

KNX IoT Hub

Getting Started Guide



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1. Getting Started with KNX IoT

This guide is describing how to get started with KNX IoT using Cascoda KNX IoT devices.

The result of following this guide is a working KNX IoT system. The resulting system is not secure, but the KNX communication is secure. See [KNX IoT Hub manual](#) for additional steps to secure the Hub.

1.1. Equipment List

- Cascoda KNX IoT Hub
 - including a Power Supply.
- Cascoda Environment Sensor.
 - including 3x AA batteries
- Computer, with the following software installed:
 - an Internet Browser
 - ETS 6.3 (or higher)
- 2x shielded Cat6

1.2. Network Connectivity Setup

The KNX IoT devices are connected via IP networking. Hence, the network first needs to be established before the devices can be configured via ETS.

For first time users, use the KNX IoT Hub as an Ethernet router, since this has the least amount of dependencies on existing network equipment and configuration.

The network configuration is depicted in the following diagram.

Extending Existing Network: Hub as Router

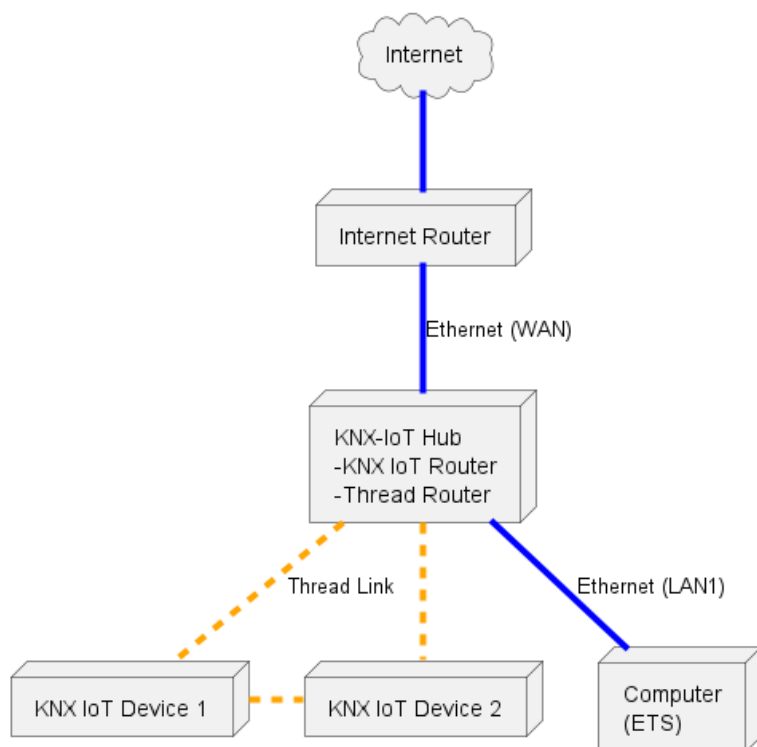


Fig 1: Typical Network Topology with a Thread network.

1.3. Wired Ethernet Setup

1. Attach the (Thread) antenna to the hub by screwing it in, then angle it upwards for maximum coverage.
2. Connect one end of the Ethernet cable to the socket on the hub marked **"PoE LAN1"**, and connect the other end to your computer. The computer should have a web browser and ETS (for KNX configurations) installed.



Fig 2: LAN port on the Hub indicated in red.

3. Connect the Hub to your Internet router or switch via Ethernet, by connecting one end of the cable into the **"WAN/LAN2"** port of the Hub, and the other end of the cable into your internet router/switch.
4. Connect the Power Supply to the Hub.
5. Now power up the Hub using the power adapter.

6. After about 30s, the Web GUI should become accessible. Navigate to <http://openwrt.local>.
7. Access the Web GUI via the computer by logging in as "root", with an empty password field. You now have full control over your KNX IoT Hub.

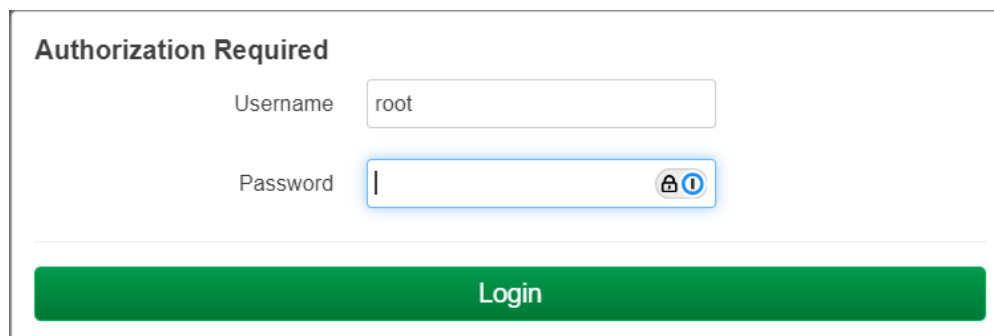


Fig 3: The KNX IoT Hub Login screen.

8. Double check that you have internet access via the Hub by opening up any web browser and searching something.

After following the steps above, you will have a (wired, blue) network topology that looks like the topology diagram [above](#). The Hub is also accessible via Wi-Fi, though by default the Wi-Fi Access Point is disabled. For instructions on how to enable it, please see [this section in the manual](#).

Congratulations! You have finished the (blue) wired ethernet part of the setup of the HUB!

1.4. Adding the Wireless Thread Devices

Use your environment sensor, and follow the steps below to add it to the Thread network.

1.4.1. Thread Network Formation

To create a Thread network using the KNX IoT Hub's Router interface, follow the steps below:

1. Login to your Hub, as described previously in this document.
2. Hover over "Thread" in the menu bar at the top, and click on "Overview".
3. Click on "Create".

Please use the default values.

CASCODA[®]

OpenWrt

Status ▾

System ▾

Services ▾

Network ▾

Thread ▾

Logout

Thread Network: OpenThread (wpan0)

The Network Configuration section covers physical settings of the Thread Network such as channel, PAN ID. Per interface related settings like networkkey or MAC-filter are grouped in the Interface Configuration.

Network Configuration

General Setup

Advanced Settings

Thread Name

OpenThread

Status

PAN ID: 0xf71c
Extended PAN ID: dead00beef00cafe
State: leader
Channel: 19

Thread network is enabled

Disable

Protocol

unmanaged ▾

Interface Configuration

Thread Security

Network Key

8ad16dcd61128cd4debcba7239b8f

Commissioner Credential

PleaseChangeMp_560d

Back to Overview

Save & Apply

Reset

Fig 4: Thread Network creation on the KNX IoT Hub.

4. Scroll down to the bottom and click on "Save & Apply".
5. Your Thread network should now be visible under "Thread - Overview"!

CASCODA[®]

OpenWrt

Status ▾

System ▾

Services ▾

Network ▾

Thread ▾

Logout

REFRESHING

Thread Overview

wpan0

Generic MAC 802.15.4 Thread

Scan

Create

Network Name: OpenThread | State: leader
PAN ID: 0xf71c | Channel: 19
Network Key: 8ad16dcd61128cd4debcba7239b85af0
Commissioner Passphrase: PleaseChangeMp_560d

Disable

Edit

View

Fig 5: Thread Network overview on the KNX IoT Hub.

Congratulations! You have created a Thread network!

1.4.2. Commissioning Devices to a Thread Network

1.4.2.1. QR Code Entry

1. Obtain the QR Code of your device.
2. Use a QR Code scanner to scan the QR Code into the input field, or alternatively use your computer's Webcam to scan the QR Code. NOTE: Using the webcam requires

secure access, so you will have to connect to the KNX IoT Hub via the https:// endpoint.

Fig 6: QR entry for Thread credentials on the Hub.

- Press "Submit" to start the commissioning procedure and wait for the commissioning to complete.

Leader Router Id	Partition Id	Weighting	Data Version	Stable Data Version
37	618116596	64	27	20

RLOC16	Role	Age	Avg RSSI	Last RSSI	Mode	Extended MAC
0x9402	Child	6	-31	-32	rdn	066bd20a17a739bd
Pending	New Joiner	Pending	Pending	Pending	Pending	b7092300cef82669

Fig 7: Thread Overview with Joiners on the Hub.

If this device is a direct neighbor to the Hub, which would be the case if this is the first device that you are commissioning to the network, then you will see it show up in the "Neighbors" table.

Note that some Thread devices are sleepy, they may have additional steps on the device so

that it can onboarded quickly.

Congratulations! You have added the Thread device to Thread network! All steps for creating the network are completed!

2. KNX IoT Standalone System

Extending Existing Network: Hub as Router

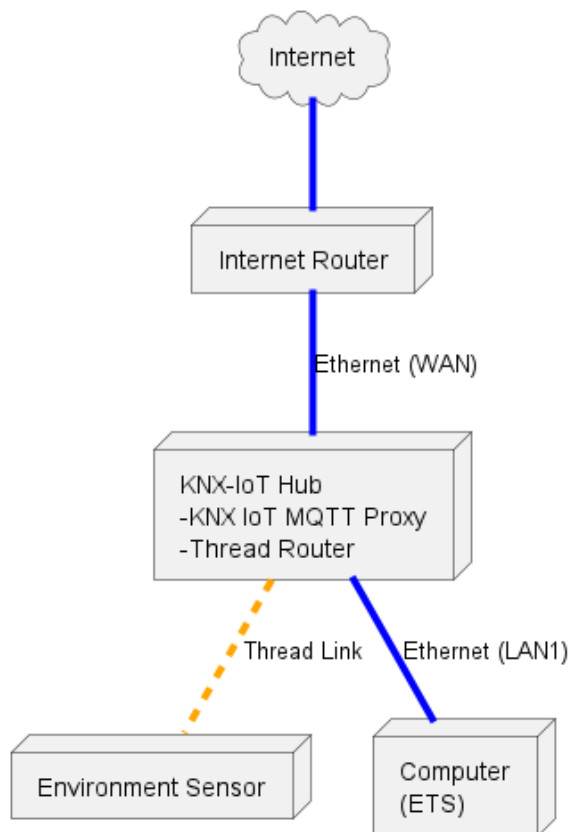


Fig 8: KNX IoT Network diagram.

KNX IoT devices will be configured by ETS in the same way as KNX TP devices. Each device has group objects and parameters. The communication between KNX IoT devices is also done via group addresses. The technology used is different, but how it is used by ETS is the same. The same steps apply for KNX IoT devices as for KNX TP devices with Data Security enable. Hence, ETS needs the KNX IoT credentials (similar to the FDSK) to communicate to the device.

The described setup only uses KNX IoT over Thread. In this setup the MQTT proxy of the Hub is used as receiver of the environment data, although the MQTT forwarding is not important. The MQTT proxy is used to connect the environment sensor. Note that ETS 6.4 does not apply downloads for group addresses with 1 link.

2.1. ETS Project Creation

Create a new project:

1. Create the "IP Main Line" (IP backbone) in the Topology Panel.

Note that ETS 6.4 does this automatically.

1. Create a IoT Line below the "IP Main Line" in the Topology Panel.

Select "IP Main Line" --> "right click" --> "+ add" --> select "Lines"

In the popup select Medium : "IoT"

A new "IoT line" is created.

2. Add the MQTT proxy to the "IoT line"

Open the panel "Catalog"

Browse through the manufacturers and select "Casco da".

Select the "MQTT proxy" and drag this device to the "IoT line" in the Topology Panel.

A popup will ask for the Device Certificate.

Copy the information of the QR code from the MQTT proxy page in the Hub to the entry field.

3. Add the Environment Sensor to the IoT Line

Open the panel "Catalog"

Browse through the manufacturers and select "Casco da".

Select the "Environment Sensor" and drag this device to the "IoT line" in the Topology Panel.

A popup will ask for the Device Certificate.

Device Certificate: scan the QR code of the environment sensor.

To display the QR code on the Environment Sensor:

- Navigate to the System Menu (using button "A")
- Navigate to the "QR Codes" (using buttons, "C" or "D"), press button "B" to show the QR code.

Use the QR Code scanner or the computer's camera to scan the displayed QR code.

4. Link Group Objects

Link the Room Temperature, by creating a group address with the following links:

- MQTT Proxy: Room Temperature

- Environment Sensor: Room Temperature

Select in the Topology Panel the Environment sensor and list all group objects.

Open the MQTT proxy in the same way.

Drag the "Room Temperature" of the Environment Sensor, and drop it onto the "Room Temperature" of the MQTT proxy.

This drag & drop action: creates a new group and links both devices to that group.

5. Setting the Environment Sensor Parameters

The Environment Sensor will send out the temperature value every 10 minutes. For demonstration purposes, the parameter "Sleep Period" can be set to 20 seconds.

6. Setting the MQTT Proxy Parameters

The MQTT proxy will receive the data and forward the received values on MQTT. For a free (public) broker, use:

- MQTT hostname: broker.hivemq.com
- MQTT port: 8884
- MQTT username: <empty>
- MQTT password: <empty>

Note that by using this broker, the generated data is shared publicly.

2.2. Downloading the Devices

2.2.1. Download the Environment sensor

1. Topology Panel --> select the Environment Sensor --> "right click" --> "Download All"
2. This will now start the downloading process by showing the "Pending operations" panel.
3. Select "Use Serial Number" in the "Pending operations" panel

Use the Environment Sensor: navigate to the "Connection" screen. This will reduce the waiting time to program the device. This will now start the downloading process.

Wait until the download is finished

2.2.2. Download the MQTT Proxy

1. Topology Panel --> select the MQTT Proxy --> "right click" --> "Download All"
2. This will now start the downloading process by showing the "Pending operations" panel.

3. Select "Use Serial Number" in the "Pending operations" panel

No interaction with the MQTT proxy is needed. The download will start immediately.

Wait until the download is finished.

Congratulations! You have commissioned your first KNX IoT system!

2.3. Check if the System Works

2.3.1. Environment Sensor

Go to the "Device Info" page on the Environment Sensor. This page shows the following information:

- IA : the individual address given by ETS to the device. This value should match what is entered in ETS.

2.3.2. KNX IoT MQTT Proxy

Navigate to the Hub using the Internet browser on the computer.

Go to the "KNX-IoT MQTT" page. This page shows the following information:

Individual Address: The individual address given by ETS to the device. This value should match what is entered in ETS.

2.3.3. ETS

Since ETS is still on the same network (connected to the Hub), the ETS group monitor can be used to see the KNX IoT messages. To start the group monitor:

1. Open the "Monitor" Panel: ETS menu --> Panels --> Select "Monitors"
2. In the Monitor panel, select Group monitor and press "Start".
3. In the panel the environment sensor temperature sensor data should show up each 20 seconds.

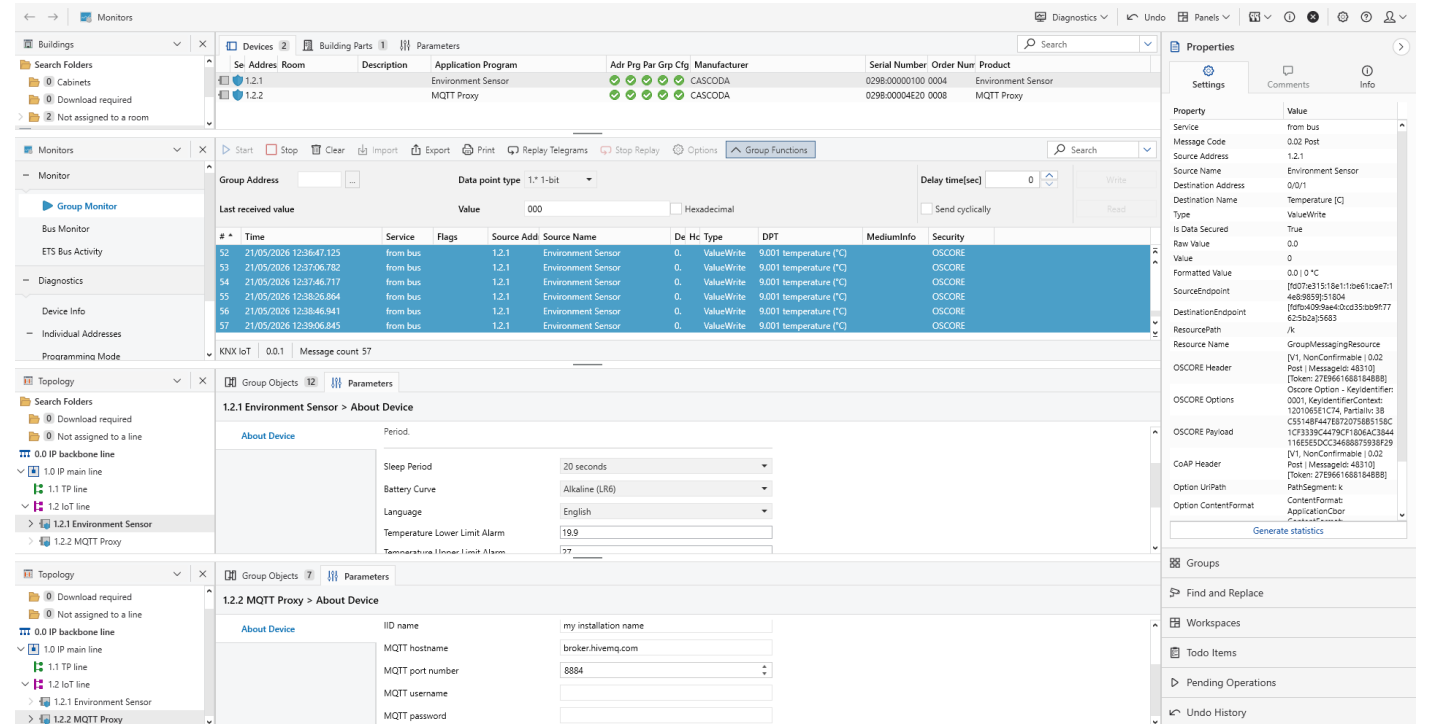


Fig 9: ETS screen capture.

Congratulations! You have checked your first KNX IoT system!

3. KNX Hybrid System

This is an example project of combining KNX IoT with KNX TP devices.

3.1. Additional Equipment List

- KNX IP router
- KNX TP power supply
- KNX TP device (actuator)
- KNX Cables to connect the TP device to the KNX IP router

3.2. Network Connectivity Setup

The KNX IoT devices are connected via IP networking. Hence, the network first needs to be established before the devices can be configured via ETS. Also, the IP Router needs to be connected to the KNX IoT Hub. Since the Hub only has 1 LAN port, it would be good to connect the computer via Wi-Fi. This frees up the LAN port so that the KNX IP Router can be connected.

Wi-Fi can be enabled by pressing the grey Wi-Fi button on top of the Hub. This will create a Wi-Fi access point with the (default) name "OpenWrt". The network is unsecured so any device can connect to the network. For instructions on how to secure it, please see [this section in the manual](#).

When the Wi-Fi is enabled, the PC can be connected to the Wi-Fi network. The cable from the PC can be used to connect to the KNX IP Router.

The IP Router can be configured as static or as DHCP client. Please use DHCP, so that the IPv4 IP address is always correct.

Network topology with Hub as IoT Router

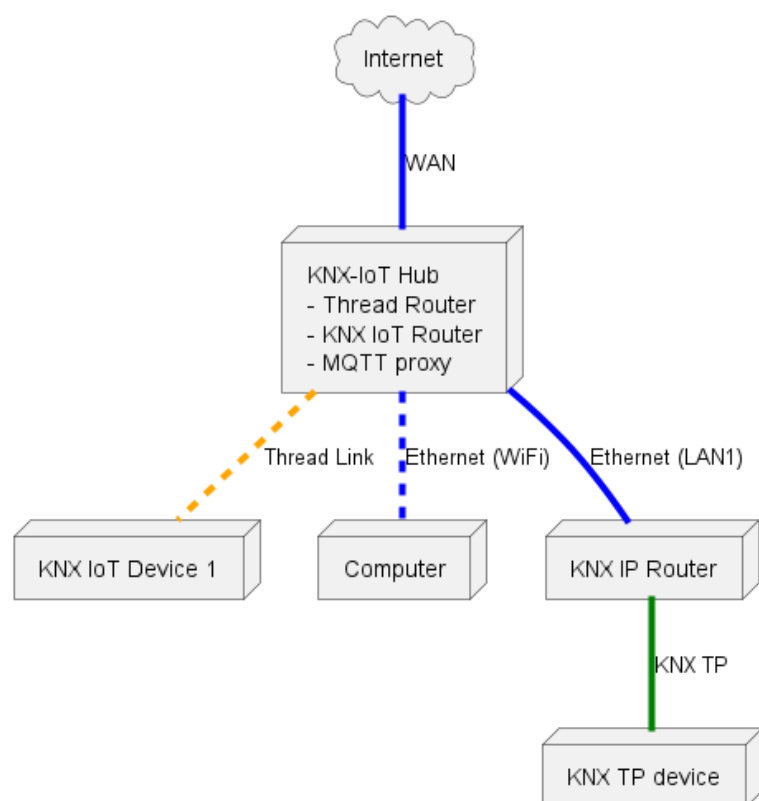


Fig 10: KNX TP IoT Hybrid Network diagram.

3.3. ETS Project Additions

Additional Steps:

- Add the KNX IoT Router to the IoT line
- Create a TP line below the IP backbone
- Add the KNX IP Router to the TP line
- Add the TP device to the TP line
- Link the TP device (sending) with the MQTT proxy
- Link the TP device (receiving) with the environment sensor
- Download the devices

Detailed steps:

1. Add the KNX IoT Router to the "IoT line"

Open the panel "Catalog"

Browse through the manufacturers and select "Cascoda".

Select the "IoT Router" and drag this device to the "IoT line" in the Topology Panel.

A popup will ask for the Device Certificate.

Copy the information of the QR code from the IoT Router page in the Hub to the entry

field.

2. Create a TP Line below the "IP Main Line" in the Topology Panel.

Select "IP Main Line" --> "right click" --> "+ add" --> select "Lines"

In the popup select Medium : "TP"

A new "TP line" is created.

3. Add the KNX IP Router to the "TP line"

Open the panel "Catalog"

Browse through the manufacturers and select an IP router from the manufacturer you have.

Select the "IP Router" and drag this device to the "TP line" in the Topology Panel.

A popup will ask for the Device Certificate (if the device is Secure. Scan the QR code of the device.

4. Add the TP Device to the "TP line"

Open the panel "Catalog"

Browse through the manufacturers and select the TP device from the manufacturer you have.

Select the "TP device" and drag this device to the "TP line" in the Topology Panel.

A popup will ask for the Device Certificate (if the device is Secure. Scan the QR code of the device.

5. Link Group Objects

For Linking TP to IoT do the following: Link the Switching, by creating a group address with the following links:

- MQTT Proxy: On/Off Switching
- TP (button) : on/off Switching

Note that ETS 6.4.1 prevents drag and drop, so one has to create the Group address first and then link the group address to the device communication objects.

For Linking IoT to TP, do the following: - Environment Temp Lower Alarm - TP (button) : Led operation (feedback)

3.3.1. Downloading the IoT and TP Devices

All the devices need to be downloaded:

IoT Devices: - MQTT proxy - Environment Sensor - KNX IoT Router

For these devices the connection (bus connection/local interface connection) of ETS should be one of the following:

- Automatic
- KNX IoT

The selection mechanism for the "Bus Interface" is on the Menu bar of ETS. Preferred usage for IoT devices is using "KNX IoT" which makes ETS specifically use the "KNX IoT" connection.

TP Devices:

- KNX IP Router
- KNX TP device

For these devices the connection (bus connection/local interface connection) of ETS should be one of the following:

- Automatic
- KNX IP Router

Preferred usage is using "KNX IP Router" which makes ETS specifically use the IP router connection.

3.3.2. Download the "Device"

1. Topology Panel --> select the "Device" --> "right click" --> "Download All"
2. This will now start the downloading process by showing the "Pending operations" panel.
3. Select "Use Serial Number" in the "Pending operations" panel

Use the Environment Sensor: navigate to the "Connection" screen. This will reduce the waiting time to program the device. This will now start the downloading process.

Wait until the download is finished.

Congratulations! You have commissioned your first KNX IoT/TP Hybrid system!

3.4. Check if the System Works

3.4.1. ETS KNX IoT filter table

To show that ETS is creating the filter table by itself, go to: Topology --> "KNX IoT Router" --> right click --> "Preview Filter Table".

The preview shows the following filter table:

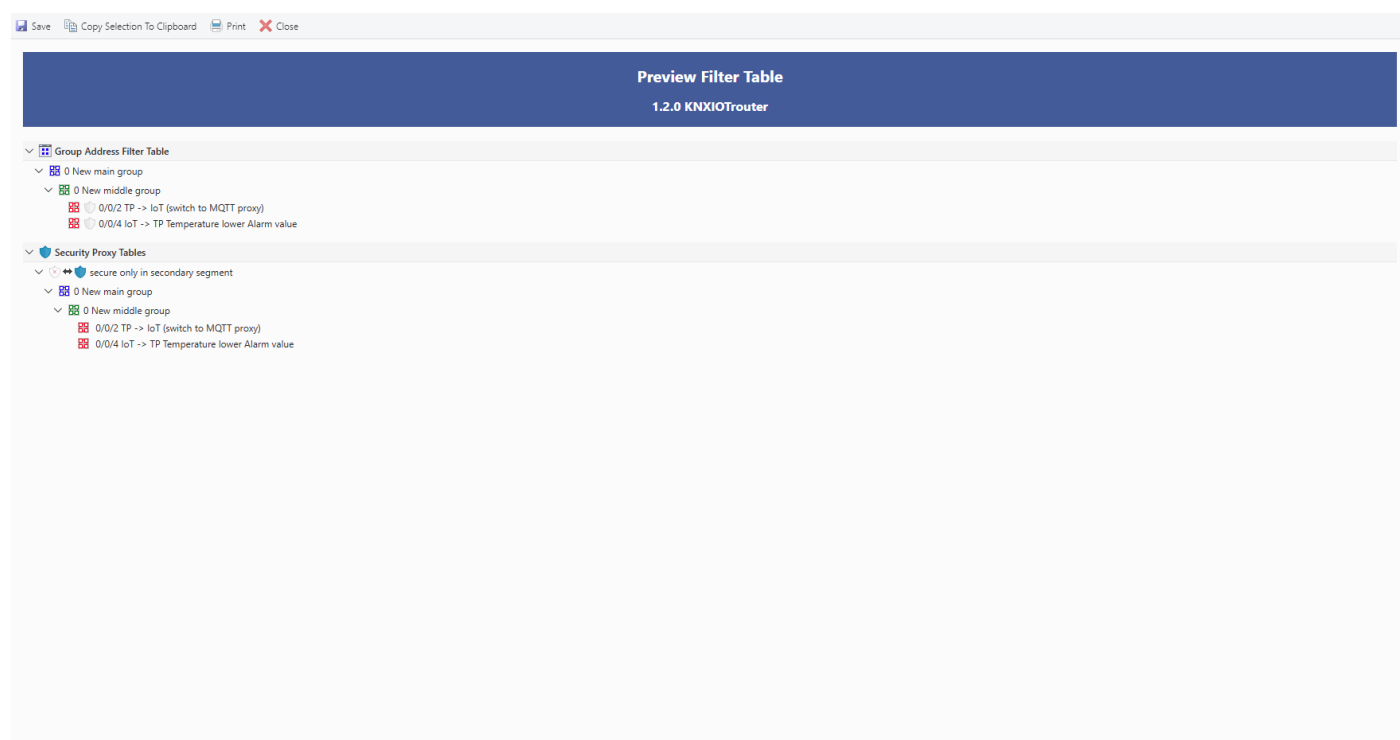


Fig 11: ETS Filter table on the KNX IoT Router.

The filter table shows (in our example): The group addresses 0/0/2 and 0/0/4. Each group address shows that it is linked with a secure IoT device and an unsecure TP device.

3.4.2. ETS group monitor

Since ETS is still on the same network (connected to the Hub), the ETS group monitor can be used to see the KNX IoT messages. To start the group monitor:

1. Open the "Monitor" Panel: ETS menu --> Panels --> Select "Monitors"
2. In the Monitor panel

Select in the left bottom of the monitor "KNX IoT"

select Group monitor and press "Start".

1. Open a 2nd "Monitor" Panel: ETS menu --> Panels --> Select "Monitors"

In 2nd the Monitor panel, select Group monitor and press "Start".

Select in the left bottom of the monitor "KNX IP Router"

Select Group monitor and press "Start".

1. Press the Button on the TP device that is linked to the MQTT proxy.

The screenshot displays the ETS (Energy Management System) software interface, specifically the Monitors section. It shows two monitors for a KNX system, one for IoT and one for TP (Temperature and Pressure) group addresses.

Top Monitor: 1.2.2 MQTT Proxy > About Device

This application is a KNX-IoT MQTT Proxy.

Associations

Security	Object	Device	Sending	Data Type	C	R	W	T	U	Product	Program	Length	Priority	Group
	7: Temp Lower Alarm - Temperature lower Alar...	1.2.1 Environment Sensor	S	switch	C	-	-	T	-	Environment Sensor	Environment Sensor	1 bit	Low	0/0/4
	28: Operation-LED - Switching	1.1.1 4-gang universal push b...S			C	-	W	-	-	4-gang universal p...	Universal 4-gang 10A511	1 bit	Low	0/0/4

Monitors

Start Stop Clear Import Export Print Replay Telegrams Stop Replay Options Group Functions

Group Address: [] Data point type: 1* 1-bit Delay time[sec]: 0 Write

Last received value: Value: 000 Hexadecimal Send cyclically Read

#	Time	Service	Flags	Source Addr.	Source Name	Destination A	Hc	Type	DPT	MediumInfo	Security
7	26/05/2026 12:31:18.412	from bus		1.2.1	Environment Sensor	0/0/1		ValueWrite	9.001 temperature (°C)		OSCORE
8	26/05/2026 12:31:18.627	from bus		1.2.1	Environment Sensor	0/0/4		ValueWrite	1.001 switch		OSCORE
9	26/05/2026 12:31:36.442	from bus		1.1.1	4-gang universal push button...	0/0/2		ValueWrite	1.001 switch		OSCORE
10	26/05/2026 12:31:37.272	from bus		1.1.1	4-gang universal push button...	0/0/2		ValueWrite	1.001 switch		OSCORE
11	26/05/2026 12:31:37.882	from bus		1.2.1	Environment Sensor	0/0/1		ValueWrite	9.001 temperature (°C)		OSCORE
12	26/05/2026 12:31:45.166	Stop									

KNX IoT Message count: 12

Bottom Monitor: KNX IP Router (192.168.1.148:3671 Udp - 0.1.0) | 1.1.0 | Message count: 13

Start Stop Clear Import Export Print Replay Telegrams Stop Replay Options Group Functions

Group Address: [] Data point type: 1* 1-bit Delay time[sec]: 0 Write

Last received value: Value: 000 Hexadecimal Send cyclically Read

#	Time	Service	Flags	Source Addr.	Source Name	De	Hop	Co	Type	DPT	MediumInfo	Security
9	26/05/2026 12:35:24.911	from bus		1.2.1	Environment Sensor	0	5		GroupValue_Write	1.001 switch		
10	26/05/2026 12:35:44.971	from bus		1.2.1	Environment Sensor	0	5		GroupValue_Write	1.001 switch		
11	26/05/2026 12:36:04.954	from bus		1.2.1	Environment Sensor	0	5		GroupValue_Write	1.001 switch		
12	26/05/2026 12:36:25.730	from bus		1.2.1	Environment Sensor	0	5		GroupValue_Write	1.001 switch		
13	26/05/2026 12:36:45.037	from bus		1.2.1	Environment Sensor	0	5		GroupValue_Write	1.001 switch		

Fig 12: ETS screen capture of IoT and TP group monitors.

Congratulations! You have checked your first KNX Hybrid TP and IoT system!

4. Enlarging the System with an External Switch

When more Ethernet ports are needed, use a switch. A switch is a device that connects multiple devices within a local area network (LAN). It facilitates communication between devices such as computers, printers, and servers by forwarding data frames based on MAC addresses. Switches operate at the data link layer (Layer 2) of the OSI model.

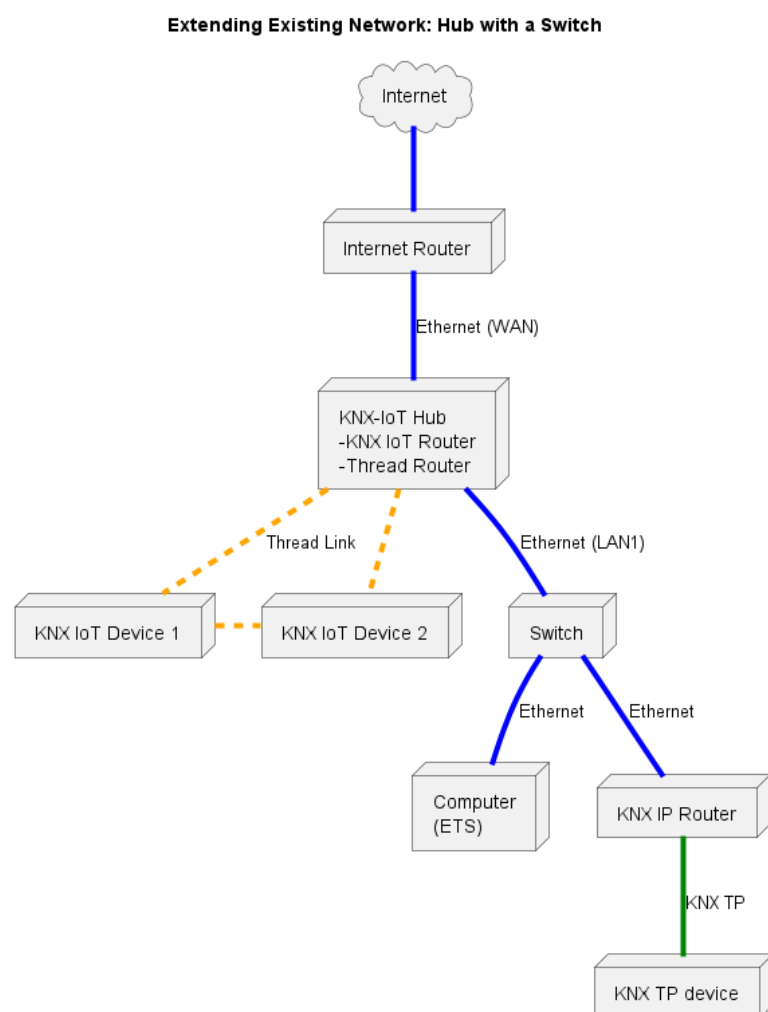


Fig 13: KNX IoT Network diagram with External Switch.

To create the setup:

- Connect the PC to the switch
- Connect the IP Router to the switch
- Connect the Hub (LAN1) to the switch

This setup can be used to check if the switch is forwarding IPv6 and multicast messages correctly. The ETS group monitor should see the KNX IoT messages and the KNX TP messages. If this setup is not working but the setup without the switch is, then replace the switch with a more recent model.

5. General information

5.1. Document version information

This guide is amended periodically and will be brought into line with new software releases. The change status (date) can be found in the contents header.

5.2. Used terms

Sign	Description
DANGER!	Indicates an immediately hazardous situation which will lead to death or severe injuries if it is not avoided.
CAUTION!	Indicates a potentially hazardous situation which may lead to trivial or minor injuries if it is not avoided.
WARNING!	Indicates a situation which may lead to damage to property if it is not avoided.
NOTE!	Indicates a situation which may lead to possible (known) side effects.

Table 1: Used Terms

5.3. Contact information

info@cascoda.com
Threefield House,
Threefield Lane,
Southampton,
SO14 3LP, UK