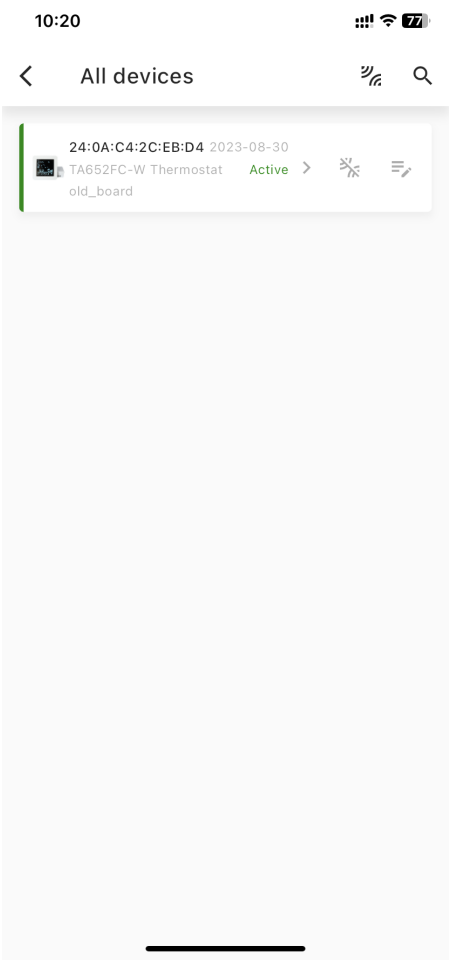


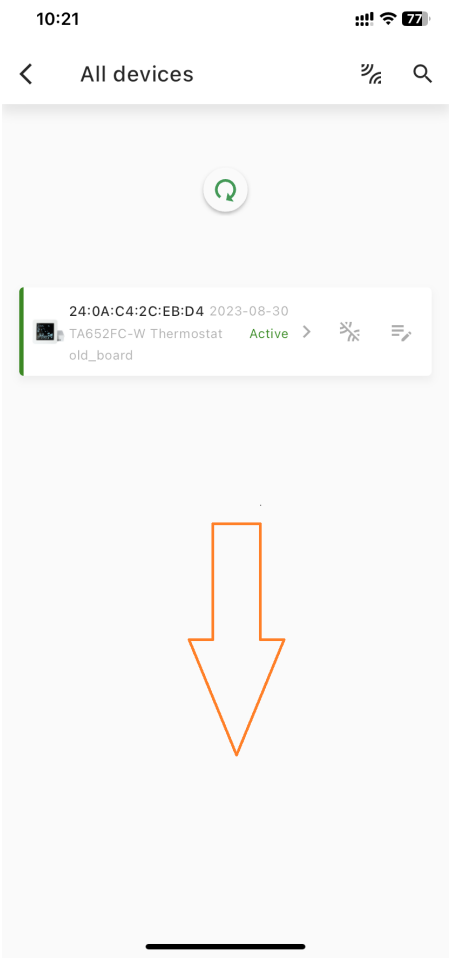
9. Device connected and Label.

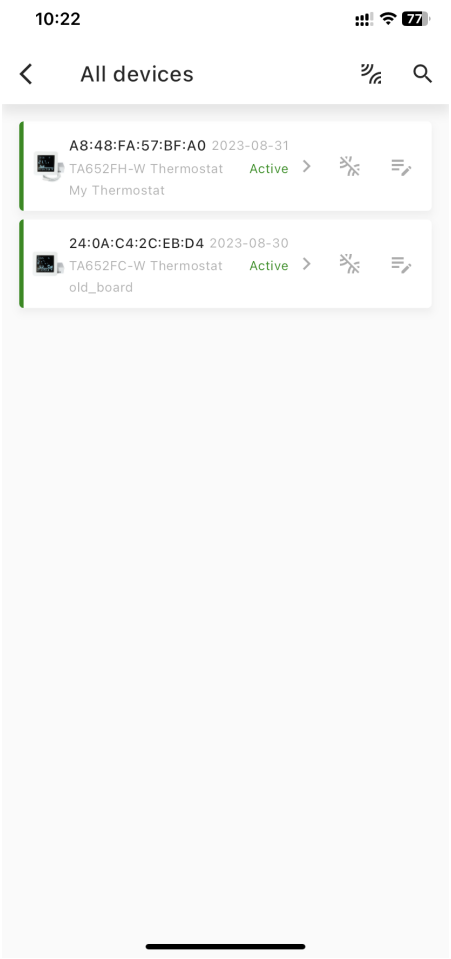


10. Pull down to refresh device list.


10:20
All devices
No Devices Found
The list is currently empty.
Try Again


10:20
All devices
24:0A:C4:2C:EB:D4 2023-08-30
TA652FC-W Thermostat
Active
old_board


10:21
All devices
24:0A:C4:2C:EB:D4 2023-08-30
TA652FC-W Thermostat
Active
old_board



-End-

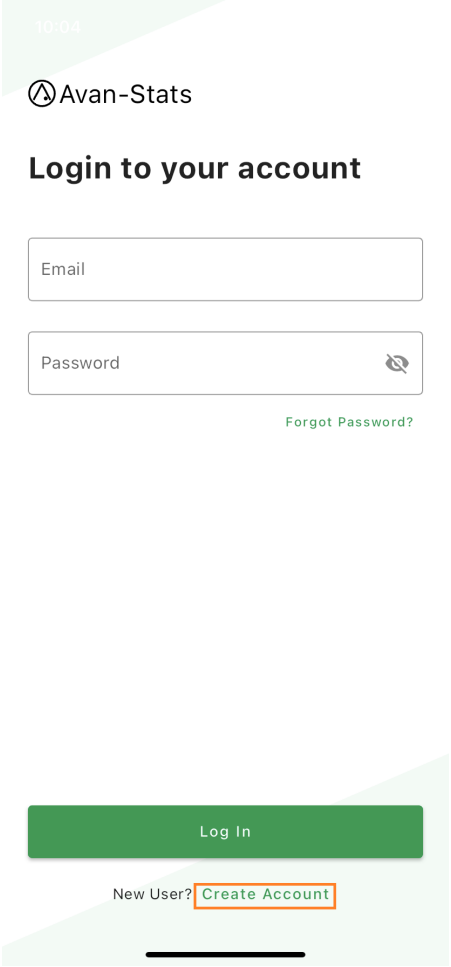
7.2 Avan-Stats Thermostat / Humidistat Wi-Fi Setup Guide (Android)

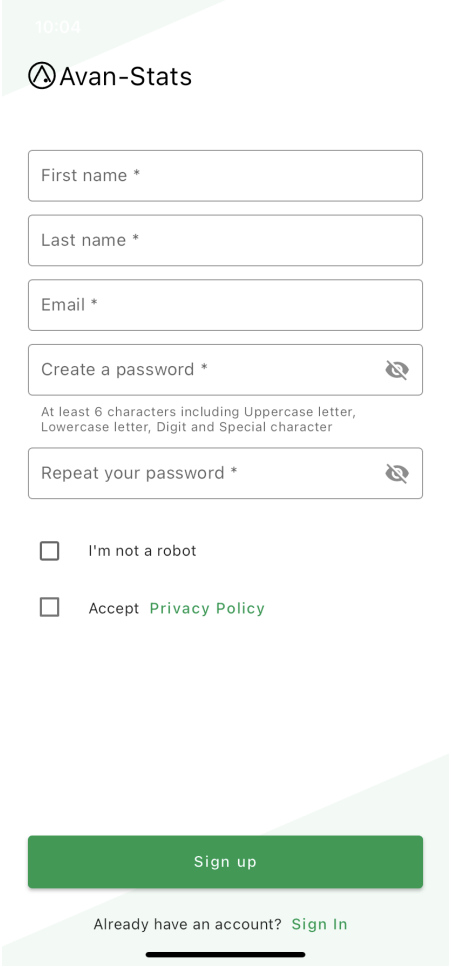
Download for Android

Avan-Stats (Google Play)

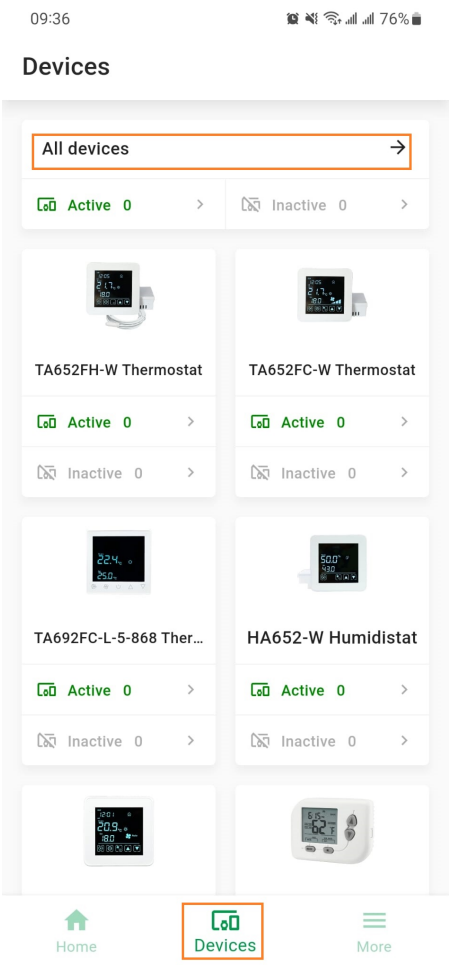
1. Press *Create Account* to Create an account for first-time users. *Sign up* by Email and Login.

   Password must be at least **6** characters, including **Uppercase** letter, **Lowercase** letter, **Digit** and **Special** character.

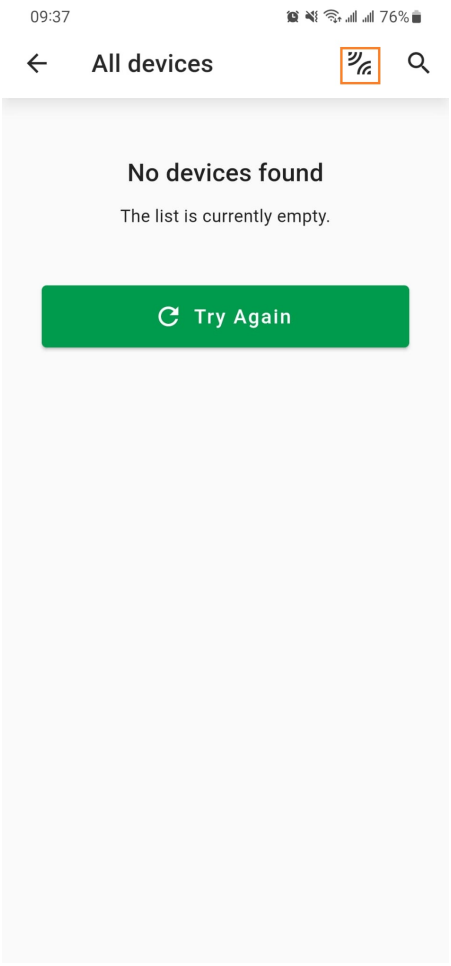

10:04
Avan-Stats
Login to your account
Email
Password
Forgot Password?
Log In
New User? Create Account



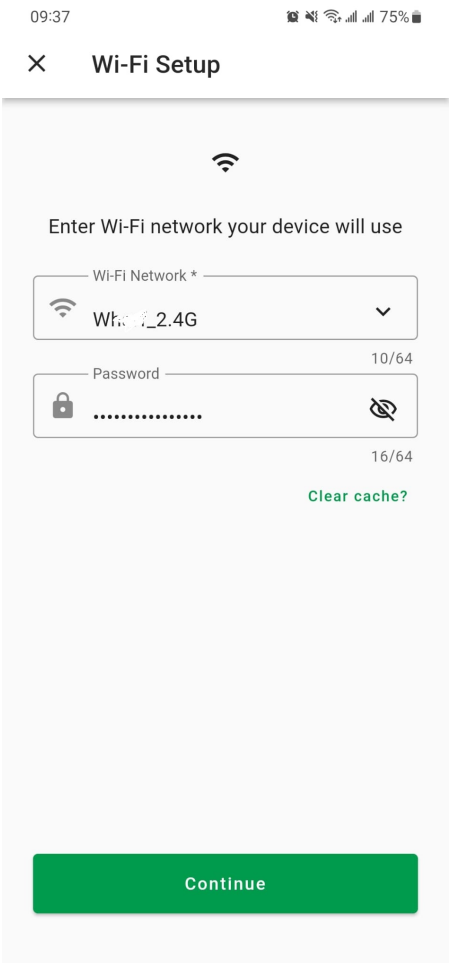
2. Press  and *All devices* ->.



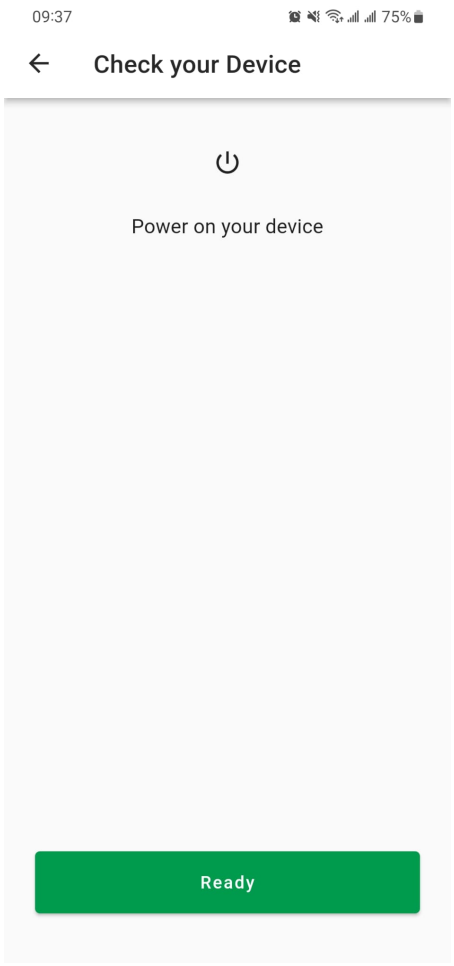
3. Press  to Claim and add new device.



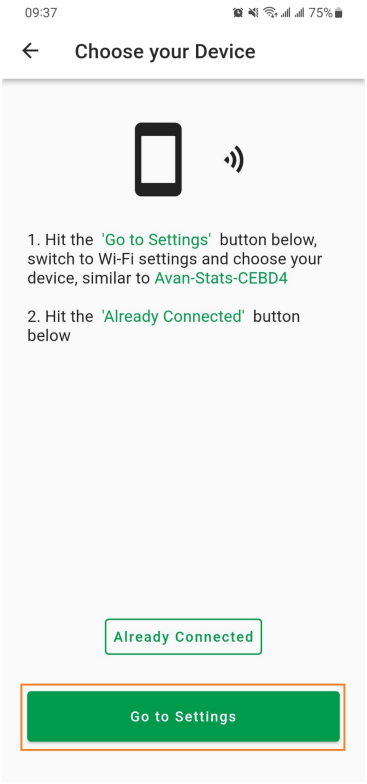
4. Enter Wi-Fi network and Press *Continue*.

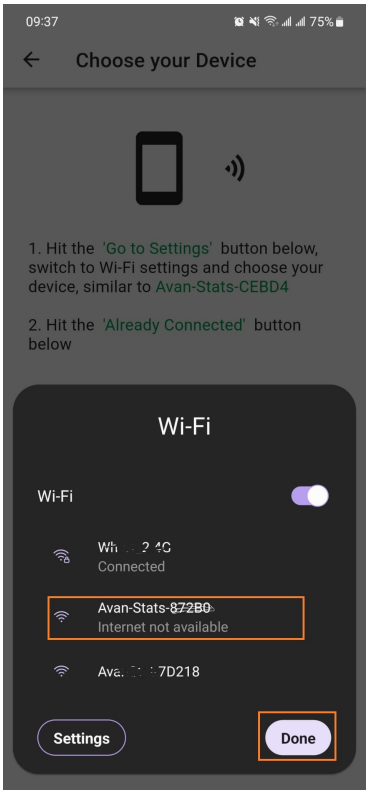


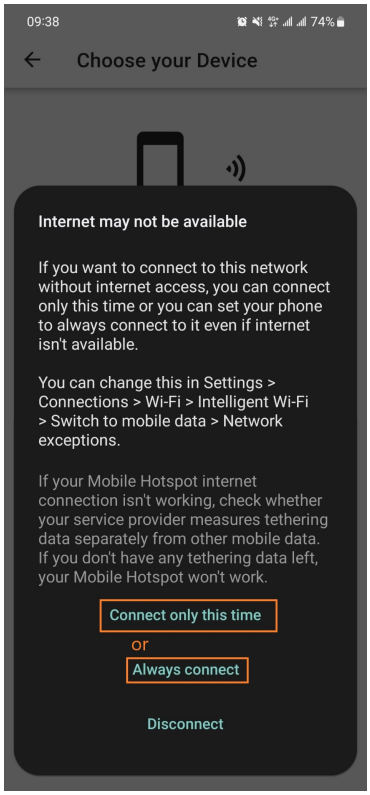
5. Power on your device and Press *Ready*.



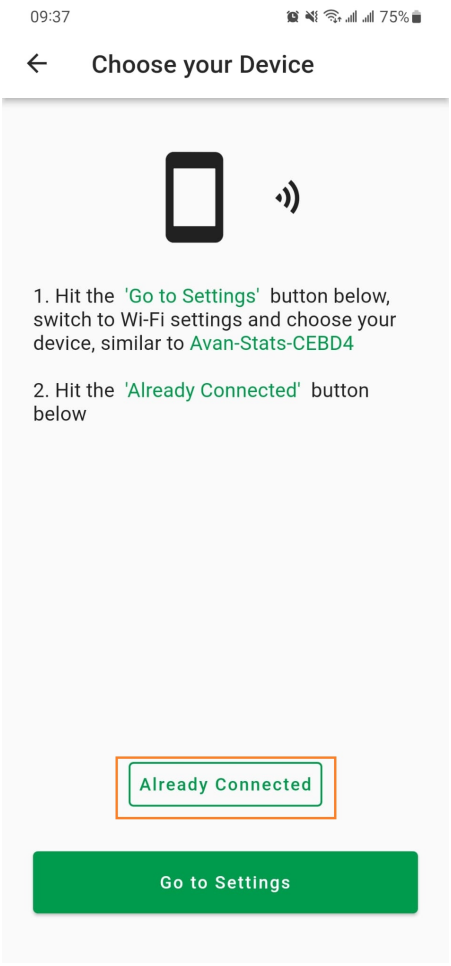
6. Press *Go to Wi-Fi Settings*, Switch to Wi-Fi settings and Choose your Device, e.g. **Avan-Status-CEBD4**, Select *Connect only this time* or *Always connect*.


09:37
75%
Choose your Device
1. Hit the 'Go to Settings' button below, switch to Wi-Fi settings and choose your device, similar to Avan-Stats-CEBD4
2. Hit the 'Already Connected' button below
Already Connected
Go to Settings

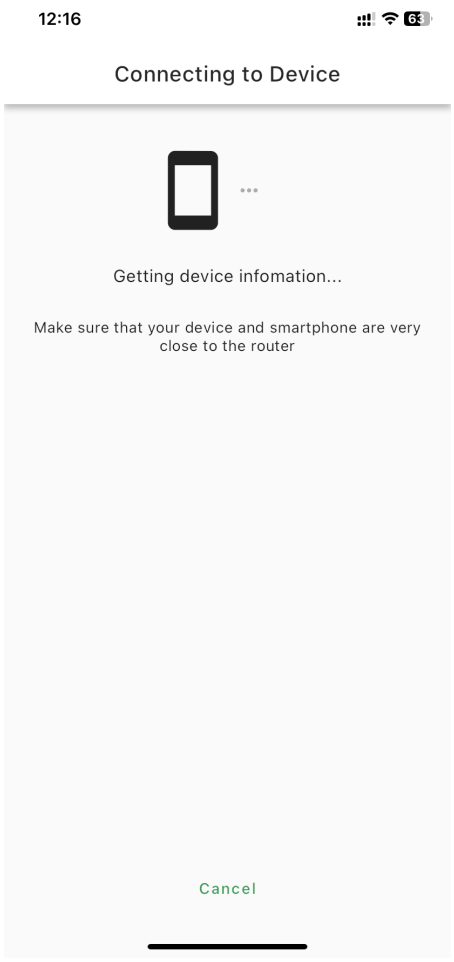

09:37
75%
Choose your Device
1. Hit the 'Go to Settings' button below, switch to Wi-Fi settings and choose your device, similar to Avan-Stats-CEBD4
2. Hit the 'Already Connected' button below
Wi-Fi
Wi-Fi
Connected
Avan-Stats-872B0
Internet not available
7D218
Settings
Done

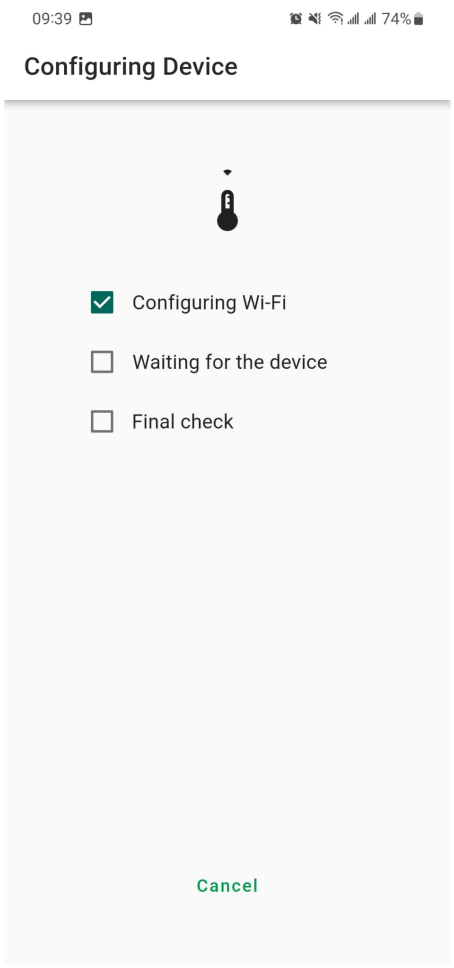


7. Go back and Press *Already Connected*.

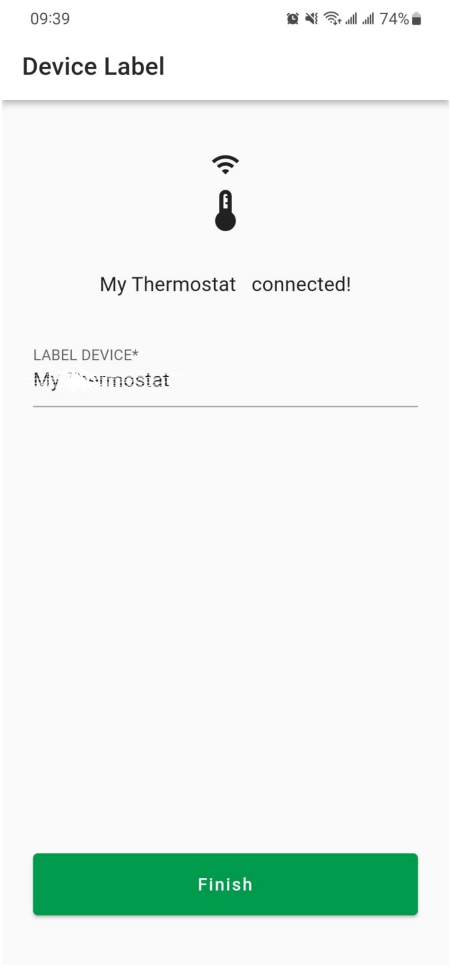


8. Wait for connection.

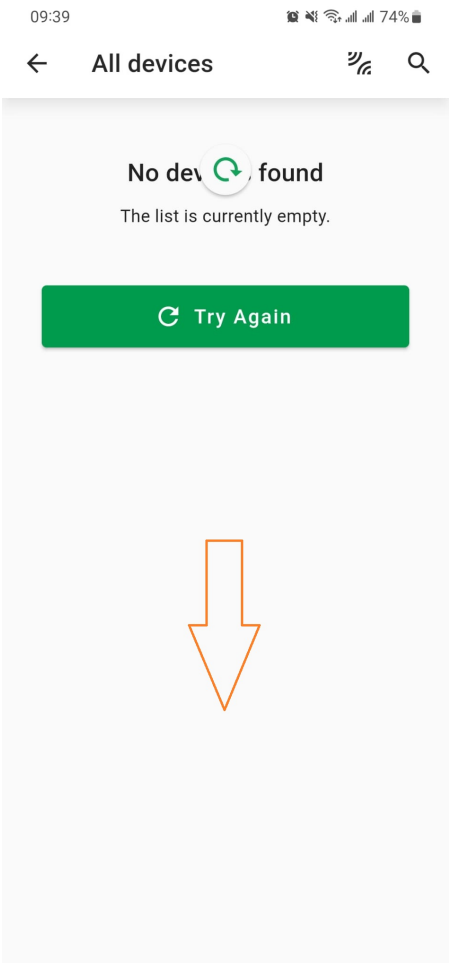

12:16
Connecting to Device
Getting device infomation...
Make sure that your device and smartphone are very close to the router
Cancel

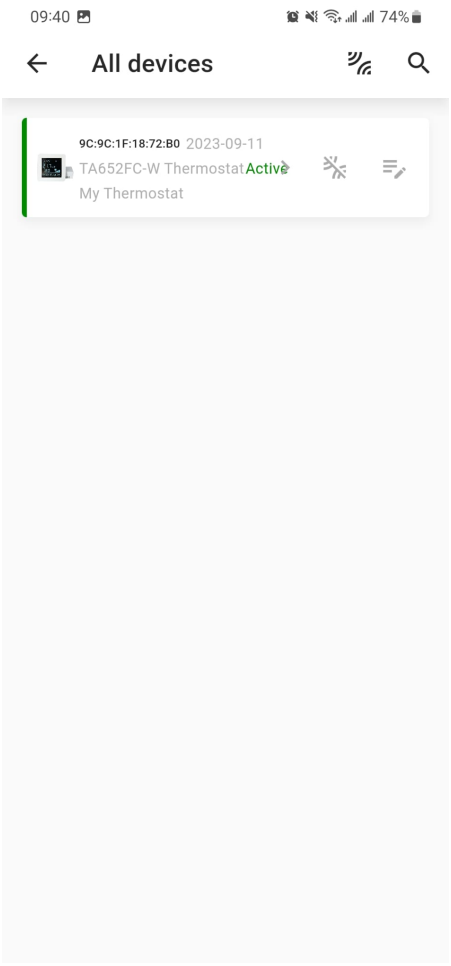


9. Device connected and Label.



10. Pull down to refresh device list.


09:39
74%
All devices
No dev found
The list is currently empty.
Try Again



-End-

7.3 Avan-Stats app User Guide

7.3.1 Download app

Download on the App Store

Avan-Stats (App Store)

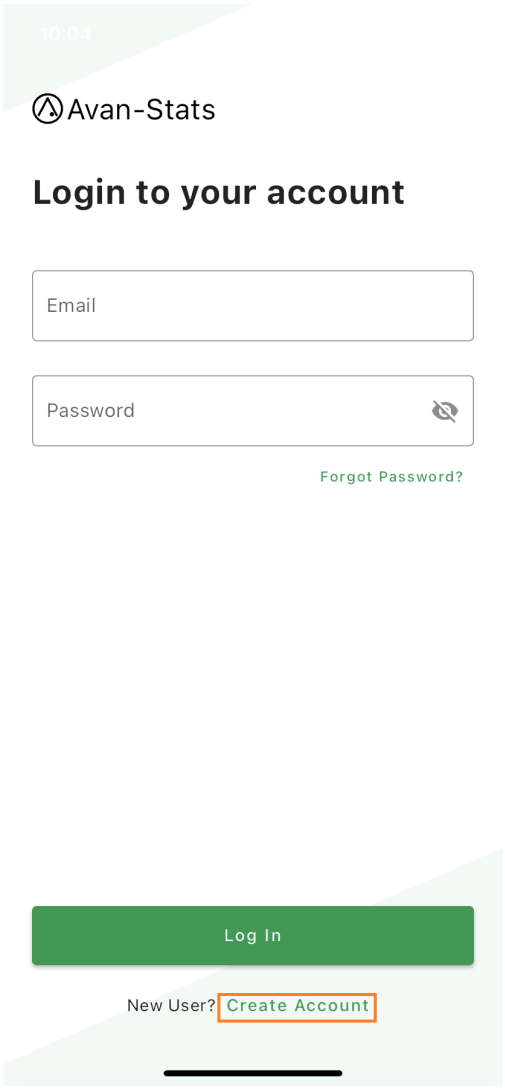
Avan-Stats (Google Play)

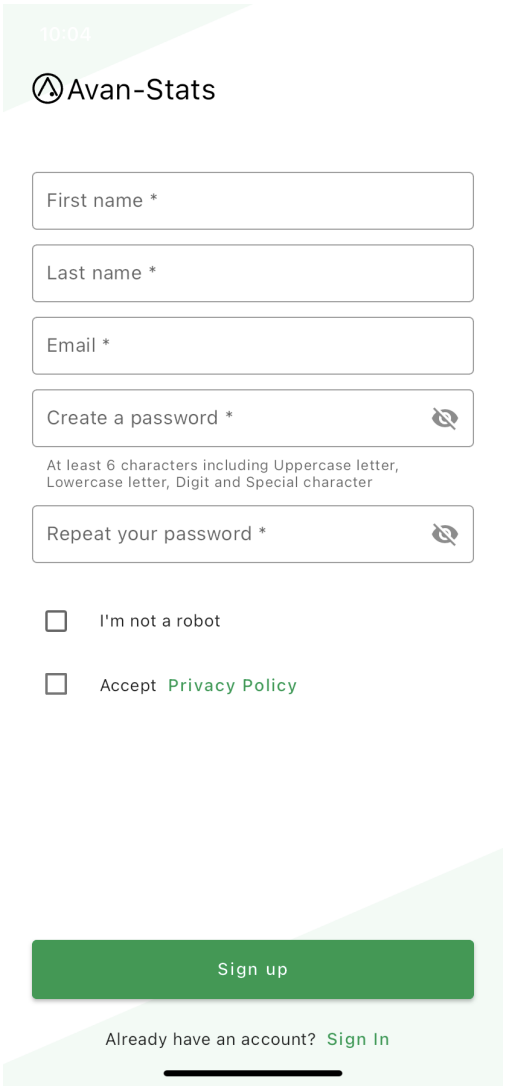
7.3.2 Create Account

Tip: If you cannot receive the registration email, you can try using **Gmail** or **Yahoo Mail**.

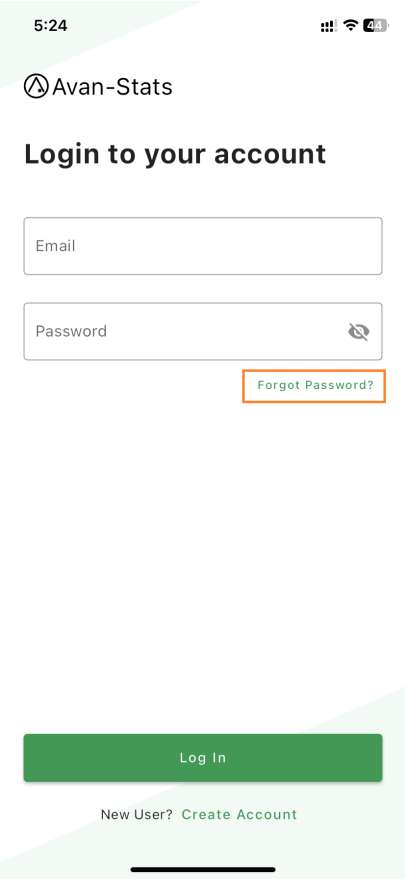
Press *Create Account* to Create an account for first-time users. *Sign up* by Email and Login.

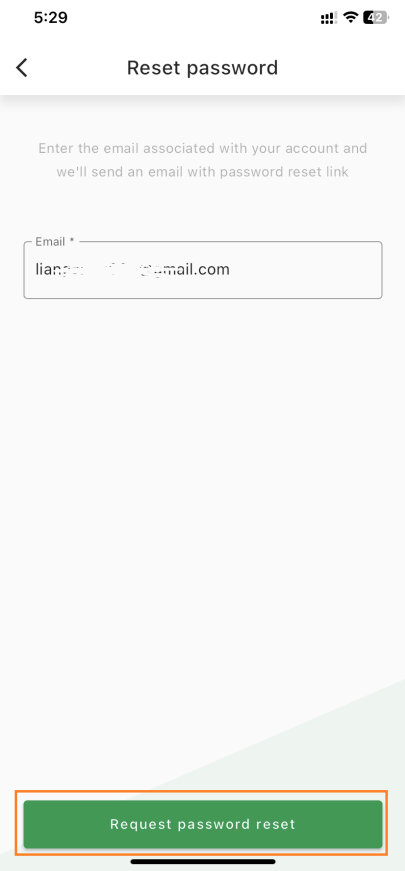
Password must be at least **6** characters, including **Uppercase** letter, **Lowercase** letter, **Digit** and **Special** character.

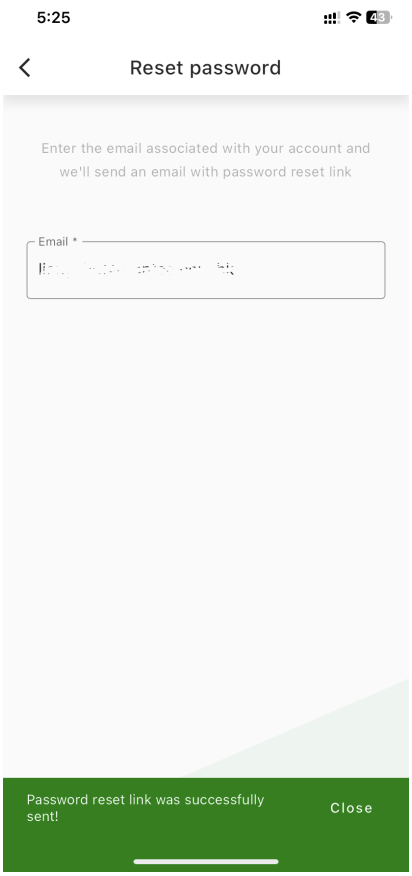

10:04
Avan-Stats
Login to your account
Email
Password
Forgot Password?
Log In
New User? Create Account

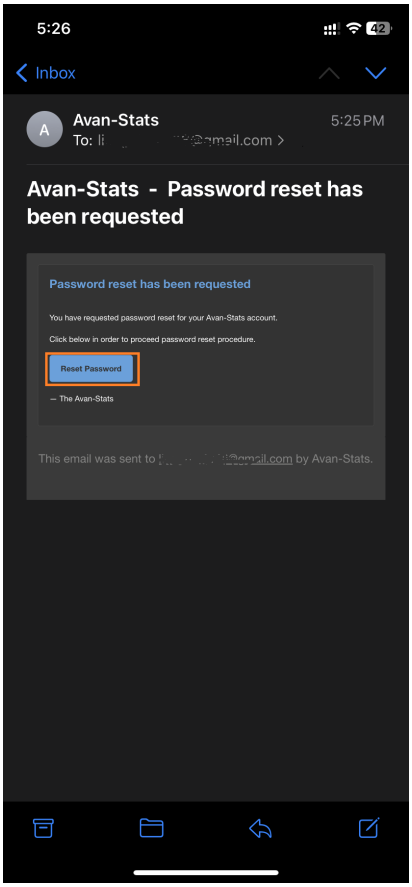

10:04
Avan-Stats
First name *
Last name *
Email *
Create a password *
At least 6 characters including Uppercase letter, Lowercase letter, Digit and Special character
Repeat your password *
I'm not a robot
Accept Privacy Policy
Sign up
Already have an account? Sign In

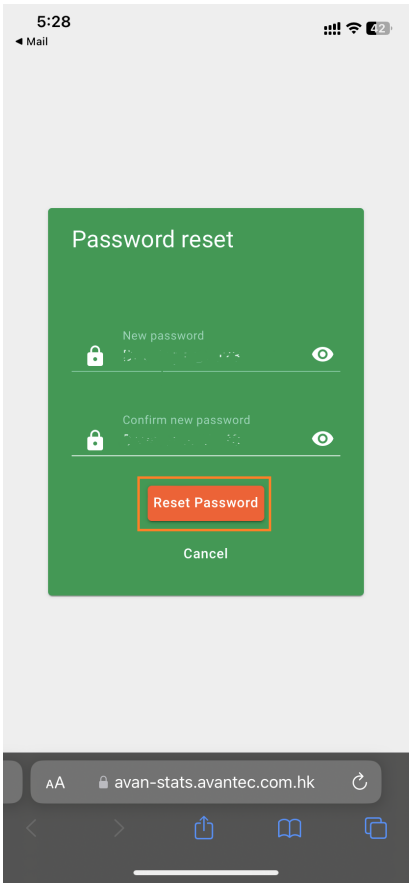
7.3.3 Forgot Password

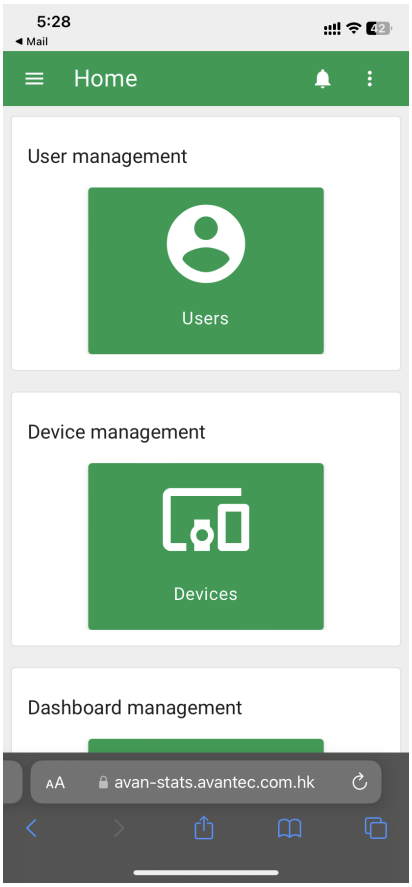



5:29
Reset password
Enter the email associated with your account and we'll send an email with password reset link
Email *
Request password reset


5:25
Reset password
Enter the email associated with your account and we'll send an email with password reset link
Email *
Password reset link was successfully sent!
Close


5:26
Inbox
Avan-Stats
To: li
5:25 PM
Avan-Stats - Password reset has been requested
Password reset has been requested
You have requested password reset for your Avan-Stats account.
Click below in order to proceed password reset procedure.
Reset Password
– The Avan-Stats
This email was sent to
by Avan-Stats.

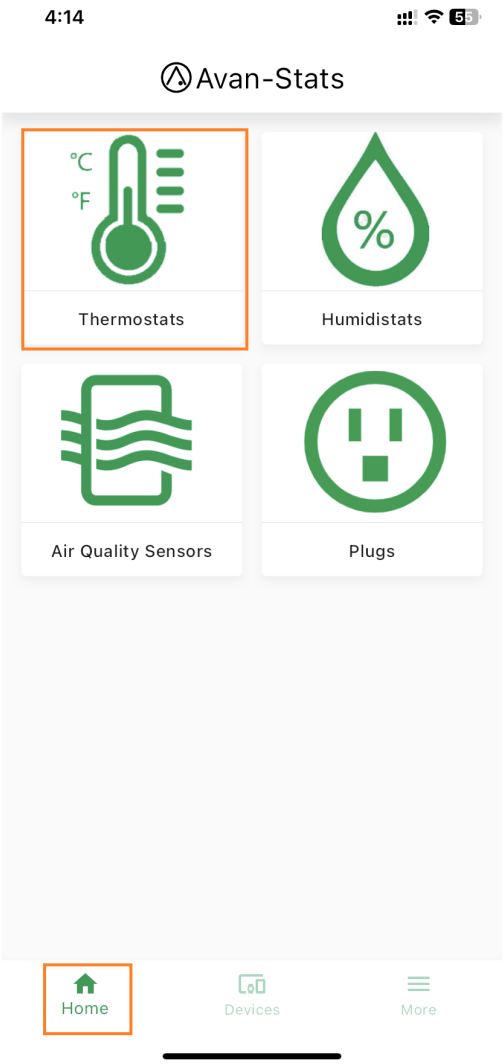

5:28
Mail
Password reset
New password
Confirm new password
Reset Password
Cancel
AA
avan-stats.avantec.com.hk

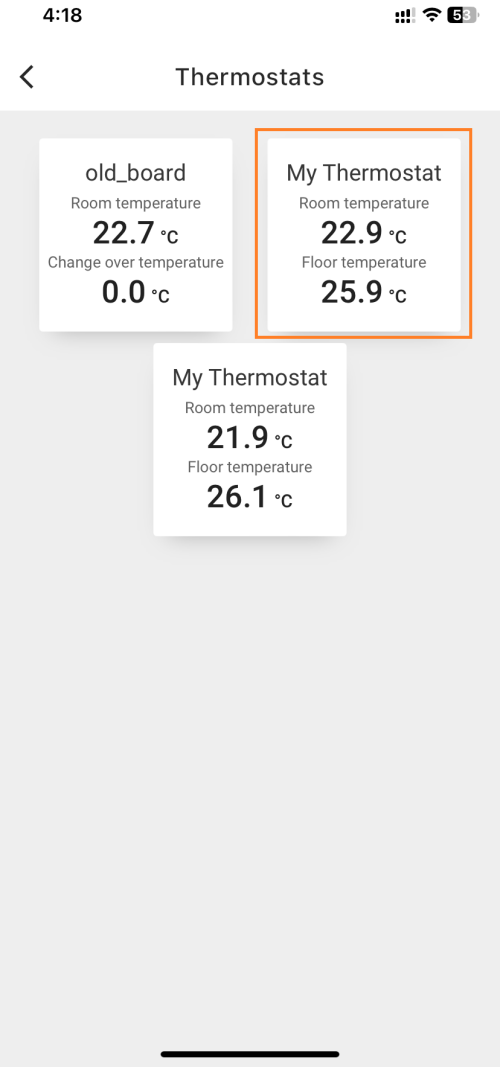


After confirming the new password, you will jump to the web page. But you can *Sign up* on the App with your new password.

7.3.4 Home

Thermostats



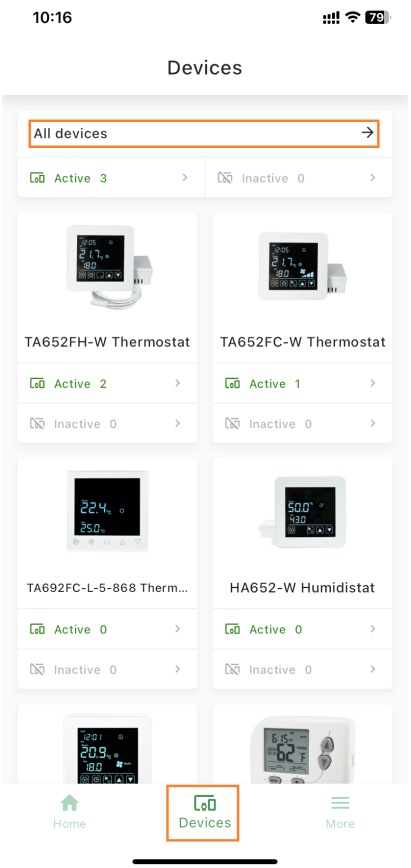


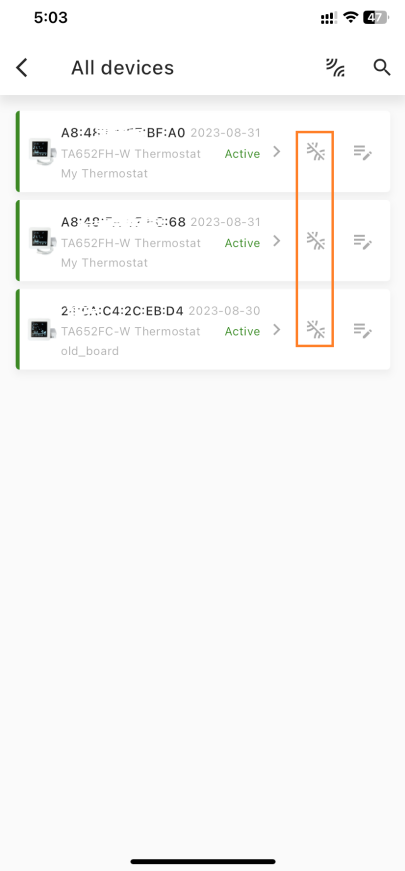
7.3.5 Devices

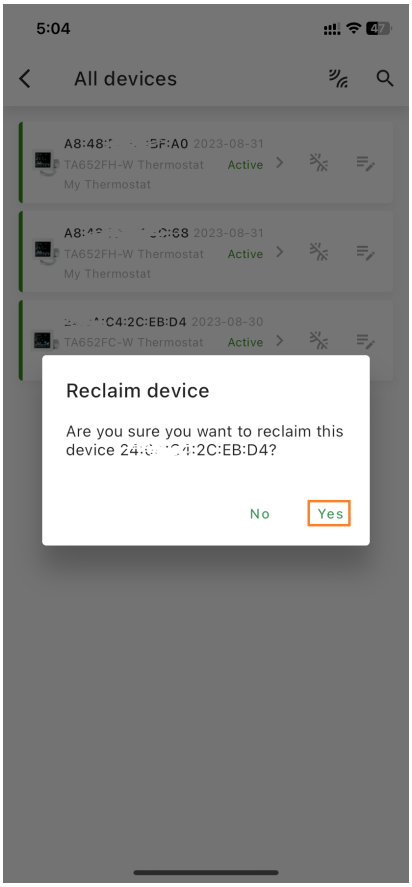
Claim & Add Device

See *Avan-Stats Thermostat / Humidistat Wi-Fi Setup Guide (iOS)* or *(Android)*.

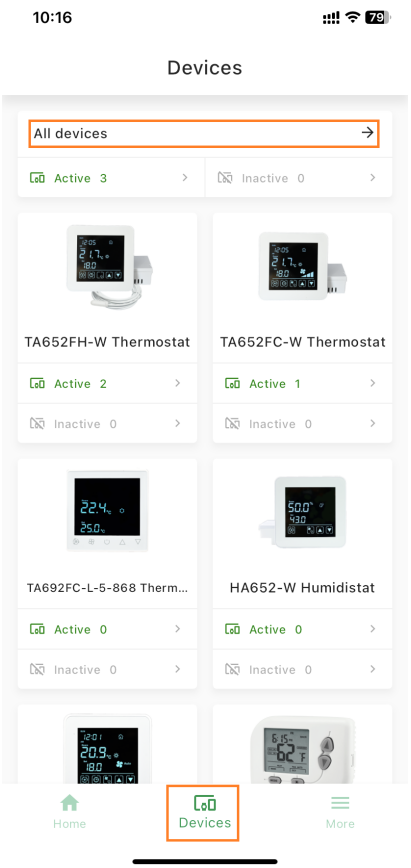
Reclaim Device

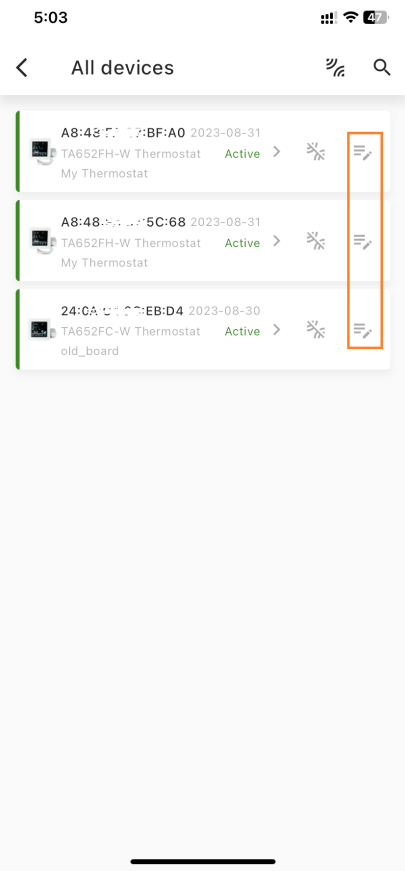


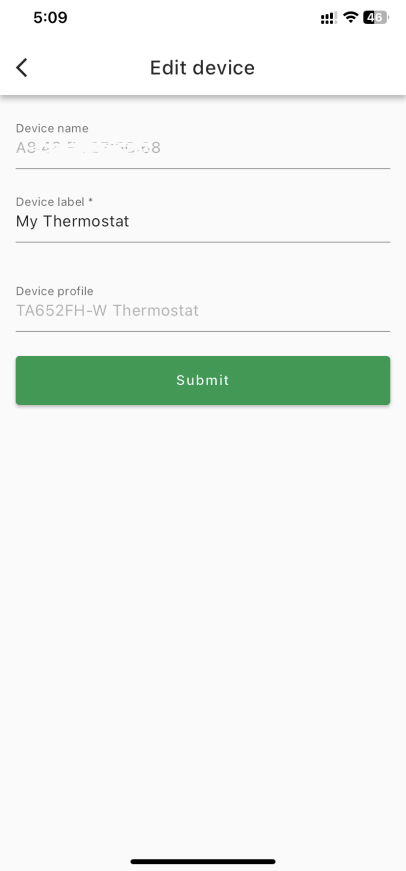

5:03
All devices
TA652FH-W Thermostat
Active
My Thermostat
TA652FH-W Thermostat
Active
My Thermostat
TA652FC-W Thermostat
Active
old_board


5:04
All devices
TA652FH-W Thermostat
Active
My Thermostat
2023-08-31
TA652FC-W Thermostat
2023-08-30
Reclaim device
Are you sure you want to reclaim this device
No
Yes

Modify Device

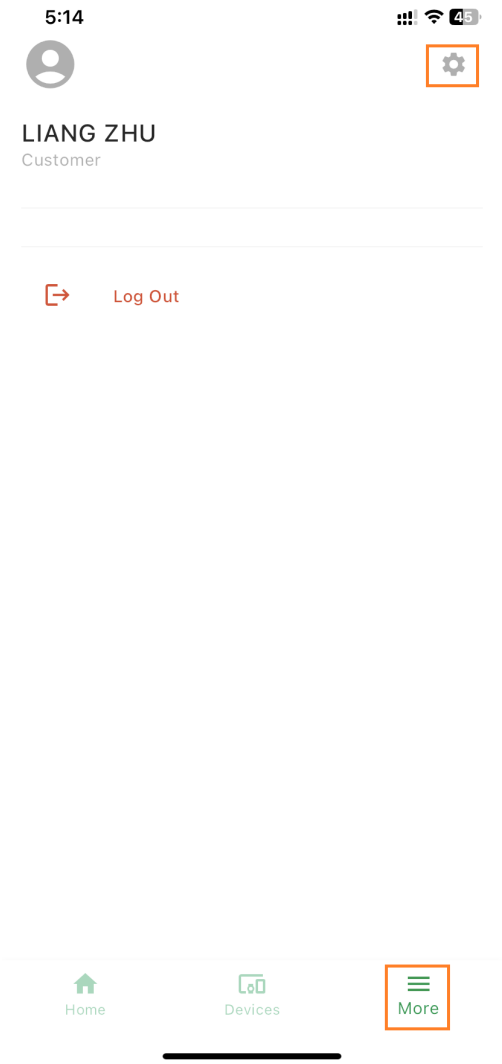


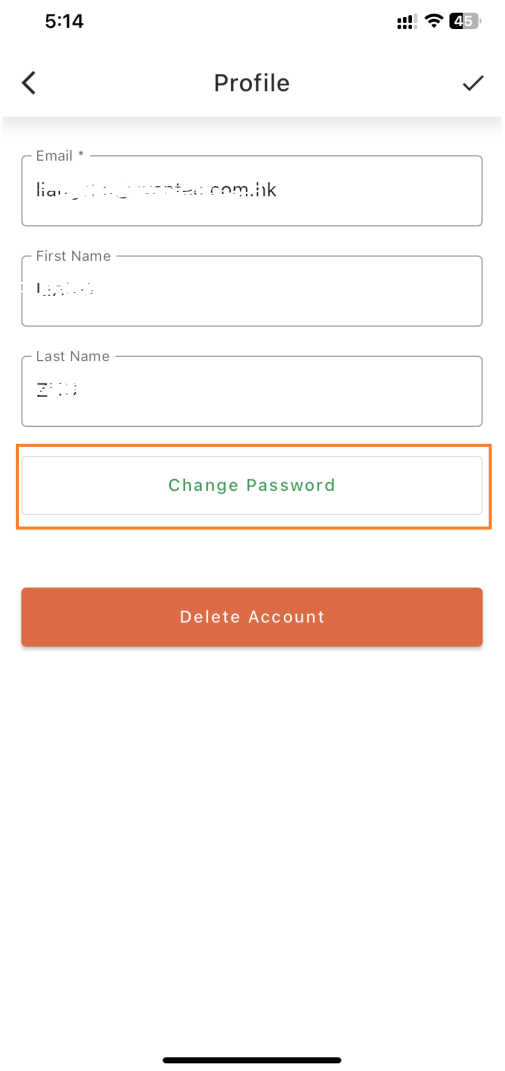

5:03
All devices
A8:48:[redacted]:BF:A0 2023-08-31
TA652FH-W Thermostat Active
My Thermostat
A8:48:[redacted]:5C:68 2023-08-31
TA652FH-W Thermostat Active
My Thermostat
24:0A:[redacted]:EB:D4 2023-08-30
TA652FC-W Thermostat Active
old_board


5:09
Edit device
Device name
Device label *
My Thermostat
Device profile
TA652FH-W Thermostat
Submit

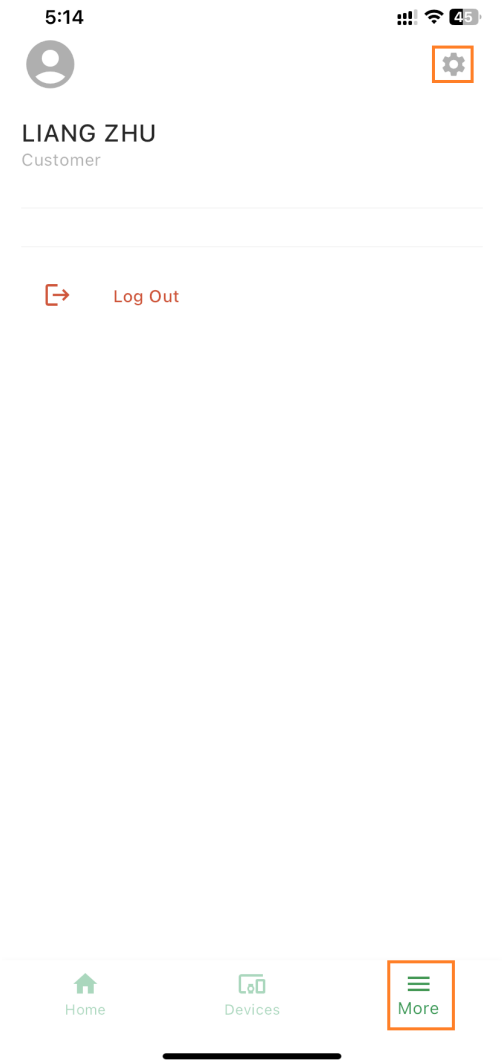
7.3.6 More

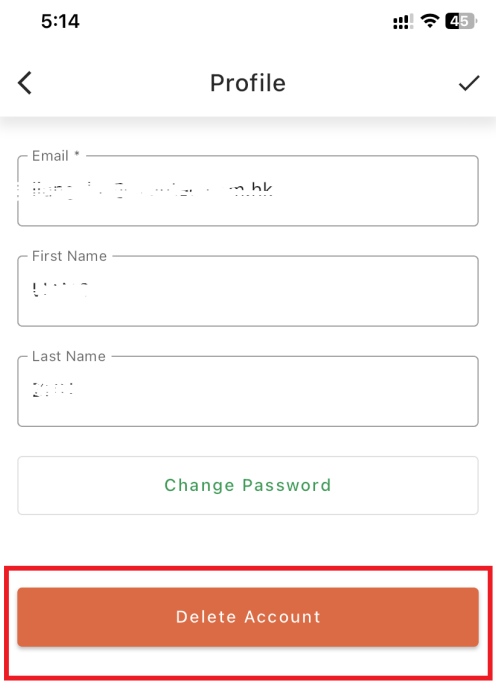
Change Password




5:14
Profile
Email *
First Name
Last Name
Change Password
Delete Account

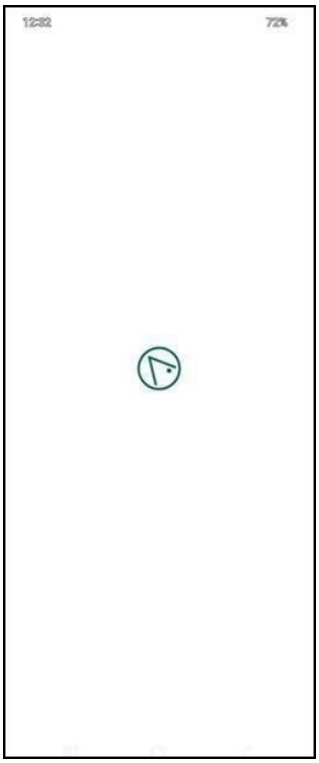
Delete Account




5:14
Profile
Email *
First Name
Last Name
Change Password
Delete Account

7.4 Avan-Stats app FAQ

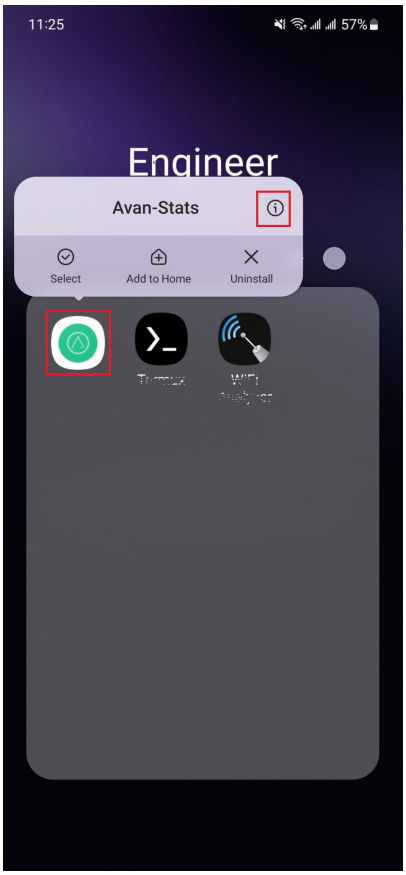
7.4.1 Why is my Android phone app freezing, crashing or closing?

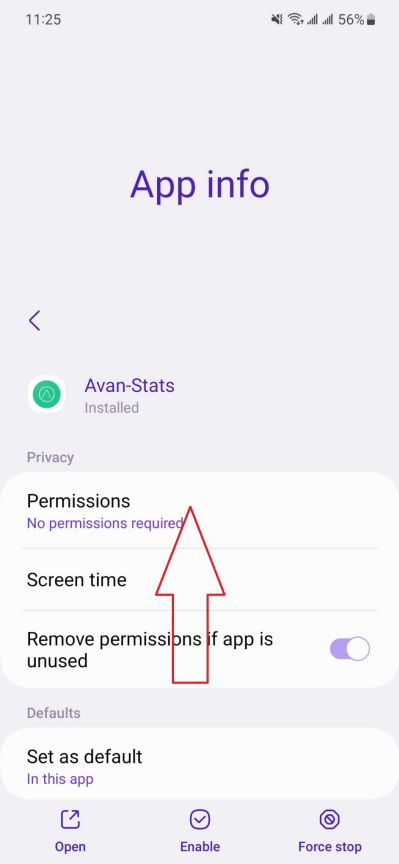


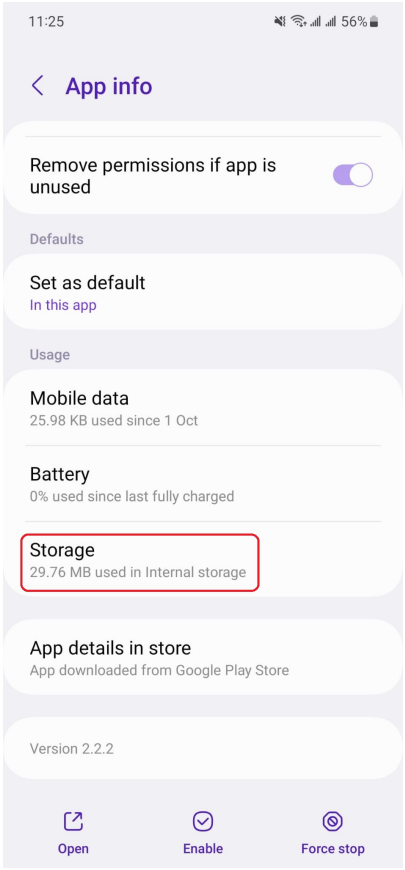
Your need to **Clear App data and cache**.

Clearing the data and cache for an app wipes all the stored data and may fix a freezing or crashing issue. This will delete your accounts, files, and settings from the app.

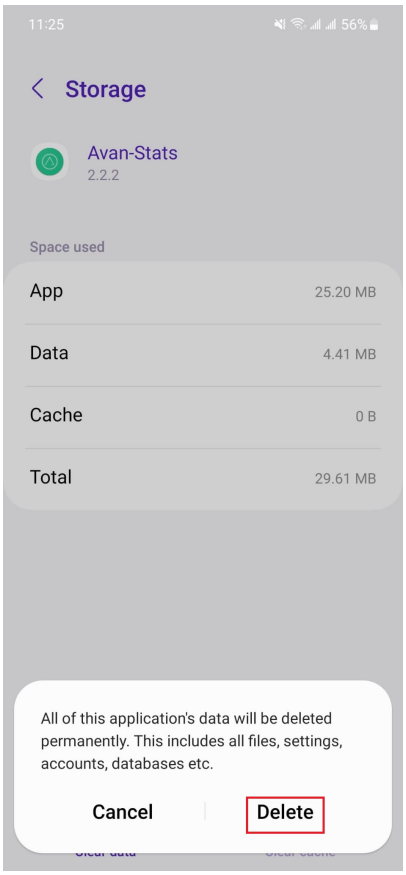
- **Step 1.** Long press your *Avan-Stats* app Tap *(i)*.
- **Step 2.** Pull up and Tap *Storage*.
- **Step 3.** Tap *Clear data* and *Clear cache*.

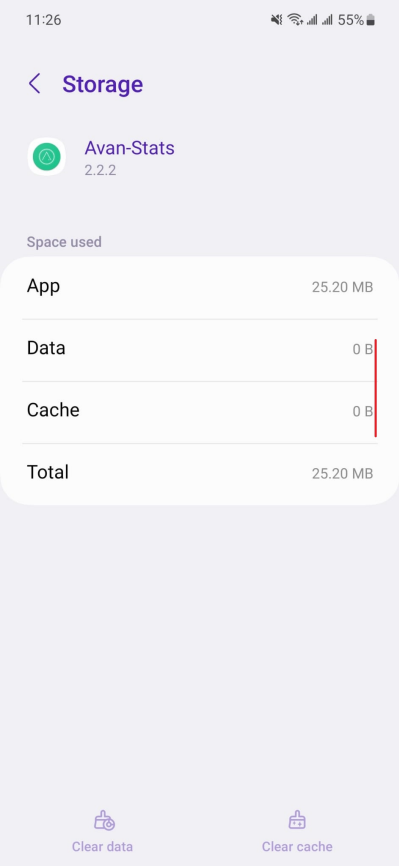

11:25
57%
Engineer
Avan-Stats
Select
Add to Home
Uninstall


11:25
56%
App info
Avan-Stats
Installed
Privacy
Permissions
No permissions required
Screen time
Remove permissions if app is unused
Defaults
Set as default
In this app
Open
Enable
Force stop


11:25
56%
App info
Remove permissions if app is unused
Defaults
Set as default
In this app
Usage
Mobile data
25.98 KB used since 1 Oct
Battery
0% used since last fully charged
Storage
29.76 MB used in Internal storage
App details in store
App downloaded from Google Play Store
Version 2.2.2
Open
Enable
Force stop


11:25
56%
Storage
Avan-Stats
2.2.2
Space used
App
25.20 MB
Data
4.42 MB
Cache
143 kB
Total
29.76 MB
Clear data
and
Clear cache


11:25
56%
Storage
Avan-Stats
2.2.2
Space used
App
25.20 MB
Data
4.41 MB
Cache
0 B
Total
29.61 MB
All of this application's data will be deleted permanently. This includes all files, settings, accounts, databases etc.
Cancel
Delete

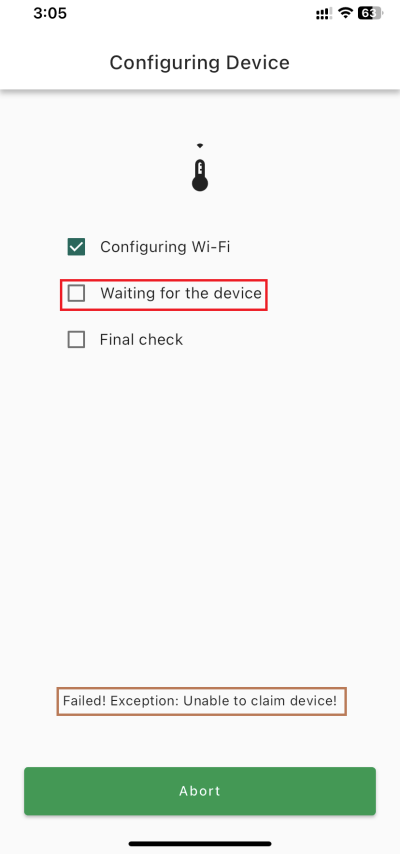


Please refer to how-to-fix-apps-that-keep-crashing-or-freezing.

7.4.2 Why do I get an exception when getting device information in Wi-Fi setup?

Check your smart phone In order to perform this operation, your smart phone must connect to **DEVICE**'s Wi-Fi hotspot at the appropriate time. Please refer to *Andorid* or *iOS*.

7.4.3 Why do I get an exception when configuring device in Wi-Fi setup?



- Your smart phone may not be connected to the Internet, please check your smart phone's WiFi settings and/or Cellular settings.
- You may have entered the wrong WiFi network or password. Please refer to *Andorid* or *iOS*.

7.4.4 Why can't I receive the registration email?

If you cannot receive the registration email, you can try using **Gmail** or **Yahoo Mail**.

7.4.5 How a family controls a shared thermostat?

One account can be used on multiple smartphones at the same time.

7.4.6 Can I use it on iPad or Android Table?

Yes. But Avan-Stats app is designed for smartphones, and it may not look good on a tablet.

7.4.7 Why is the temperature on Avan-Stats app different from the temperature on the thermostat?

The thermostat reports the temperature every 5 minutes.

-End-

CHAPTER

EIGHT

RELEASE NOTES

Release notes about documents, MQTT protocol, widgets, dashboard, etc.

8.1 Release Notes

8.1.1 v2.4.2 (Dec 21, 2023)

- Update *Avan-Stats app FAQ*.

8.1.2 v2.4.1 (Dec 5, 2023)

- Add address for TA652FC-W specification and TA652FH-W specification.

8.1.3 v2.4 (Nov 17, 2023)

- Updated all widgets, dashboards, device profiles and rule-chains for TB PE v3.6.x.
- Added documentation for Avan-Stats app.

8.1.4 v2.3.4 (Nov 8, 2023)

- Modify two wrong links in *Add TA692FC-L-5 to ThingsBoard*.

8.1.5 v2.3.3 (Sep 25, 2023)

- **Avantec Dashboard**
  - New widget - `Buttons navigation bar`.
  - Update widget - `Tabs navigation bar`.
  - Update widget - `Update time value with pattern key`.
  - Update widget - `Setting list`.
  - Update dashboard - `TA692FC-L-5 Detail Dashboard`

  - Update dashboard - `TA652FC-W Detail Dashboard`
  - Update dashboard - `TA652FH-W Detail Dashboard`

8.1.6 v2.3.2 (July 5, 2023)

- **Avantec Dashboard**
  - Updated `TA692FC-L-5 Detail Dashboard`
  - Updated `TA652FC-W Detail Dashboard`
  - Updated `TA652FH-W Detail Dashboard`

8.1.7 v2.3.1 (July 5, 2023)

- **Avantec Widgets**
  - New widget - `Entities cards`.

8.1.8 v2.3 (June 20, 2023)

- **Add TA692FC-L-5's documents**
  - Add TA692FC-L-5 Specification
  - Add TA692FC-L-5 LoRaWAN Device API
  - New appliction note: Add TA692FC-L-5 to ThingsBoard
  - Add TA692FC-L-5 List Dashboard
  - Add TA692FC-L-5 Detail Dashboard
- **Avantec Widgets**
  - New widget - `Update shared string attribute with segmented switch`.

8.1.9 v2.2 (June 1, 2023)

- **TA652FC-W MQTT API/Protocol**
  - **New feature: support (control mode) on/off in schdule.**
    - New client-side attributes: `supportCtrlModeInSchedule` (string), `prgNextCtrlMode` (string), `prgCtrlModeXX` (string).
    - New Server-side RPC: `remoteSetPrgCtrlModeXX`.
- **Avantec Widgets**
  - New widget for on/off in schdule - `Styled button of string value with pattern key`.
  - Fixed bug: primary color of some widgets about button can't be used in ThingsBoard v3.5.1.
  - Fixed bug: Setting list is not disyplayed properly in ThingsBoard v3.5.1.
- **TA652FC-W Dashboards**
  - **TA652FC-W List Dashboard**

        * New feature: support for modifying device label.
    - **TA652FC-W Detail Dashboard**
        * New feature: support (control mode) on/off in schdule.
- **TA652FH-W Dashboards**
    - **TA652FH-W List Dashboard**
        * New feature: support for modifying device label.
    - New dashboard - Office Center Dashboard

8.1.10 v2.1 (Apr 18, 2023)

- **TA652FC-W/TA652FH-W MQTT API/Protocol**
    - New shared attributes: `uploadThreshold` (double).
    - New client-side attributes: `uploadThresholdMin`, `uploadThresholdMax`, `uploadThresholdStep` (double).
- Refactor all documentation
- Refactor all widgets
- Refactor all dashboards

8.1.11 v1.0 (Jul 24, 2020 / Dec 20, 2022)

Inital version.

8.2 Upgrade instructions

- **Update Widgets Bundles:**
    - *Update Avantec Widgets*
- **Update Dashboards:**
    - **TA652FC-W**
        * *Update TA652FC-W List Dashboard*
        * *Update TA652FC-W Detail Dashboard*
    - **TA652FH-W**
        * *Update TA652FH-W List Dashboard*
        * *Update TA652FH-W Detail Dashboard*
        * *Update Office Center Dashboard*
    - **TA692FC-L-5**
        * *Update TA692FC-L-5 List Dashboard*
        * *Update TA692FC-L-5 Detail Dashboard*
- **Update F/W:**

- *OTA Updates*

CHAPTER

NINE

AVANTEC AND THE PROJECT

Learn about the project and the company.

About us | *Copyrights and Licenses*

9.1 About us

Avantec Manufacturing Limited was founded in 1983. We specialize in designing and manufacturing HVAC, telecom and VoIP products.

The company's headquarter is located in Kwun Tong, Hong Kong. This owned property hosts 40 staffs from R&D, Marketing, Shipping, Purchasing and Accounting Departments. Our products are distributed worldwide for years with CE, FCC, PTT and ROHS approvals.

We have a representative office and product development center in downtown Shenzhen.

We also work for customers on OEM projects. We have different R&D teams responsible for product design, software / PCB / tooling development and product approvals. We follow the rapid technology change and provide the products meeting customer's expectation and requirements.

With the abundant experience in this industry, our expertise is guaranteed. We are confident in providing you with innovative products meeting your requirements and in high quality. We are definitely looking forward to establishing a long term business partnership with you!

https://www.avantec.com.hk

9.2 Copyrights and Licenses

9.2.1 Copyrights

9.2.2 ThingsBoard License