SIEMENS

QxA289x/WI, OCT200.KNBA, OCT100.R

Thread room sensor, KNX IoT to BACnet IP gateway, Thread mesh extender

Operation Manual

Preliminary

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Smart Infrastructure

2022-11-16

Table of Contents

1 System overview ... 3
1.1 KNX IoT to BACnet IP gateway ... 4
1.2 Thread room sensor ... 6
1.3 Thread mesh extender ... 7
2 Mounting and installation ... 8
2.1 KNX IoT to BACnet IP gateway ... 8
2.2 Thread room sensor ... 8
2.3 Thread mesh extender ... 8
2.4 Installation onsite ... 8
3 Setup and commissioning ... 9
3.1 Login gateway web UI ... 9
3.2 Workflow ... 10
3.3 Commissioning ... 12
3.3.1 HOME ... 12
3.3.2 WIRELESS ... 12
3.3.3 NETWORK ... 12
3.3.4 KNXIOT GATEWAY ... 13
3.3.5 SYSTEM ... 19
3.3.6 MORE SETTINGS ... 24
4 Maintenance ... 26
4.1 Replacing gateway ... 26
4.2 Replacing sensor or extender ... 26
5 Frequently asked questions ... 27
5.1 What should users do if connection issue occurs? ... 27
5.2 Why cannot sensor join Thread network? ... 27
5.3 Why cannot extender join Thread network? ... 27
5.4 Why cannot sensor indicate data in real-time? ... 28
5.5 Why cannot sensor parameters be transmitted successfully? ... 28
5.6 Why cannot present values be displayed after clicking refresh below diagnostics? ... 28
5.7 Why cannot programming mode be entered after sensor joins Thread network? ... 28
5.8 What is Gateway web UI refresh rates? ... 29
5.9 Why cannot offset of temperature, humidity and CO2 be applied after users change in programming mode? ... 29
5.10 Why does LED C flash red on gateway? ... 29
5.11 Why does it fail after clicking "Start join"? ... 29
5.12 Do users need reconfigure parameters after sensor factory reset if sensor joins Thread network before? ... 29
5.13 What should users do, if device is added/removed/modified in allow-list? ... 30
5.14 What should users do, if device is replaced in allow-list? ... 30
5.15 In the same BACnet network, should device instance be unique? ... 30
5.16 What BACnet services are supported? ... 30
5.17 Not recommended operations ... 30
6 Appendix ... 31
6.1 Cyber security disclaimer ... 31

Preliminary

1 System overview

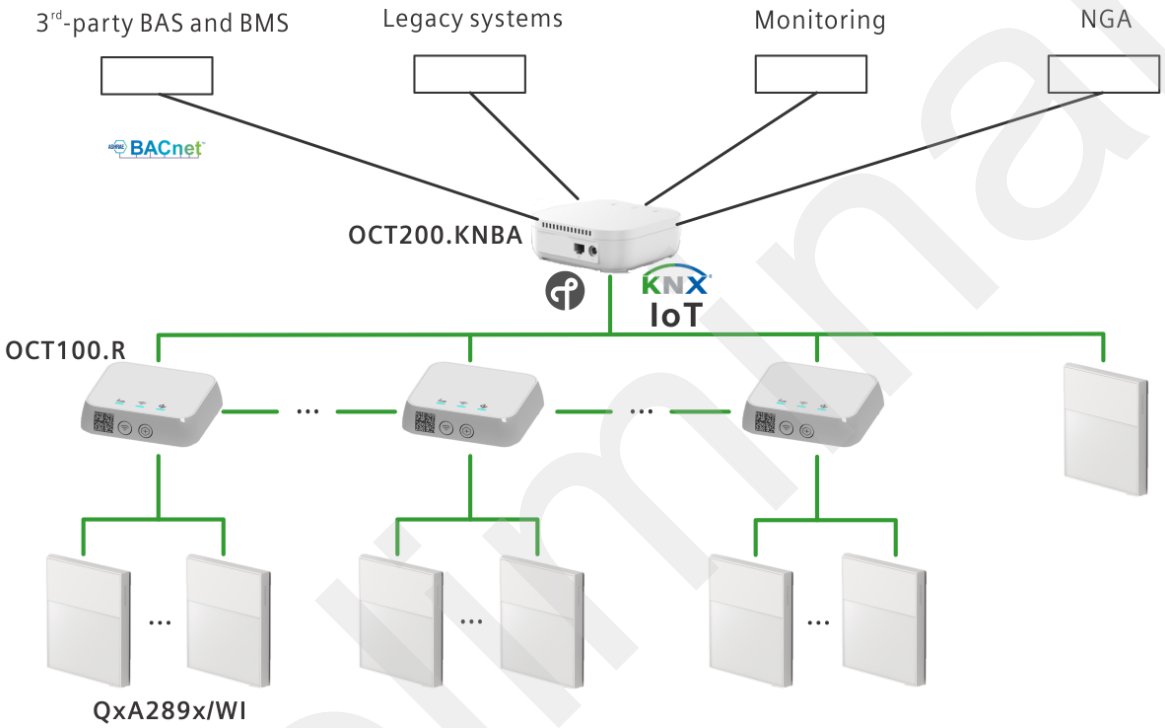
Via KNX IoT to BACnet IP gateway (OCT200.KNBA), Thread room sensor data can be wirelessly exchanged to Siemens controllers or other 3rd-party building automation/management system (via BACnet). The supported controlling systems from Siemens include:

- Classic Desigo
- Desigo Control Point
- PXC5

In Thread network, the total number of connected sensor and extender is 100.

- For gateway, maximum directly connected sensor is 32 and extender is 22.
- For extender, maximum directly connected sensor number is 32.

Topology



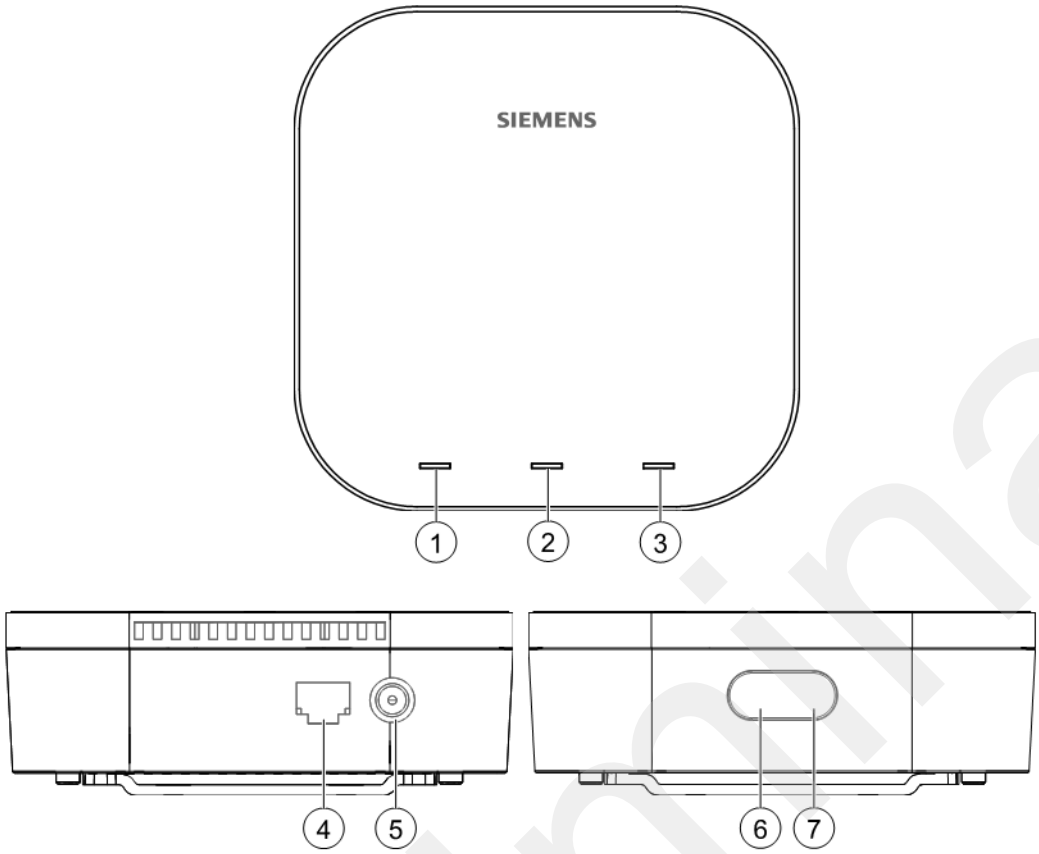
Legend

OCT200.KNBA	KNX IoT to BACnet IP gateway (hereinafter, short for gateway)
QxA289x/WI	Thread room sensor (hereinafter, short for sensor): QAA2890/WI, QFA2890/WI, QPA2892/WI
OCT100.R	Thread mesh extender (TME) (hereinafter, short for extender)
3rd-party BAS and BMS	3rd party building automation system and building management system
Legacy systems	Classic Desigo
Monitoring	Desigo Control Point
NGA	PXC5

Preliminary

1.1 KNX IoT to BACnet IP gateway

Gateway is mains-powered by AC 100...240 V (with external power adapter).



No.	Product description	No.	Product description
①	⏻ LED A: Device	④	Ethernet terminal
②	LED B: WLAN	⑤	Power input terminal
③	LED C: Thread	⑥	Button A used for factory reset and WIFI on/off
⑦	Button B used for gateway joining Thread network		

Preliminary

In the following table:

- Short press (<2 s) means short press the push button
- Middle press (5...20 s) means middle press the button
- Long press (≥20 s) means long press the push button

LED A

LED color	Device status	LED pattern	Push button operation
Off	Unpowered device or device is switched off.	Off	N/A
Green	Start up (e.g. device is powered on)	Flashing (1/4 s on / 7/4 s off) for 80 s	N/A
	Normal (connected)	On	
	Firmware downloading		
	Firmware installation	Flashing (1/4 s on / 7/4 s off) for 80 s	
Orange	Factory reset	Fast flashing (100 ms on / 100 ms off) for 15 s	Long press button A to start factory reset
Red	Hardware error	Fast flashing (100 ms on / 100 ms off) for 200 ms	N/A
Green	Confirm key press	Flashing (1/4 s on / 7/4 s off) until button pressing stop	Middle press button A

LED B

LED color	Device status	LED pattern	Push button operation
Off	LAN/WLAN is not connected or switched off.	Off	N/A
Green	LAN/WLAN is on.	On for 3 s	Middle press button A
	WLAN access is switched on.	Fast flashing (100 ms on / 100 ms off)	N/A
Orange	WLAN access is switched off.	On for 3 s	Middle press button A

LED C

LED color	Device status	LED pattern	Push button operation
Orange	Thread initial status (Device is not defined or joined a network.)	On	N/A
Green	Commissioning mode (Device joined the network.)	Fast flashing (100 ms on / 100 ms off) for 200 ms	N/A
	In operation	On	
	Joining	Flashing (1/4 s on / 7/4 s off) for 2 s	Short press button B
Red	Connection lost	Flashing (1/4 s on / 7/4 s off) for 2 s	N/A

Preliminary

1.2 Thread room sensor

Sensors are sleepy device. They transmit data only when awoken and normally connected to network.

Powered by alkaline battery

The sensor is powered by alkaline battery that is supplied with sensor in package.

- QAA2890/WI, QFA2890/WI: 3 x alkaline batteries type AAA, 1.5 V
- QPA2892/WI: 2 x alkaline batteries type AA, 1.5 V

When battery level is low and network connection is normal, low battery level alarm is sent to the gateway for brand-new battery replacement.

Users can check battery level by short press push button on the rear of the device to activate the LED. The batteries are almost empty if LED turns red and keeps fast flashing (100 ms on / 100 ms off) for 8 s and must be replaced within 2 weeks.

Notes

- Do not install used or low-quality battery.
- Do not mix used and new batteries. Otherwise, it may cause battery leakage.
- Do not use leaking or deformed battery.
- Do not use rechargeable battery.
- Do not remove battery during commissioning and configuration.
- As lower battery alarm is sent to gateway if battery power is in low-level, brand-new battery needs to be replaced. The used batteries should be disposed in accordance with local and national legislation.
- Network connection is lost if battery level reduces too much after low battery alarm raised.
- Check battery power periodically as battery in low power level for long time may cause battery leakage

Battery lifetime

Battery life is calculated in lab. The value may change or deviate as per environment.

Push button and LED indication

Push button is on the rear of the device used for operation. LED is on the front of device used for status checking.

LED

In the following table:

- Short press (<2 s) means short press the push button
- Long press (>20 s) means long press the push button

LED color	Device status	LED pattern	Push button operation
Off	Unpowered device / powered device without display	Off	N/A
Green	Start up (e.g. battery installation)	Fast flashing (100 ms on / 100 ms off) for 3 s	N/A
	Normal (connected)	On for 8 s	Short press to activate LED
	Joining	Flashing (1/4 s on / 7/4 s off) during joining and is timeout after 120 s	Short press to activate LED, then short press within 8 s to join [1]
Orange	Initial state (no connection)	On for 8 s	N/A
	Factory reset	Fast flashing (100 ms on / 100 ms off) for 8 s	Long press to start factory reset
Red	Connection lost [4]	Flashing (1/4 s on / 7/4 s off) for 8 s	Short press to activate LED
	Low battery / Hardware error	Fast flashing (100 ms on / 100 ms off) for 8 s	
	Programming mode	Constant on during programming mode and timeout after 4 minutes. In programming mode, power consumption is higher.	Short press to activate LED, then short press within 8 s to enter programming mode [2] [3]
	Response for button press	Constant on until users stop pressing within 2 s	Short press to active

Preliminary

LED color	Device status	LED pattern	Push button operation
Off and green	Firmware update	Constant off during firmware downloading, fast flashing (100 ms on / 100 ms off) during new firmware startup.	N/A

Notes

[1] Device is in initial state (no connection).

[2] Before entering programming mode, device needs connect to Thread network.

[3] Device can enter programming mode via gateway. The icon of programming mode in gateway web UI is **Device Identification** locates in **KNXIOT GATEWAY** -> **Device Management** -> **Configuration** -> **Maintenance Commands**.

[4] If device connection is lost (LED flashes red) and rejoining to the network is needed, users need factory reset the device firstly.

1.3 Thread mesh extender

LED

Extender is powered by USB-C power adapter.

LED A

LED color	Device status	LED pattern
Green	Start up (e.g. device is powered on)	Fast flashing
	Normal operation	Solid

LED B

LED color	Device status	LED pattern
Green	WLAN is switched on.	N/A
	Traffic	Fast flashing
Yellow	WLAN access is switched off.	N/A

LED C

LED color	Device status	LED pattern
Yellow	Not commissioned	Solid
Green	Joining	Flashing
	Commissioning mode	Solid
Red	Network lost	Solid

Push button

WLAN ON/OFF button	Thread ON/OFF button
Factory reset (Press > 20 s)	Start Thread join (Toggle: Press < 2 s)
WLAN ON/OFF (Press 5...20 s)	

Preliminary

2 Mounting and installation

2.1 KNX IoT to BACnet IP gateway

For detailed mounting instructions, see Mounting instructions.

For detailed environmental conditions, see Data sheet.

- The device is designed for wall mounting and can also be placed on a horizontal surface.
- Inside wall (not an outside wall!) of the room to be air conditioned; not in recesses, behind curtains, above or close to heat sources or shelves and not on walls where a chimney is located. Do not expose the unit to spotlights or direct sunlight.
- Install the device in the occupied space about 2.2 m above the floor and at least 20 cm from the next wall.

2.2 Thread room sensor

For detailed mounting instructions, see Mounting instructions.

For detailed environmental conditions, see Data sheet.

- The device is designed for wall mounting, flush mounting, and tape mounting.
- Inside wall (not an outside wall!) of the room; not in recesses, behind curtains, above or close to heat sources or shelves and not on walls where a chimney is located. Do not expose the unit to spot lights or direct sunlight.
- Install the sensor in the occupied space about 1.5 m above the floor and at least 20 cm from the next wall.
- Seal the end of the conduit at the sensor to prevent false measurements caused by draughts through the conduit.

2.3 Thread mesh extender

Thread mesh extender can be mounted on walls or ceilings. The ideal orientation is vertically on a flat wall, with Power and Ethernet cables facing down. A clearance of 2 cm on all sides should be maintained.

- Do not install the device in a cabinet or metal container.
- Do not install the device behind walls or other obstructions which would interfere with line of sight to other Thread devices on your network.
- Do not install the device too low to the ground.
- Do not install the device on rough or uneven surfaces.
- Install in a central location which offers best coverage for devices in the premise.
  - Repeater devices can be added to your Thread network to improve network coverage.

2.4 Installation onsite

Install all devices to planned location as per provided mounting instructions.

Communication range refers to the table below. The actual range depends on building structure and environment.

Communication range	
Direct distance between • Sensor and gateway • Sensor and extender • Extender and gateway	 • Approximate 50 m • Approximate 50 m • Approximate 50 m

If sensor is not connected to Thread network successfully, recommend adding extenders to extend network or see resolutions described in Frequently asked questions [→ 27].

Preliminary

3 Setup and commissioning

3.1 Login gateway web UI

- Connect a smart phone or PC to a specific gateway WLAN, e.g., KNBAxxxx1D. No password is needed.
- Log in URL: https://192.168.8.1
- No default password, click **Login** directly.

Login management interface for the first time

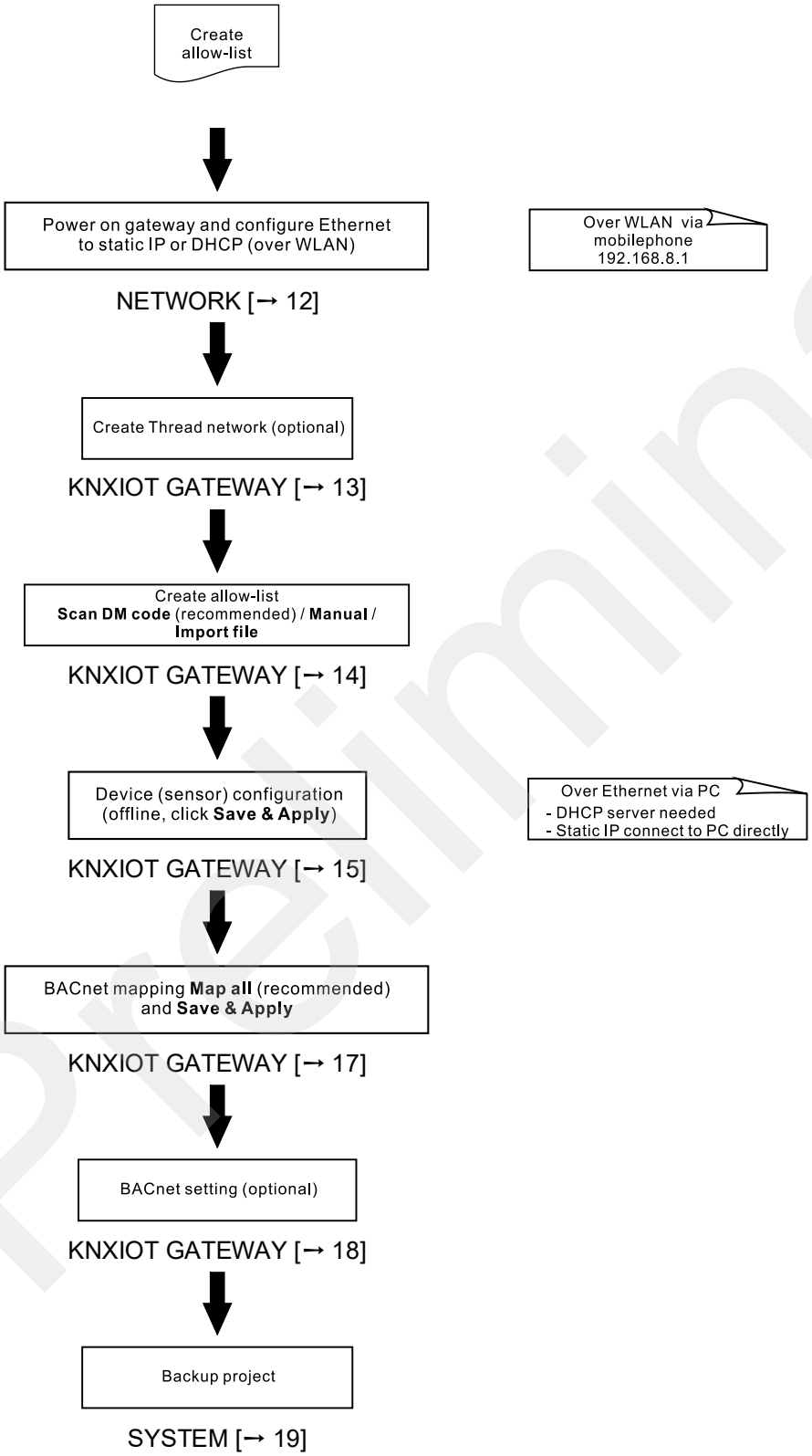
1. Select the desired language and click **Next**.
2. Set new password: At least 8 characters including upper case letters, lower case letters, special characters and numbers.
3. Confirm new password and click **Submit**.
   – Login is successful and the new password is set for future logins.

Preliminary

3.2 Workflow

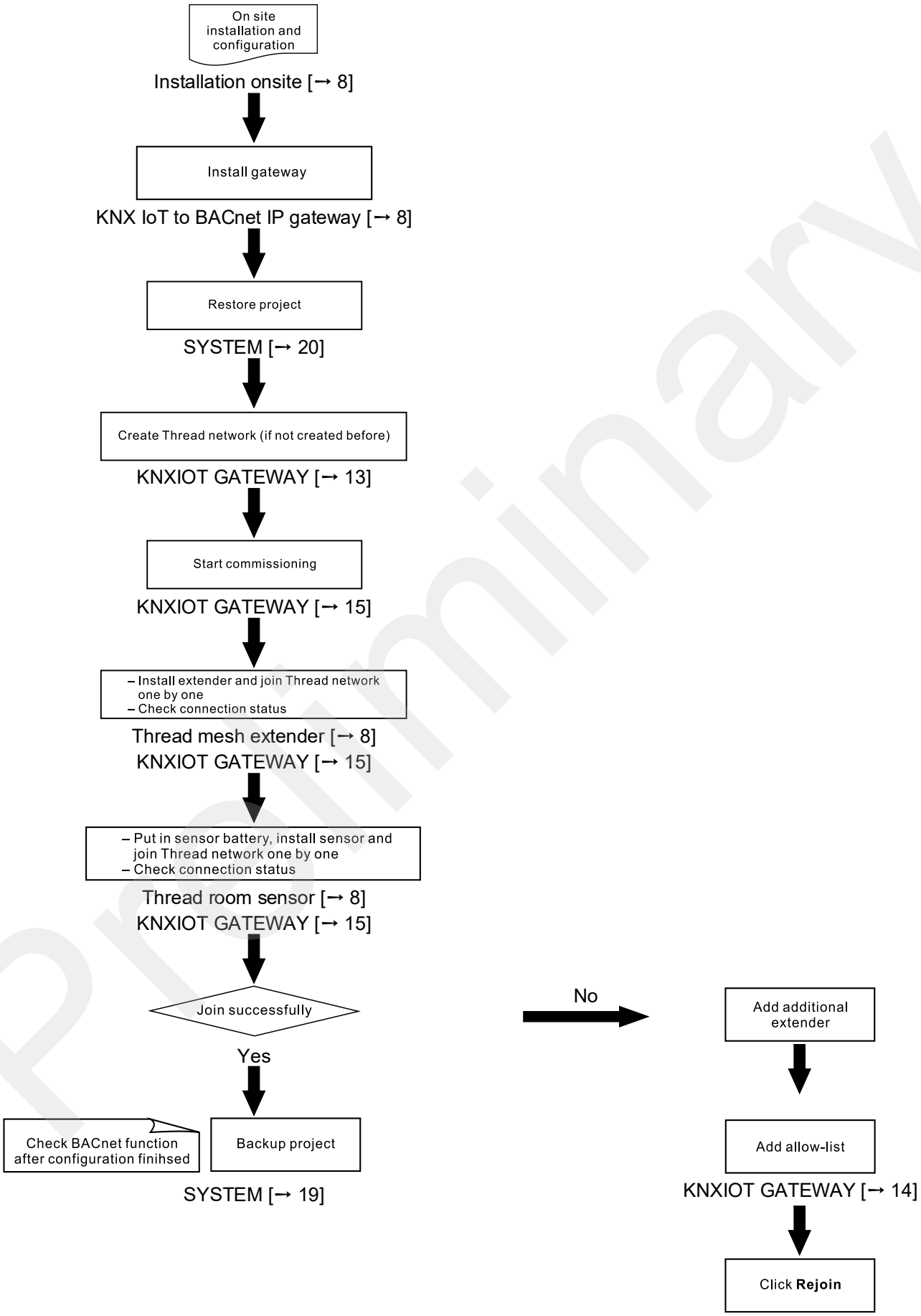
Setup, commissioning and installation workflow for all devices in the system is as follows:

Create allow-list



Preliminary

On site installation and configuration



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For setup and commissioning, users need to:

- Connect sensor to Thread network
- Configure corresponding information
- Map parameters to BACnet network

3.3 Commissioning

3.3.1 HOME

Thread network topology is displayed. Users can click:

- Gateway WLAN name, e.g., **KNBA00000001** directly jumps to **WIRELESS**
- **WLAN Clients** icon directly jumps to **WLAN Clients** under **NETWORK**
- **LAN Clients** icon directly jumps to **LAN Clients** under **NETWORK**
- **IPv6** icon directly jumps to **IPv6** page under **MORE SETTINGS**
  Note: BACnet IP communication only supports IPv4.

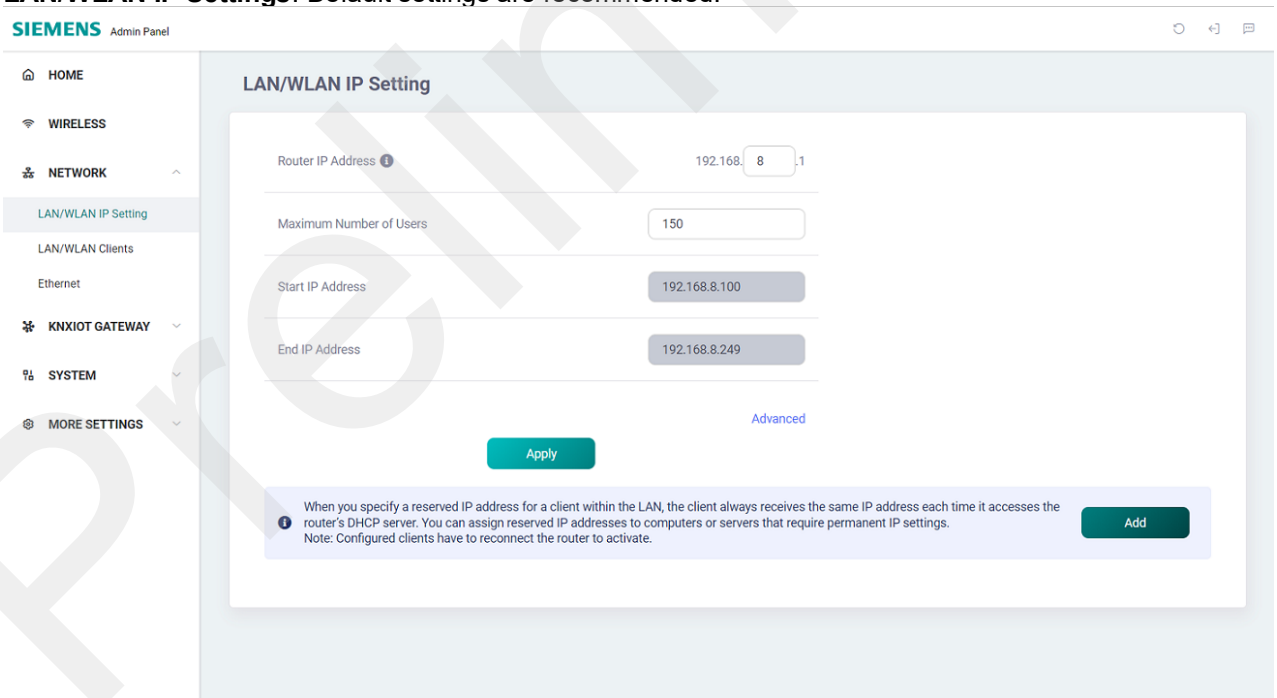
3.3.2 WIRELESS

Configure WLAN parameters

- WLAN is enabled by default. Make sure WLAN is enabled during commissioning.
- Users can change the parameters as desired by clicking **Modify** then click **Apply**.
  Change WLAN password after first login.

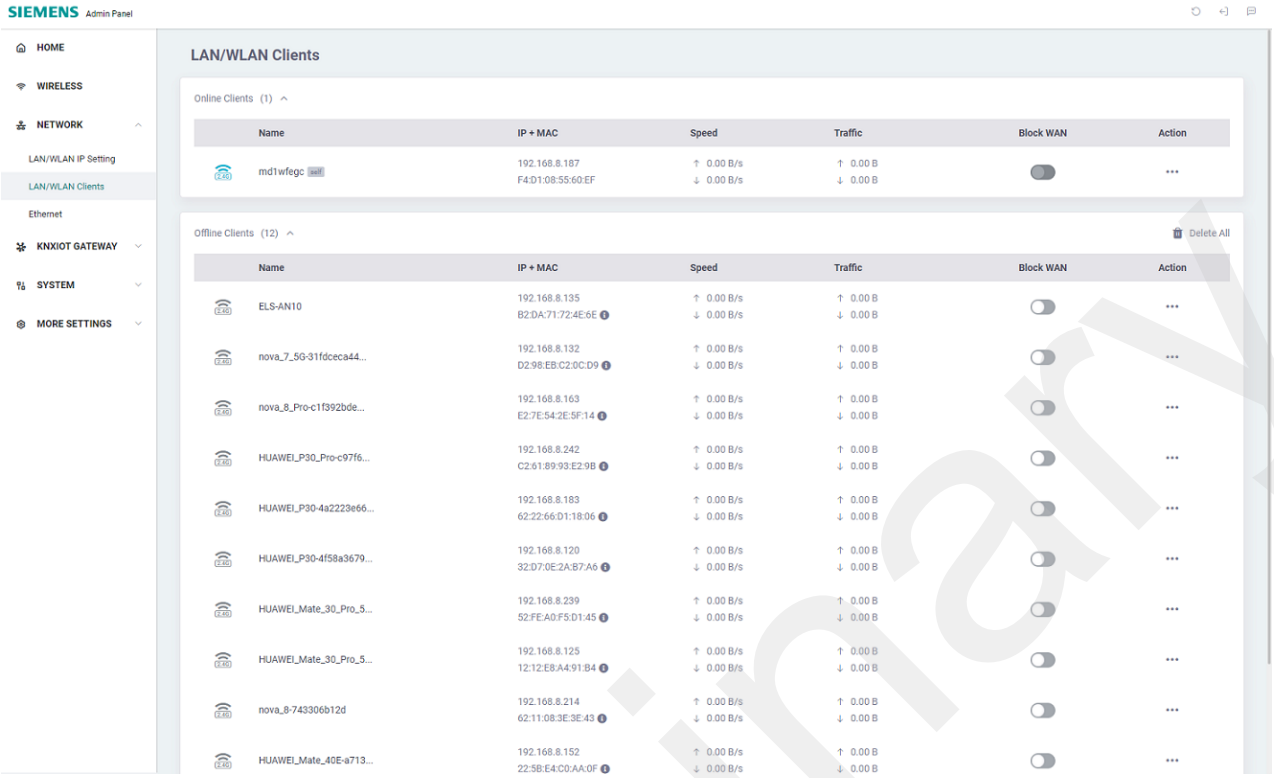
3.3.3 NETWORK

- **LAN/WLAN IP Settings**: Default settings are recommended.

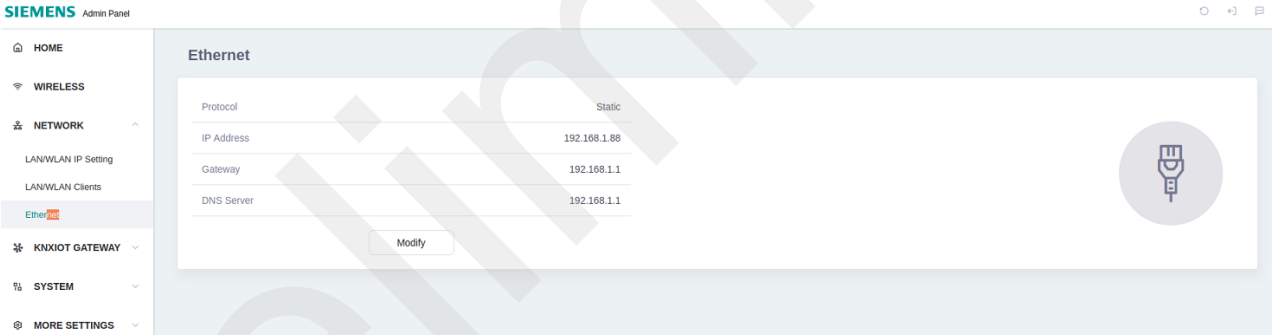


Preliminary

- **LAN/WLAN IP Clients**: Show online and offline clients

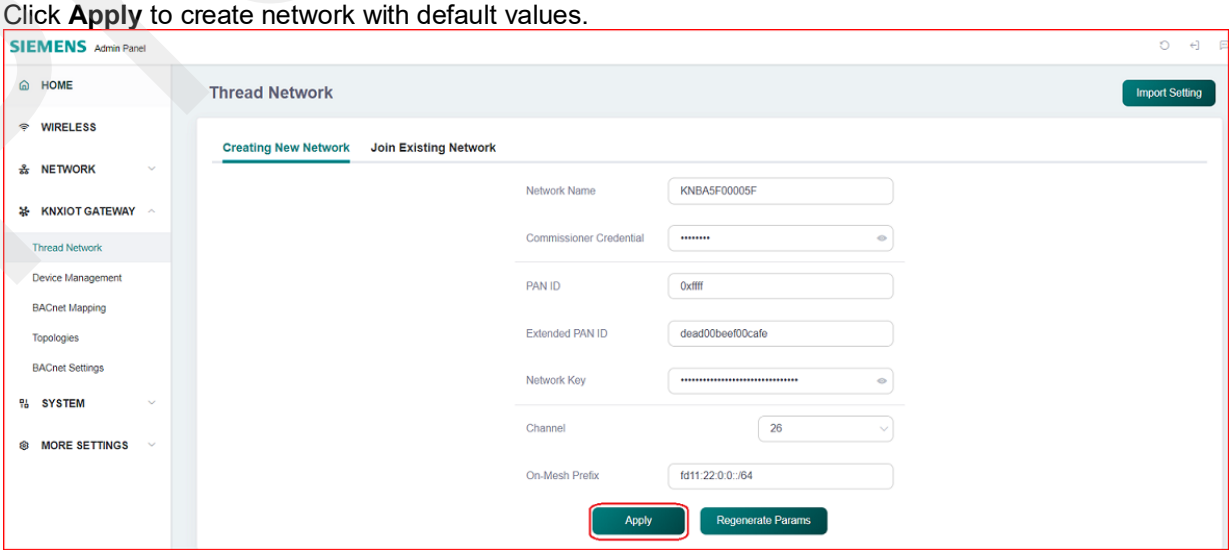


- **Ethernet**: The default connection is DHCP. Default settings are recommended.
  If users need to use Ethernet cable to connect gateway directly, configure static IP over WLAN.



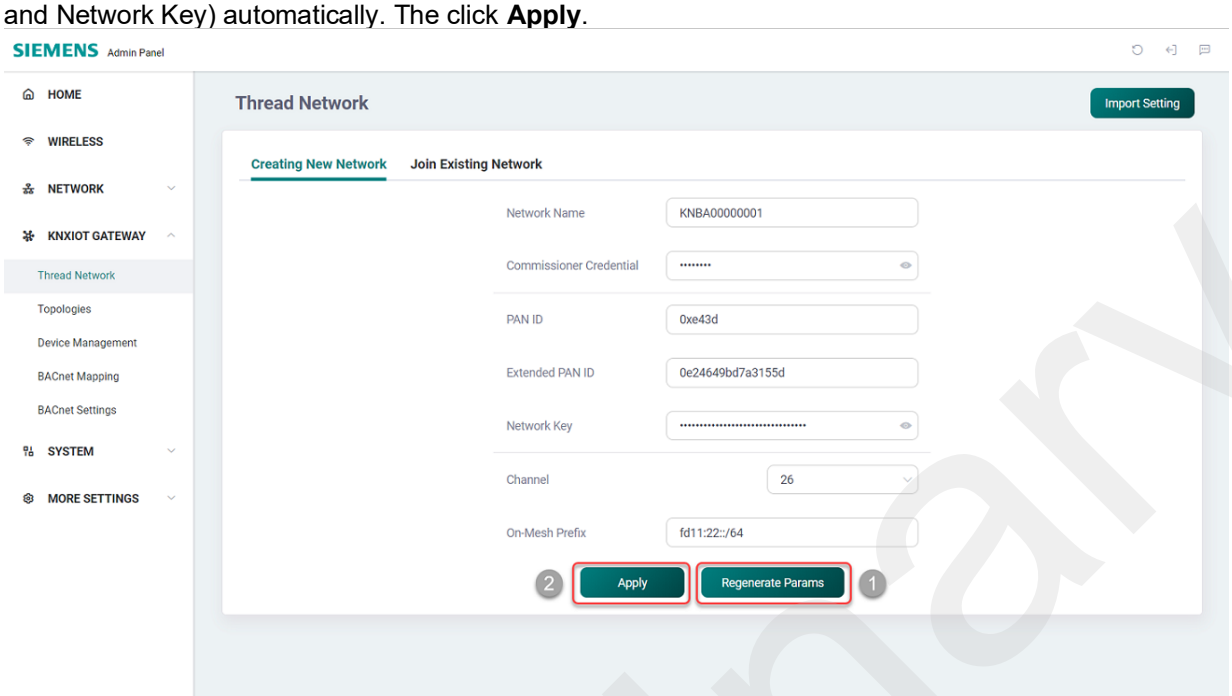
3.3.4 KNXIOT GATEWAY

- **Thread Network**: **Creating New Network** Two options are available:
  – Click **Apply** to create network with default values.

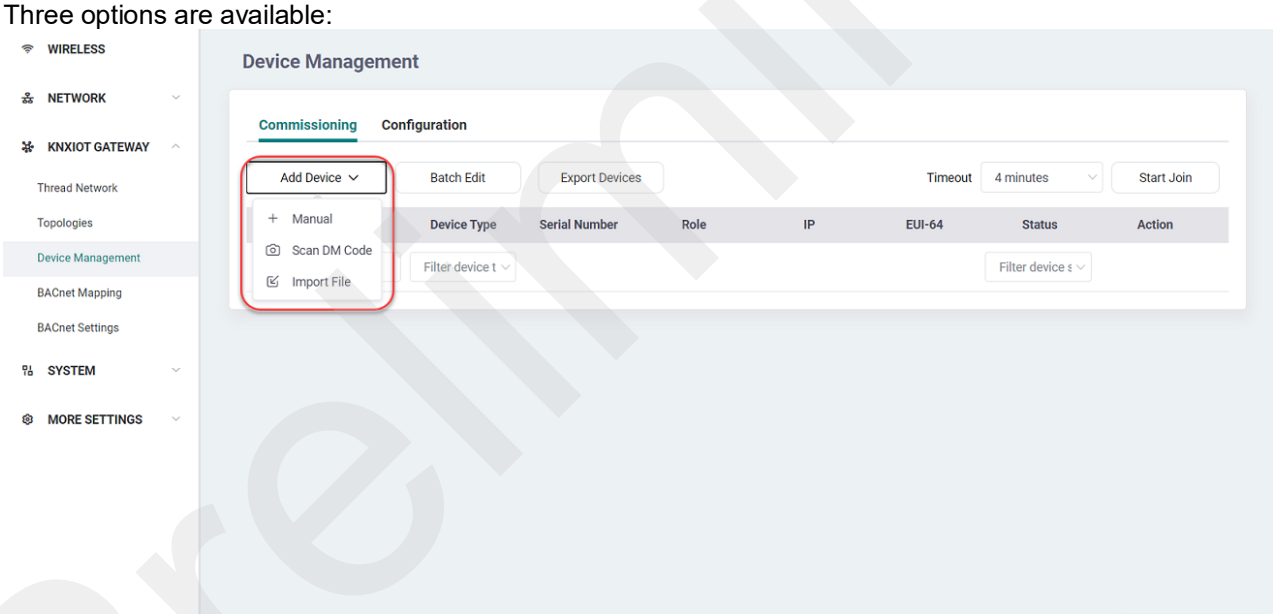


Preliminary

– Click **Regenerate Params** to generate a new network with new parameters (PAN ID, Extended PAN ID and Network Key) automatically. The click **Apply**.



- **Device Management - Commissioning**: Add devices to allow-list
  Three options are available:

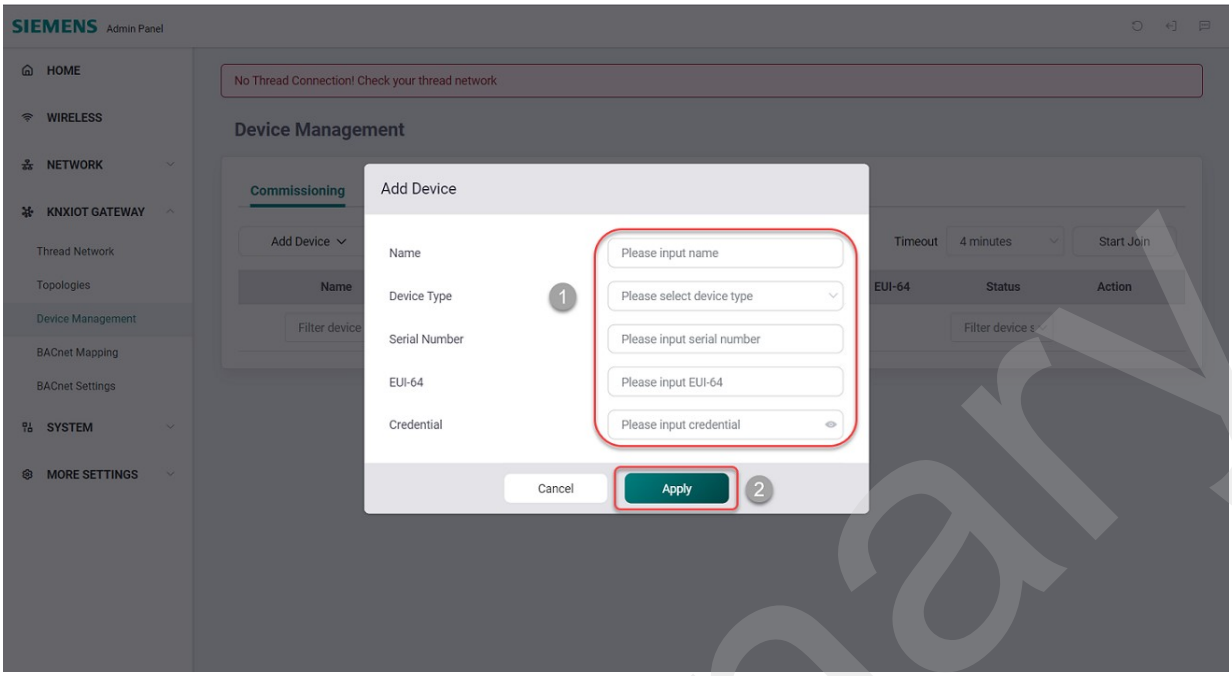


– **Scan DM Code**
  1) Make sure smart phone connect to gateway wireless network.
  2) Click **Scan DM code** to scan DM code on the rear of sensor or on the front of extender.
  3) Add device window pops up and enter device Name and click **Apply** to add device to the allow-list. All device status is **Disconnected**.
  Note: Do not add same device repeatedly and the allowed maximum device number is 100. If one same device is added twice, the .CSV file of allow-list import fails.

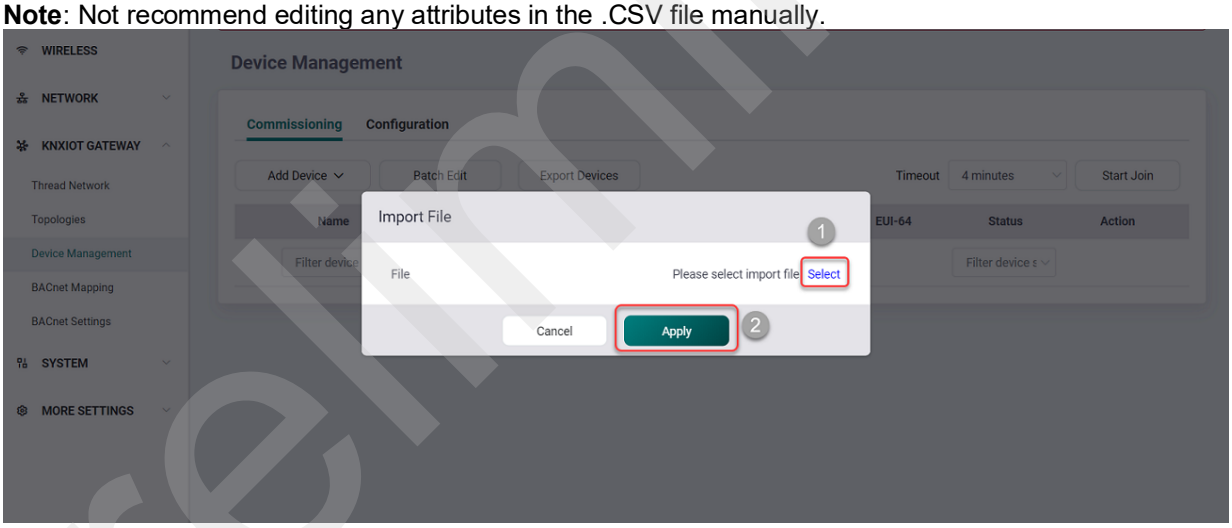
– **Manual** - Add devices (sensor and extender) to Thread network by entering parameters: Name, Device Type, Serial number, EUI64 and Credential (Sensor: PXXXXXXXX; Extender: P:XXXXXX). Related info

Preliminary

can be found on the rear of device. Users can define Name.

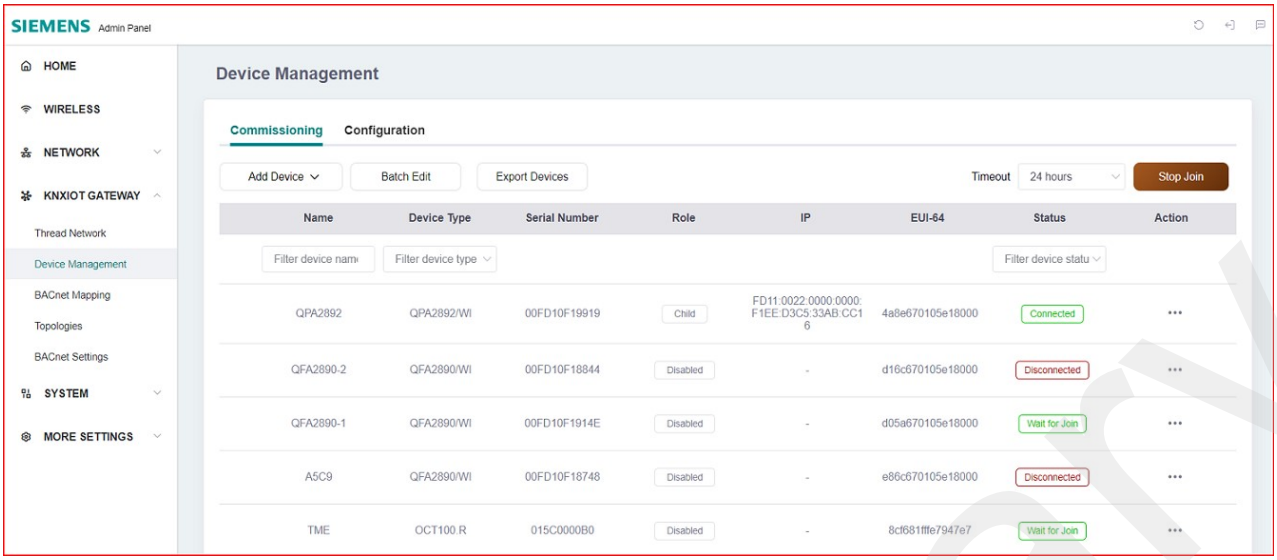


– **Import File** - When smartphone cannot connect Thread network or users are not on site, they can scan all needed devices using smart phone to generate .csv file and save to desired path.
Click **Select** to import the completed .csv file then click **Apply**.
Note: Not recommend editing any attributes in the .CSV file manually.

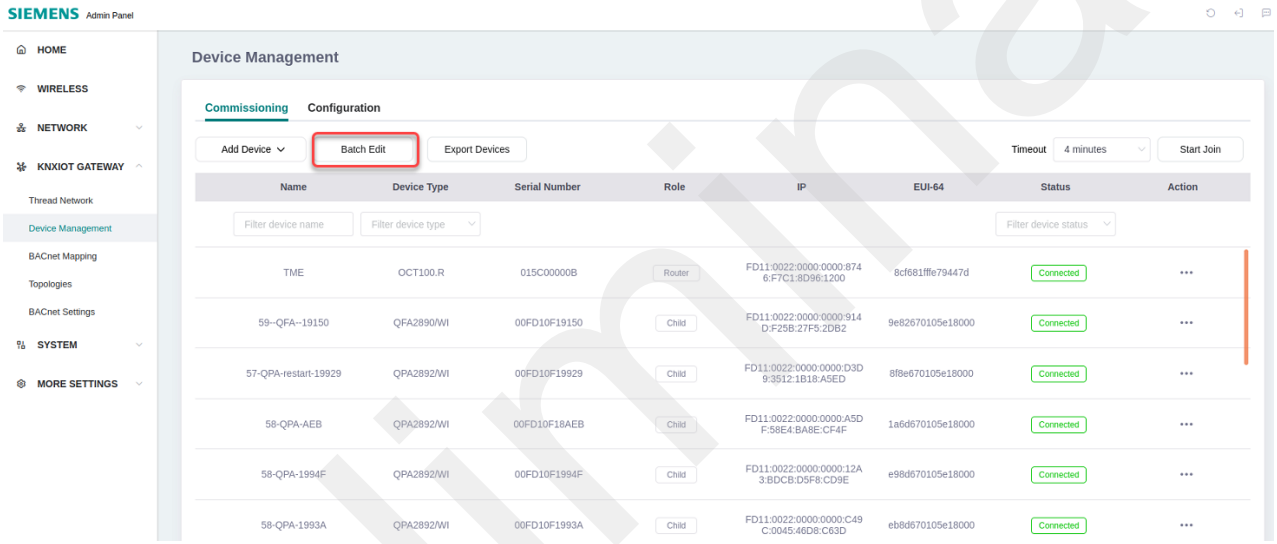


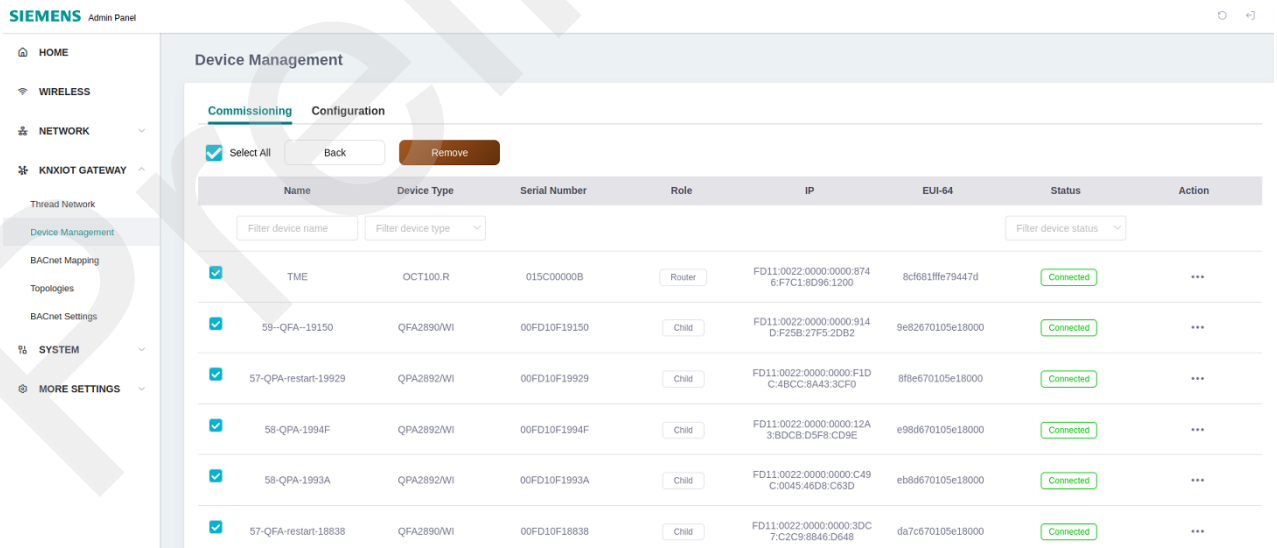
- **Commissioning**:
1) Set timeout to max. value and click **Start Join**. Then all device status is **Wait for Join**.
2) Power on extenders one by one. Extenders join Thread network automatically. (LED A & C green is constant on if join successfully.)
3) Install battery to power sensors. Sensors join Thread network automatically (Per device takes max. 2 minutes). Then LED green on for 8 s if join successfully.
4) Check if all devices join successfully. Status changes **Disconnected** -> **Wait for Join** -> **Connected**.

Preliminary



Note: User can click **Batch Edit** to remove devices in batches.

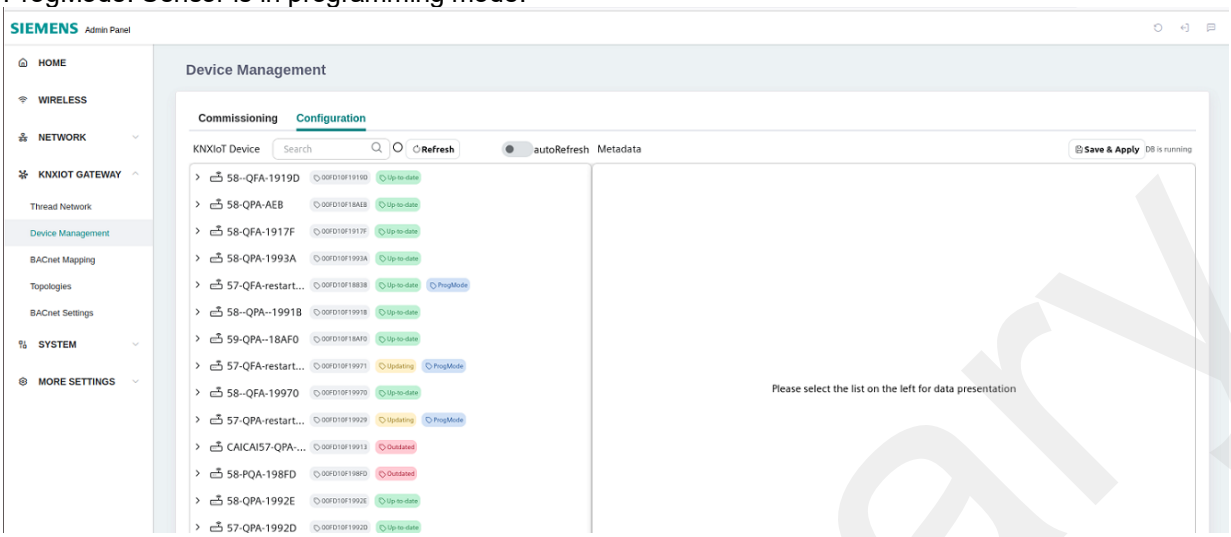




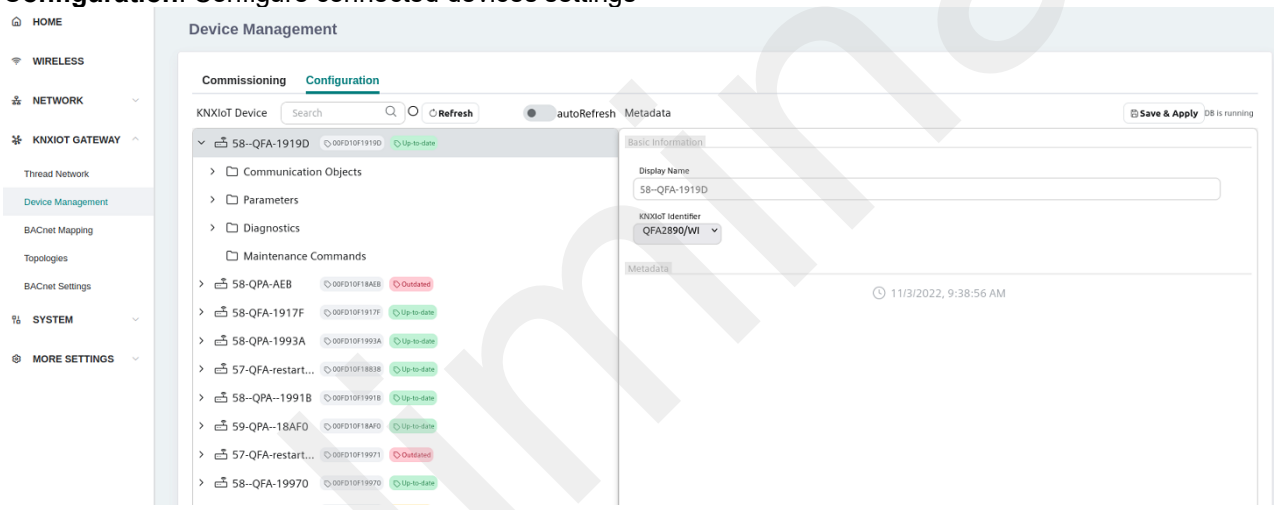
- **Configuration**
  Click **Save & Apply**.
  Sensor enters programming mode next wake-up cycle and LED red on for 4 minutes. Some of the following tags displayed near the device name, depending on data transmission:
  – Outdated: Synchronization timeout.
  – Updating: Information is syncing.

Preliminary

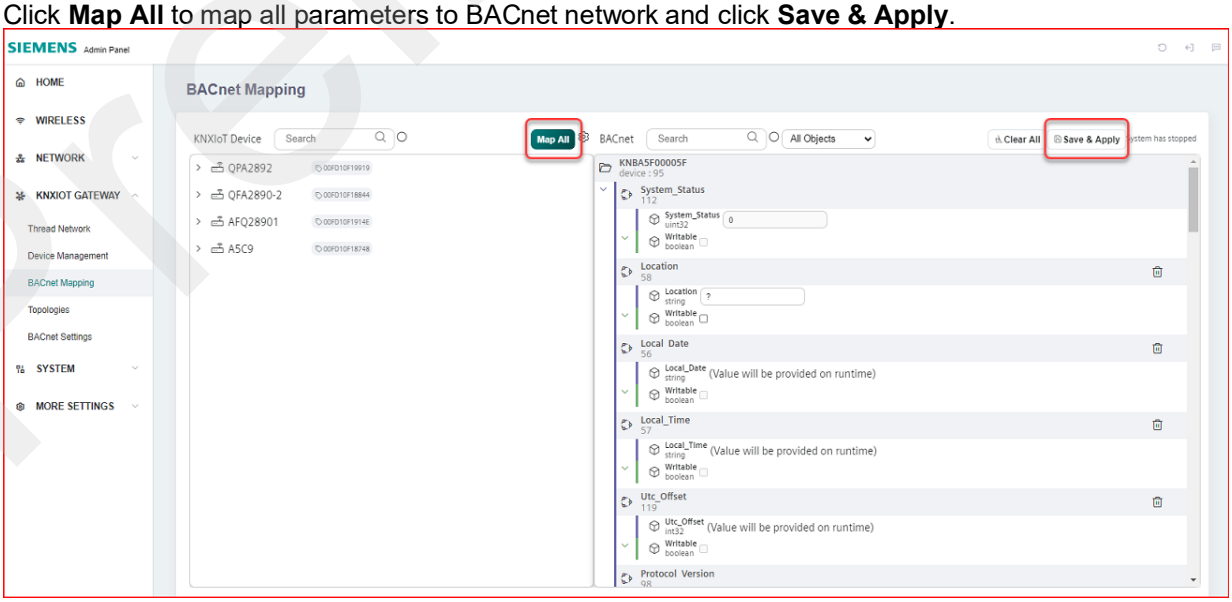
– Updated: Information synchronization is finished.
– ProgMode: Sensor is in programming mode.



- **Configuration**: Configure connected devices settings



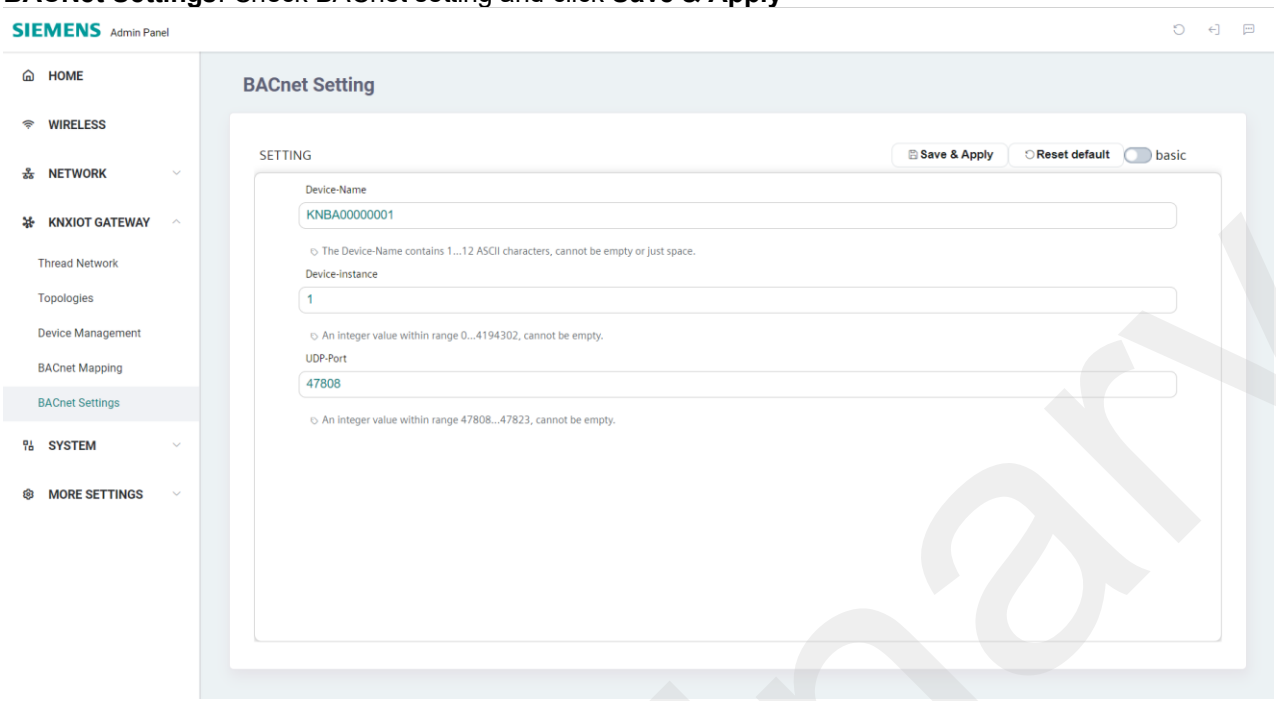
- **BACNet Mapping**: Two options are available:
  – Click **Map All** to map all parameters to BACnet network and click **Save & Apply**.



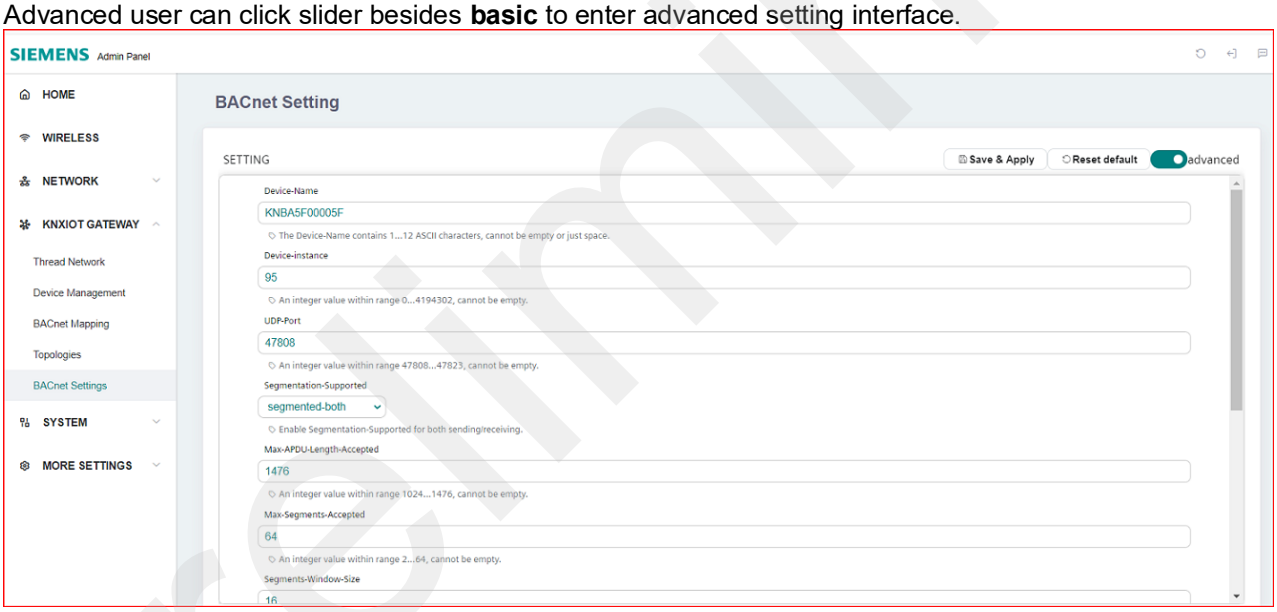
  – Map desired parameters from KNX IoT to BACnet and click **Save & Apply**.
  Select definite parameter on left side and drag it to related position on right side.

Preliminary

- **BACNet Settings**: Check BACnet setting and click **Save & Apply**



Advanced user can click slider besides **basic** to enter advanced setting interface.



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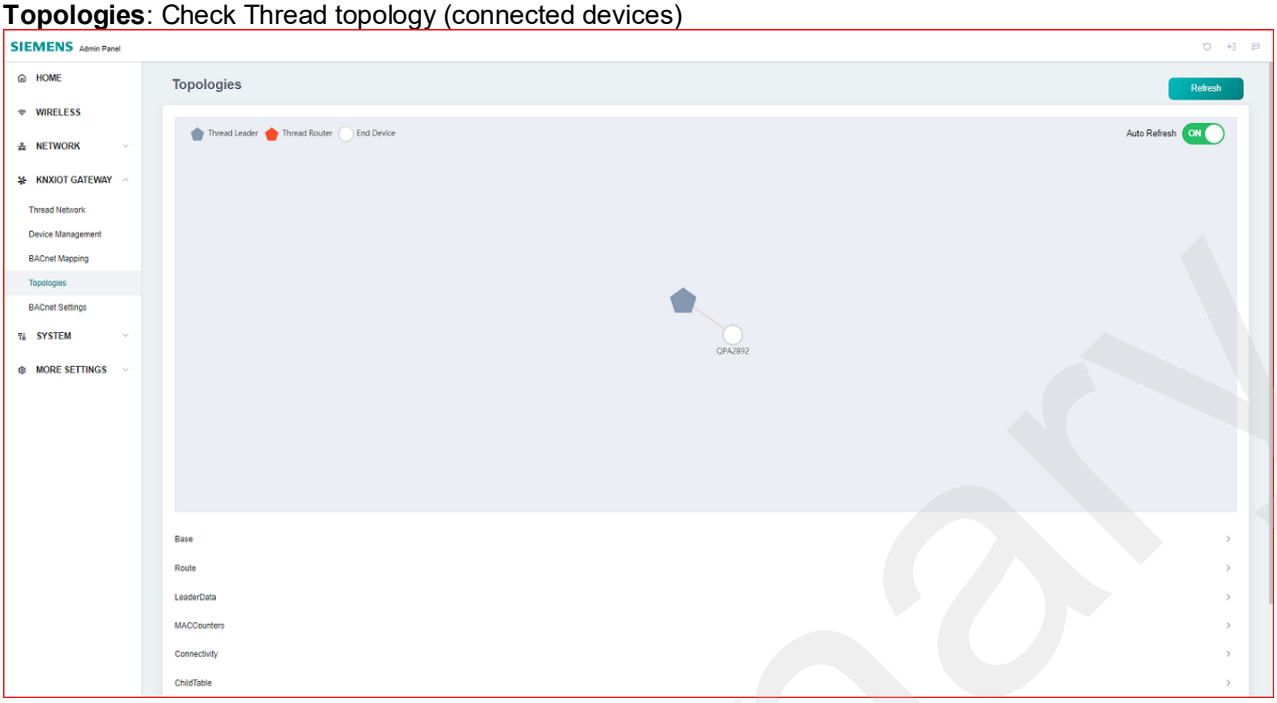
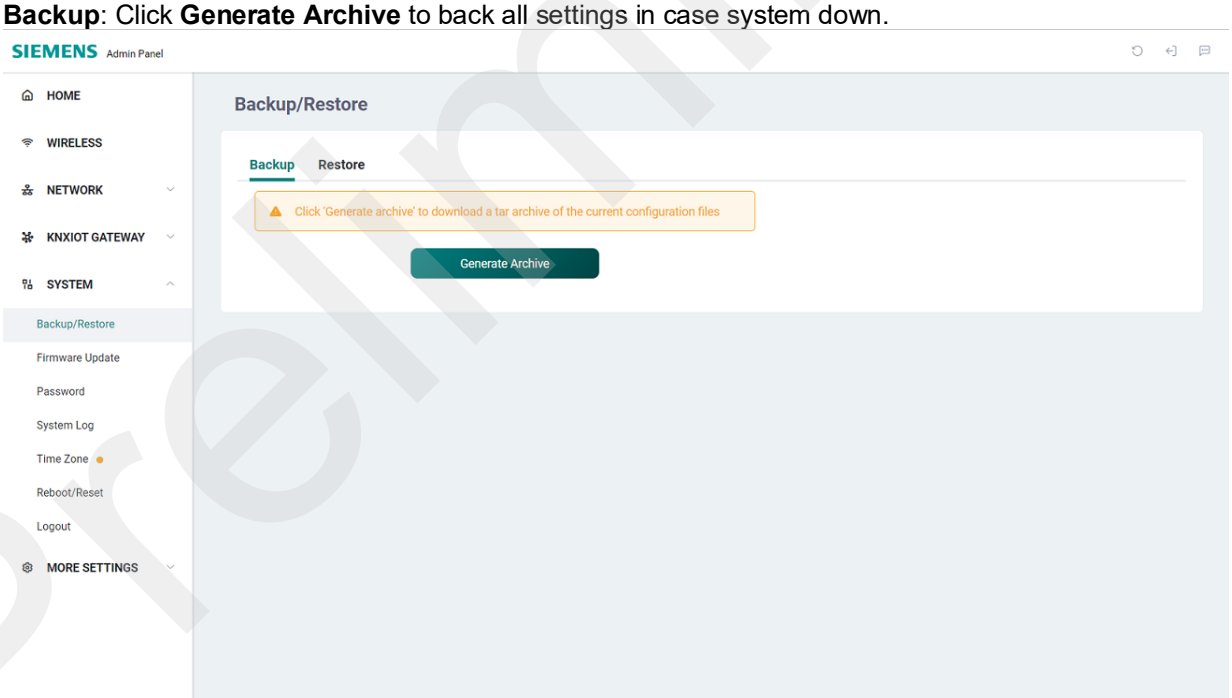
- **Topologies**: Check Thread topology (connected devices)



3.3.5 SYSTEM

- **Backup/Restore**: After system is set up successfully, backup entire system settings.
  - **Backup**: Click **Generate Archive** to back all settings in case system down.



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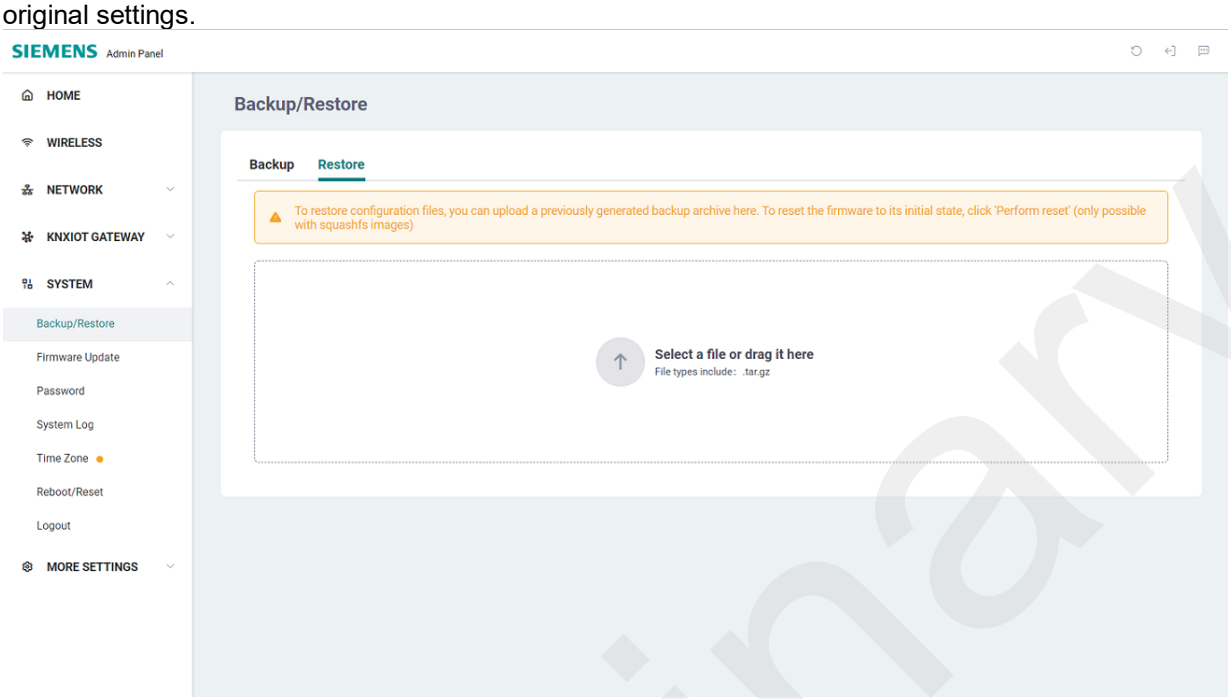
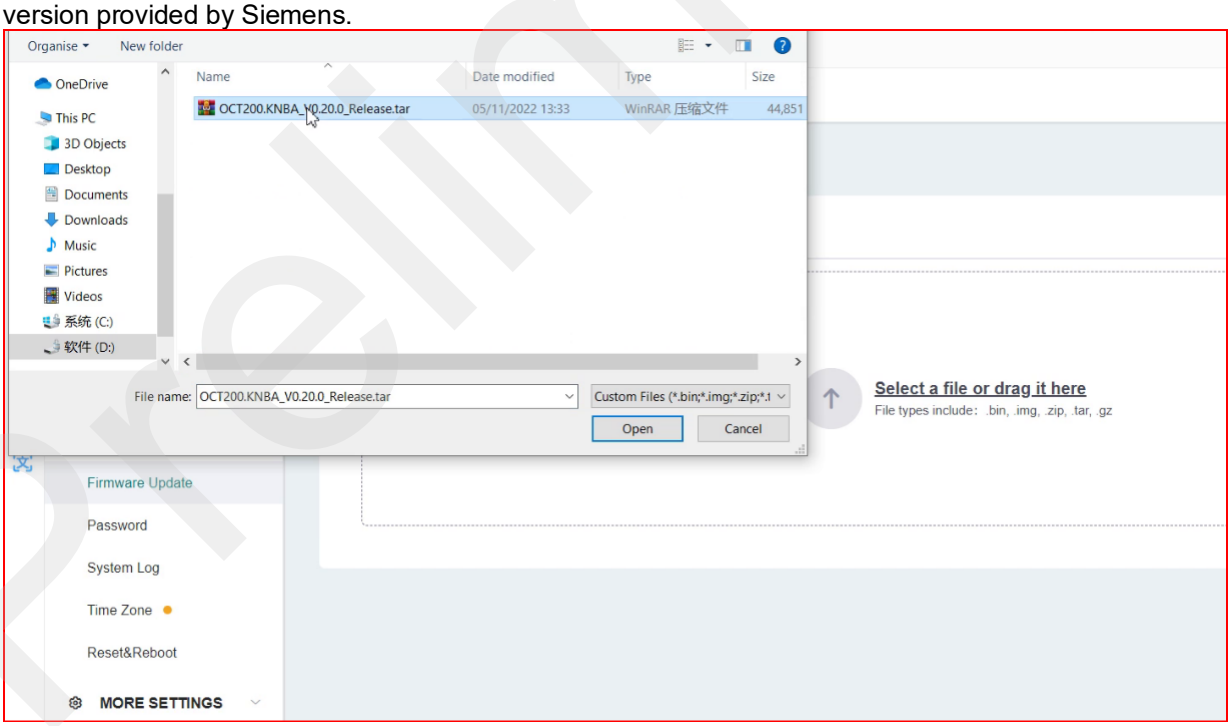
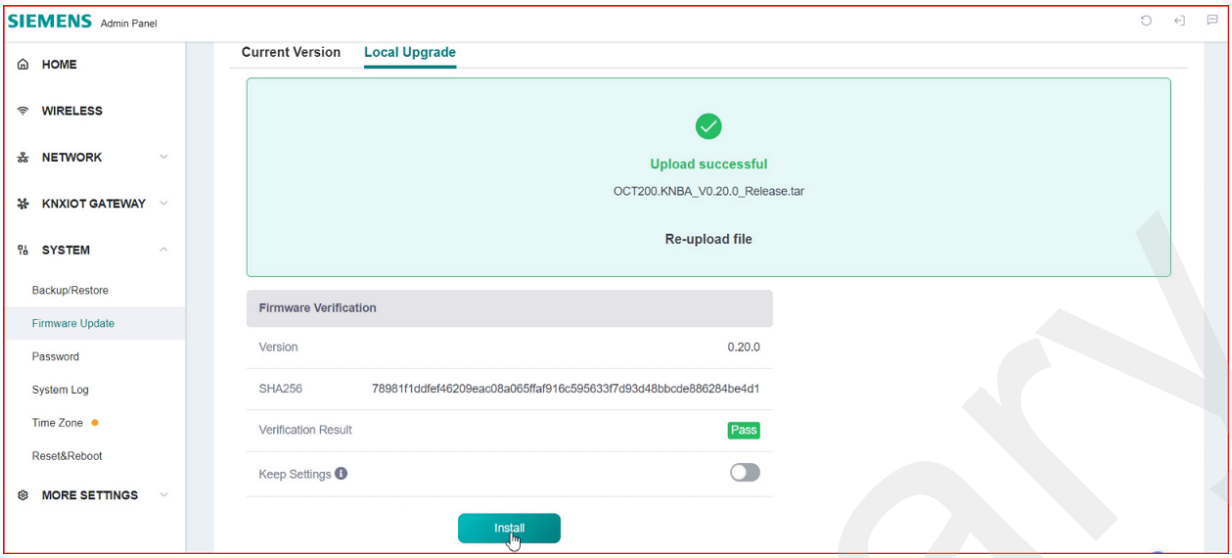
- **Backup/Restore**: Restore settings
  - **Restore**: Click **Select a file or drag it here** to select a file (backup.tar.gz) or drag the file to restore original settings.



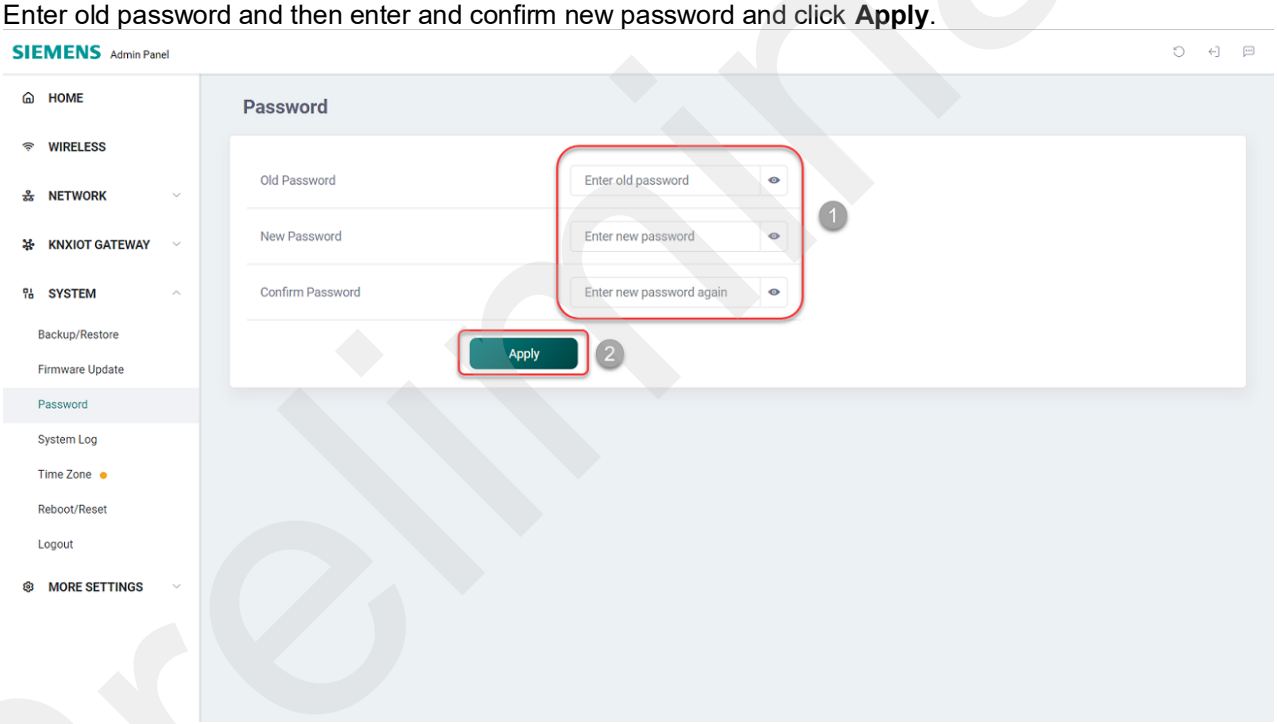
- **Firmware Update**
  - **Current Version**: Check current gateway firmware and Thread suite version and make sure use latest version.
  - **Local Upgrade**: Click **Select a file or drag it here** to select a file or drag a file to upload new firmware version provided by Siemens.



Preliminary

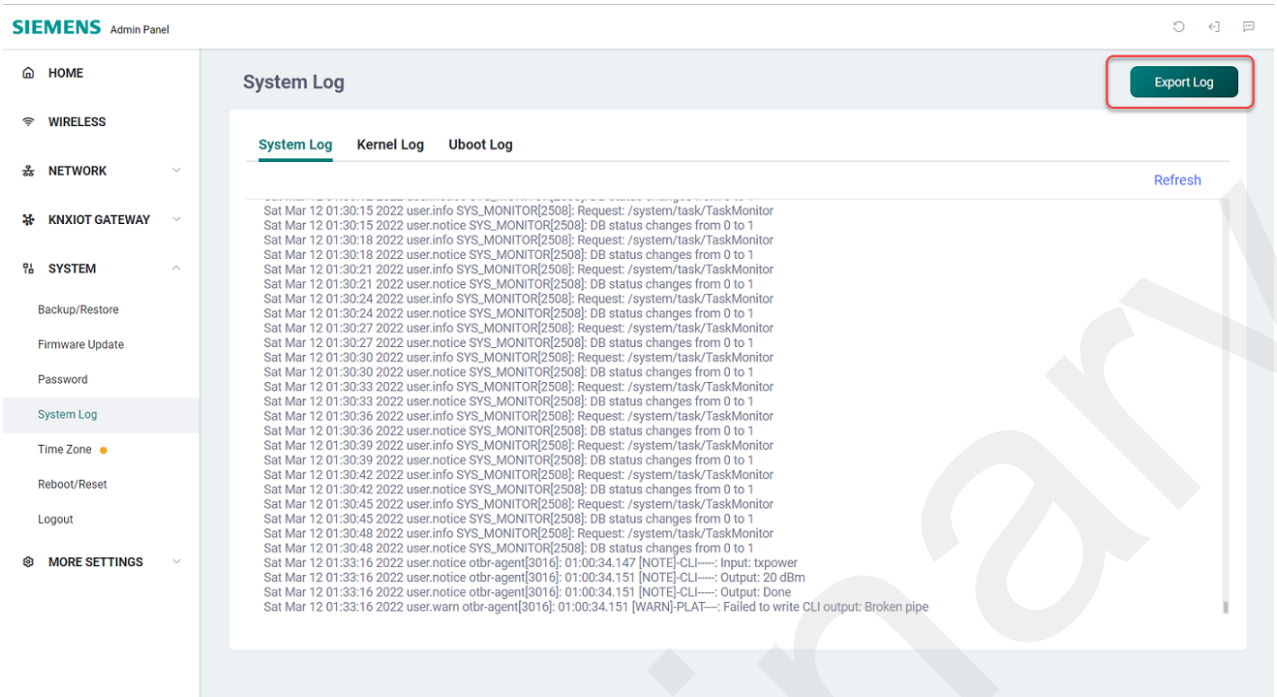


- **Password**: Change password: At least 8 characters including upper case letters, lower case letters, special characters and numbers
  Enter old password and then enter and confirm new password and click **Apply**.

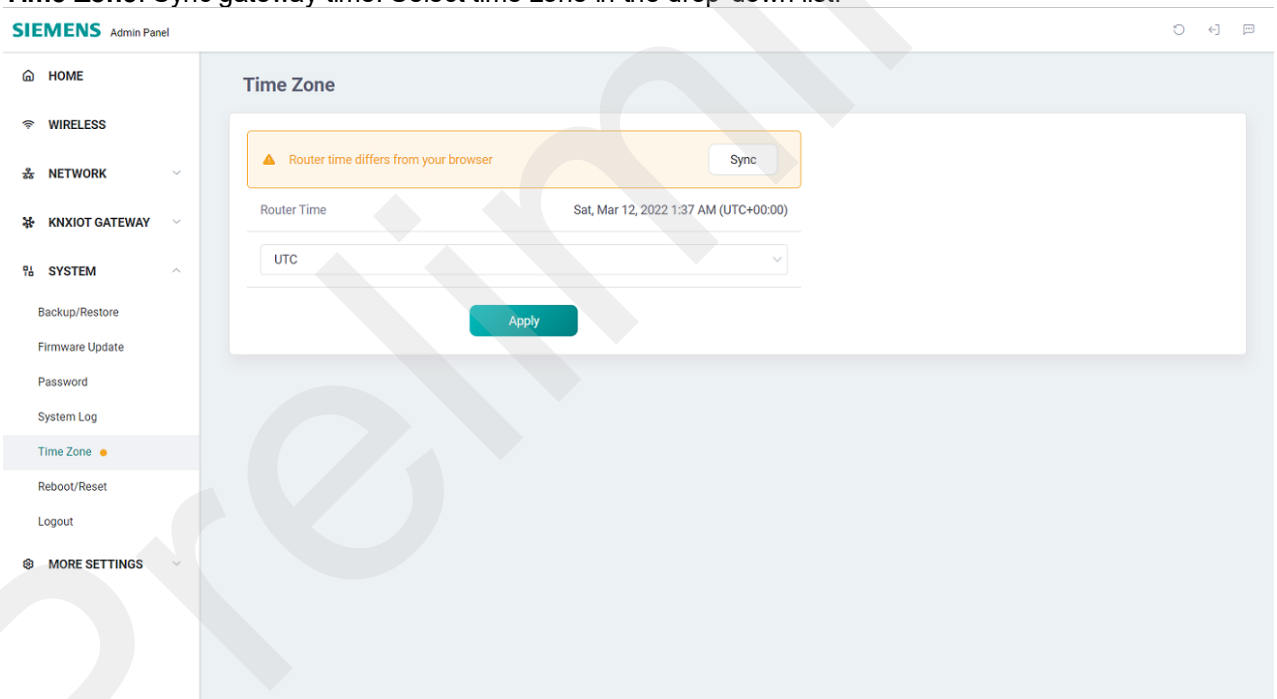


Preliminary

- **System Log**: Display system log, Kernel Log and Uboot Log and users can click **Export Log** to save logs to local.

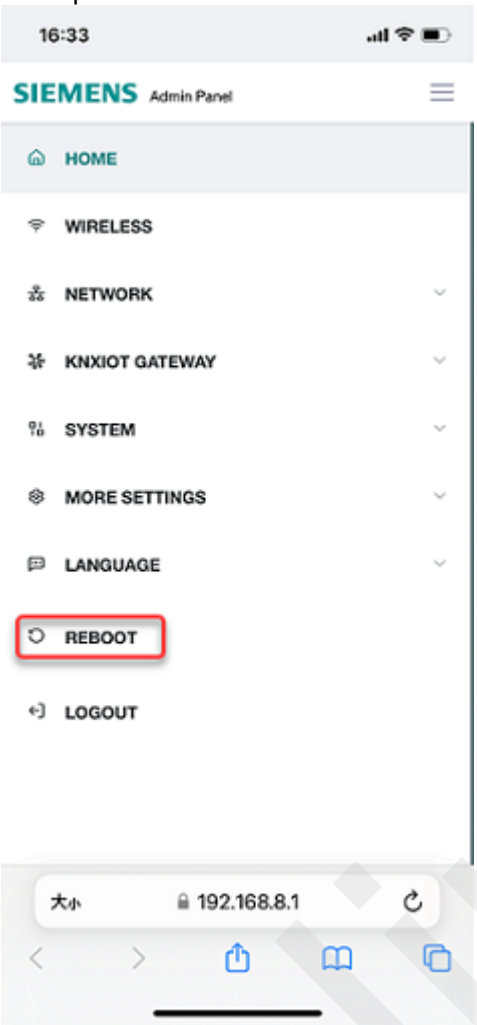


- **Time Zone**: Sync gateway time. Select time zone in the drop-down list.

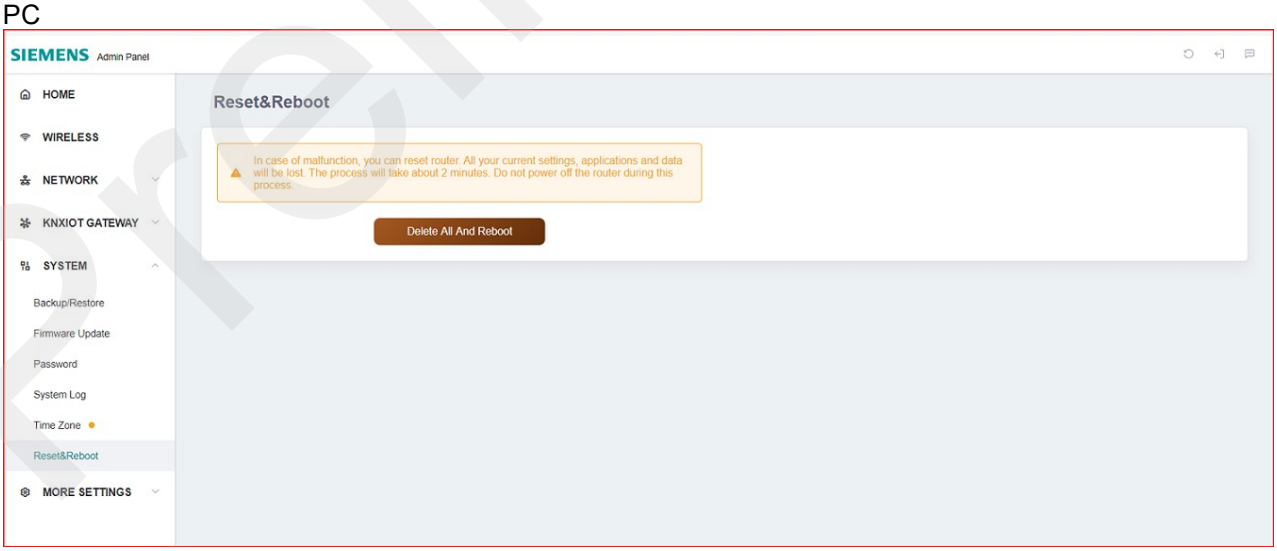


Preliminary

- **Reboot/Reset**: Users can click **Delete All And Reboot** on PC or **REBOOT** on smartphone to reboot gateway.
  Note: Not recommend power off the device during reboot.
  Smartphone



PC



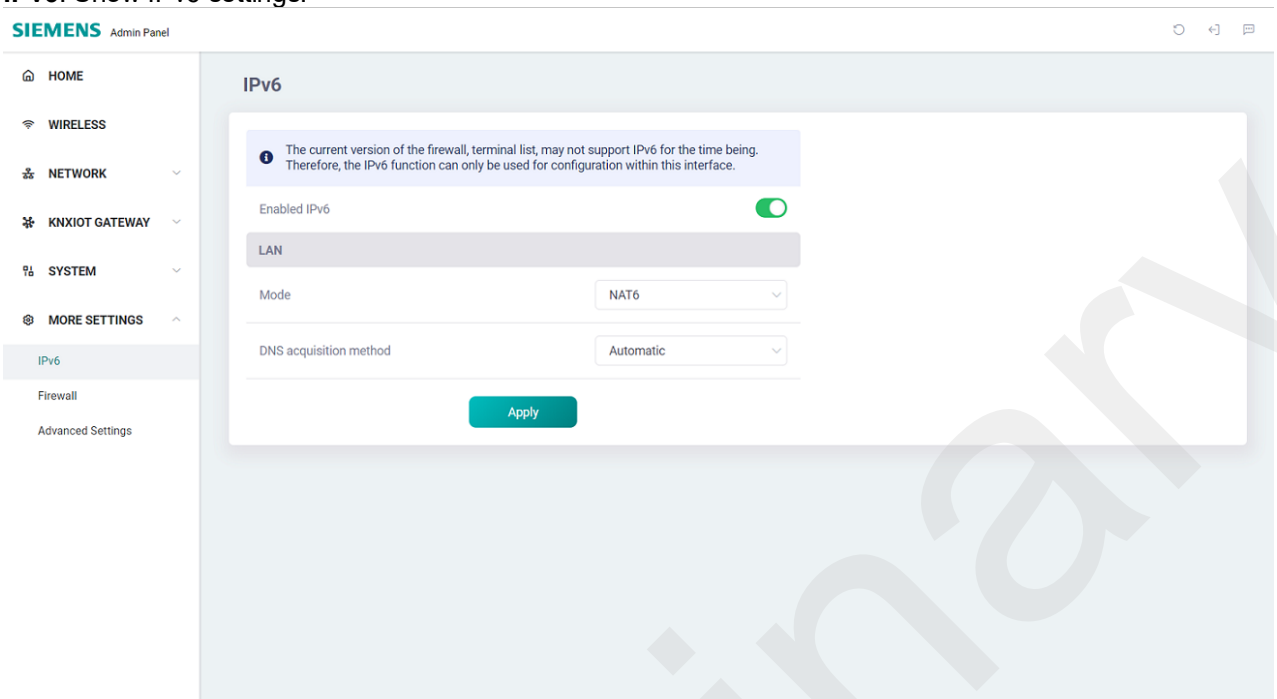
Note: Icons on right corner

: Reboot, : Logout, : Language

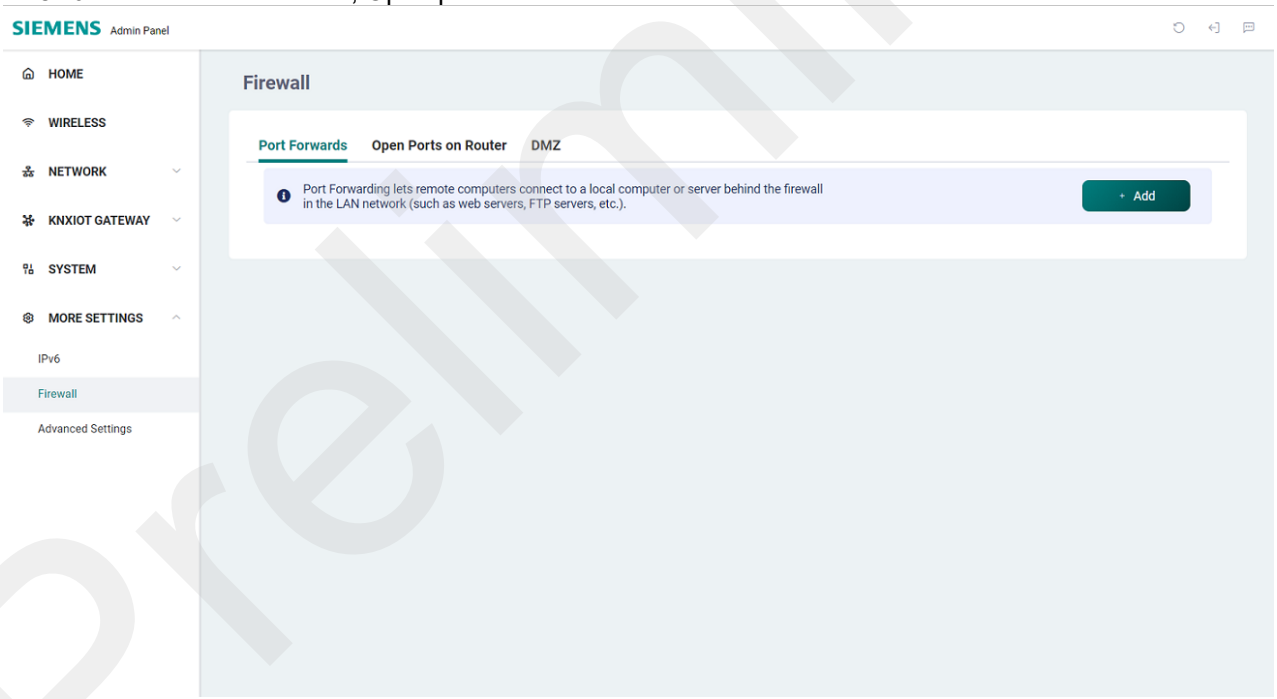
Preliminary

3.3.6 MORE SETTINGS

- **IPv6**: Show IPv6 settings.

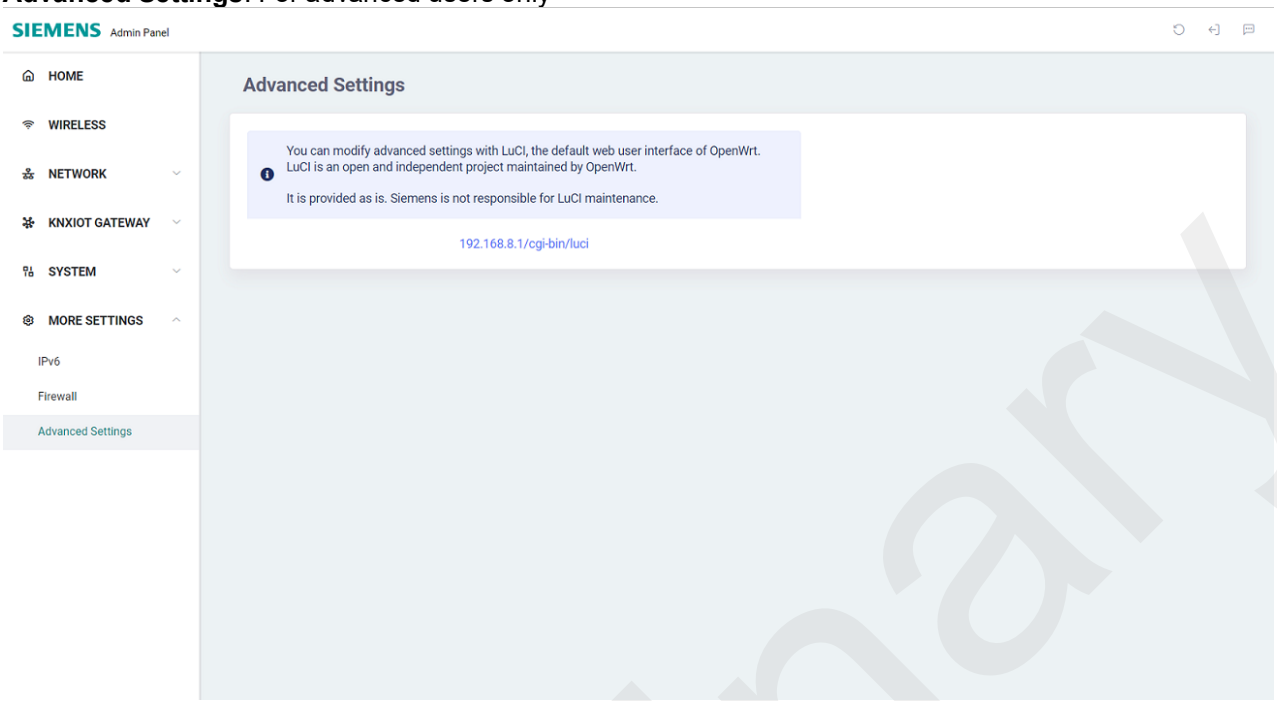


- **Firewall**: Show Port forwards, Open ports on Router and DMZ.



Preliminary

- **Advanced Settings**: For advanced users only



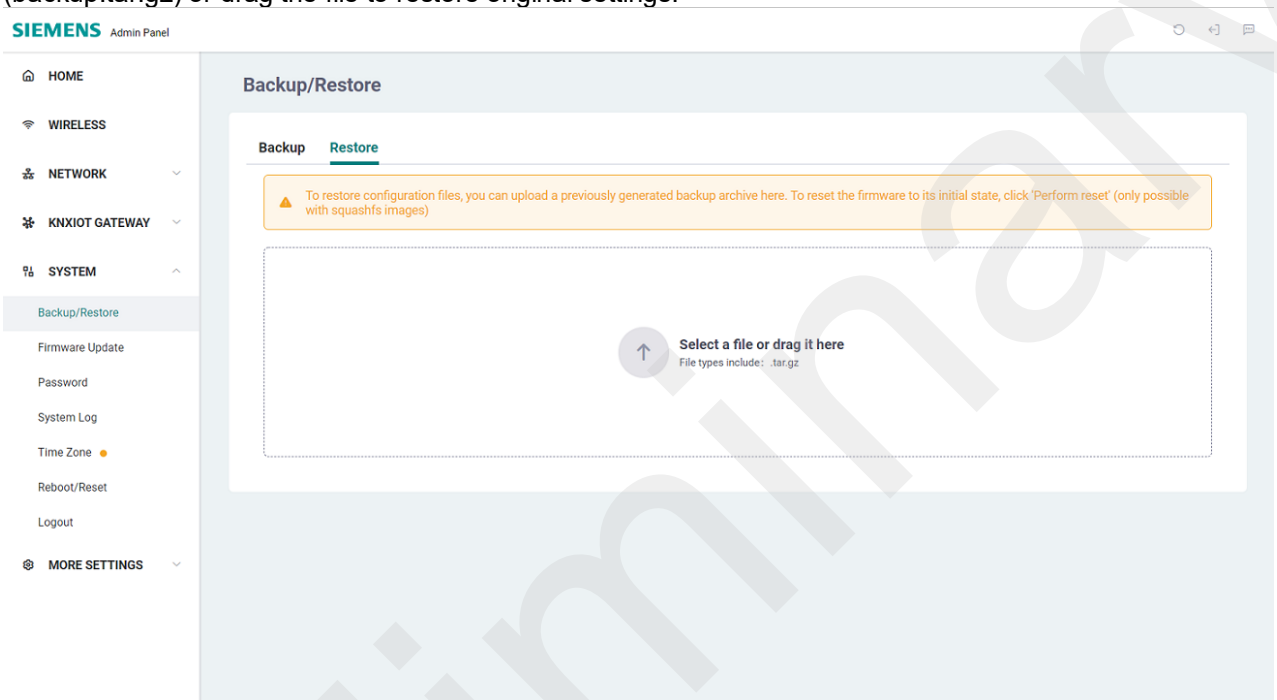
Preliminary

4 Maintenance

4.1 Replacing gateway

Proceed as follows:

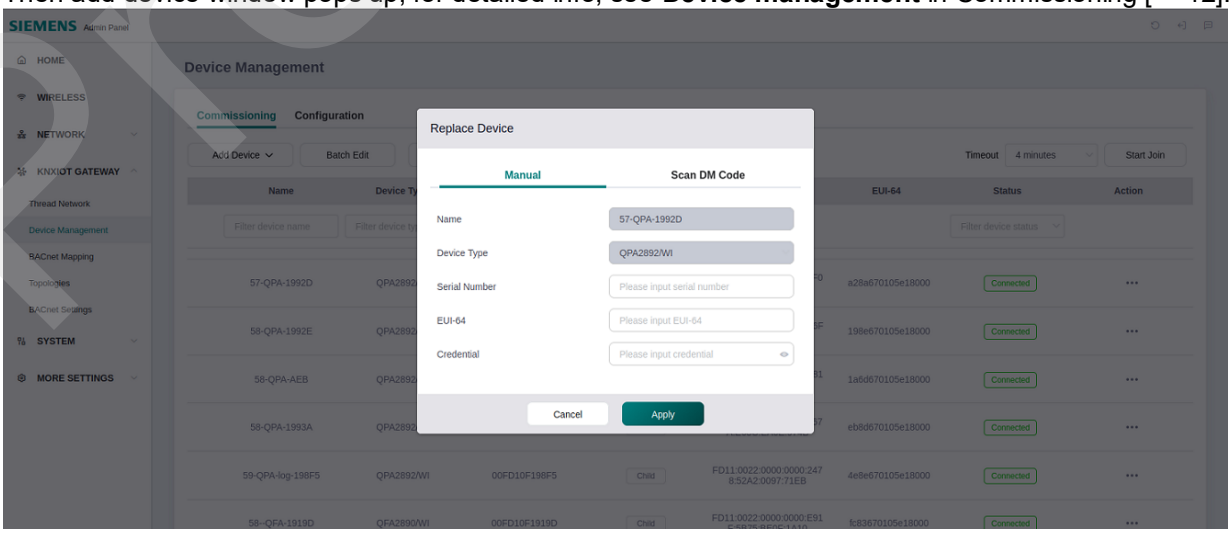
- Backup all settings before replacing gateway.
- Log into web UI of the new gateway, for login procedure, see Login gateway web UI [→ 9].
- Under **SYSTEM** ⇒ **Backup/Restore** ⇒ **Restore**: Click **Select a file or drag it here** to select a file (backup.tar.gz) or drag the file to restore original settings.



4.2 Replacing sensor or extender

Proceed as follows:

- Log into web UI, see Login gateway web UI [→ 9].
- Under **Device Management**, locate the device to be placed. Click **Replace** next to the device.
  - Then add device window pops up, for detailed info, see **Device management** in Commissioning [→ 12].



Note: If newly added device are added to allow-list before, it can join Thread network automatically once powered on.

Preliminary

5 Frequently asked questions

5.1 What should users do if connection issue occurs?

BACnet IP gateway, Thread mesh extender and Thread room sensor are for system solution. Before checking detailed setting for each device, do the following:

- Check if there is any damage to devices.
- Check if each device connected with qualified power supply.
- Check if each device is installed in suitable environment mentioned in Mounting and installation [→ 8].
- Check if actual distance among 3 devices is within allowed limitation. If not, try to move them closer in the network topology.
- Check if devices number is enough in network topology to cover expected network area. For details, see System overview [→ 3].

5.2 Why cannot sensor join Thread network?

If LED flashing red (1/4 s on, 7/4 s off) for 8 s after short pressing sensor push button once, it indicates network connection is lost.

To fix the issue, do the following:

- Check basic status as described in 6.1 [→ 27].
- Check if information about the target sensor matches that in allow-list, such as credential (pskd) and EUI64. If not, make sure the connected sensor is the correct one.
- If the issue persists, rejoin Thread network by clicking **Rejoin** in commissioning tab of gateway web UI. Make sure sensor status is displayed as **Wait for join** on web UI. Otherwise, rejoining fails. Afterwards, long pressing sensor push button for 20 s to reset the device within timeout period.

If LED fast flashing red (100 ms on / 100 ms off) for 8 s with device status of **Disconnected** after short pressing sensor push button once, it indicates the battery is very low. Replace batteries as soon as possible.

If LED green on for 8 s after short pressing sensor push button once, wait for 10 minutes to check if sensor can connect to gateway thread network. If not, click **Rejoin** in commissioning tab of gateway web UI. Make sure sensor status is displayed as **Wait for join** on web UI. Otherwise, rejoining fails. Afterwards, long pressing sensor push button for 20 s to reset the device within timeout period

5.3 Why cannot extender join Thread network?

If there is network connection issue and LED C turns to yellow.

To fix the issue, do the following:

- Check basic status as described in 6.1 [→ 27].
- Check if information about the target extender matches that in allow-list, such as credential (pskd) and EUI64. If not, make sure the connected extender is the correct one.
- If the issue persists, rejoin Thread network by clicking **Rejoin** in commissioning tab of gateway web UI. Afterwards, rejoining Thread network by pressing push button b.

If there is network connection issue and LED C turns to green.

To fix the issue, do the following:

- Check basic status as described in 6.1 [→ 27].
- Check if extender and gateway are within same mesh network in topology.
- Check if information about the target extender matches that in allow-list, such as credential (pskd) and EUI64. If not, make sure the extender is your target extender to connect and correct the information; If yes, recommend waiting for 1...2 minutes.
- If the issue persists, try the following:
  - Clean cache.

Preliminary

– Refresh browser.
– Power off extender and power on again.
– Factory reset extender and then rejoin Thread network.

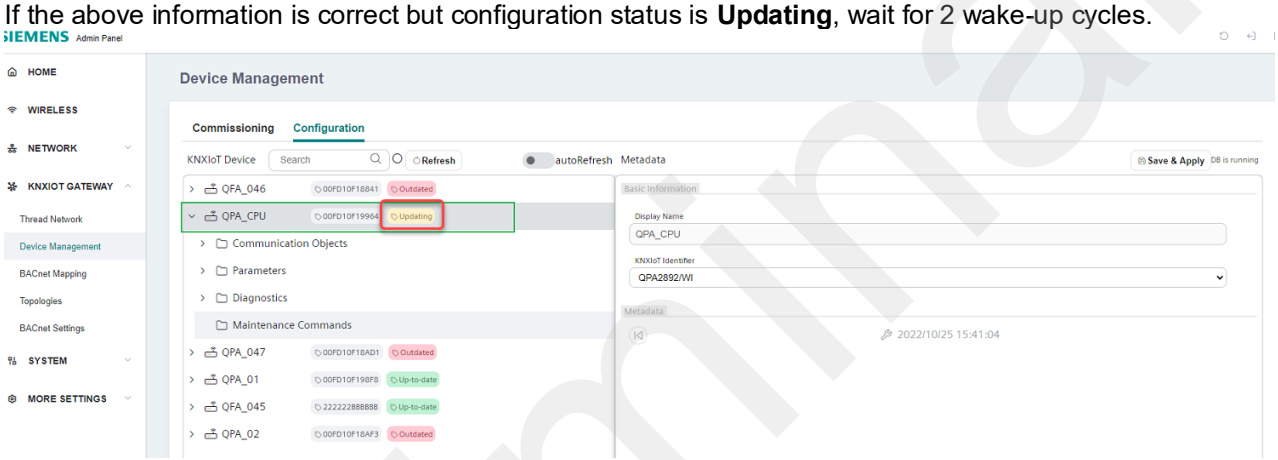
5.4 Why cannot sensor indicate data in real-time?

Sensors are sleepy device. They transmit data only when awoken and normally connected to network.

5.5 Why cannot sensor parameters be transmitted successfully?

To fix the issue, do the following:

- Check if sensor is connected with gateway and sensor status is **Connected** on gateway web UI.
- Check if device type of sensor is correct on the commissioning tab of gateway web UI.
- If the above information is correct but configuration status is **Updating**, wait for 2 wake-up cycles.



- If issue persists, long press sensor push button for 20 s to rejoin Thread network.

5.6 Why cannot present values be displayed after clicking refresh below diagnostics?

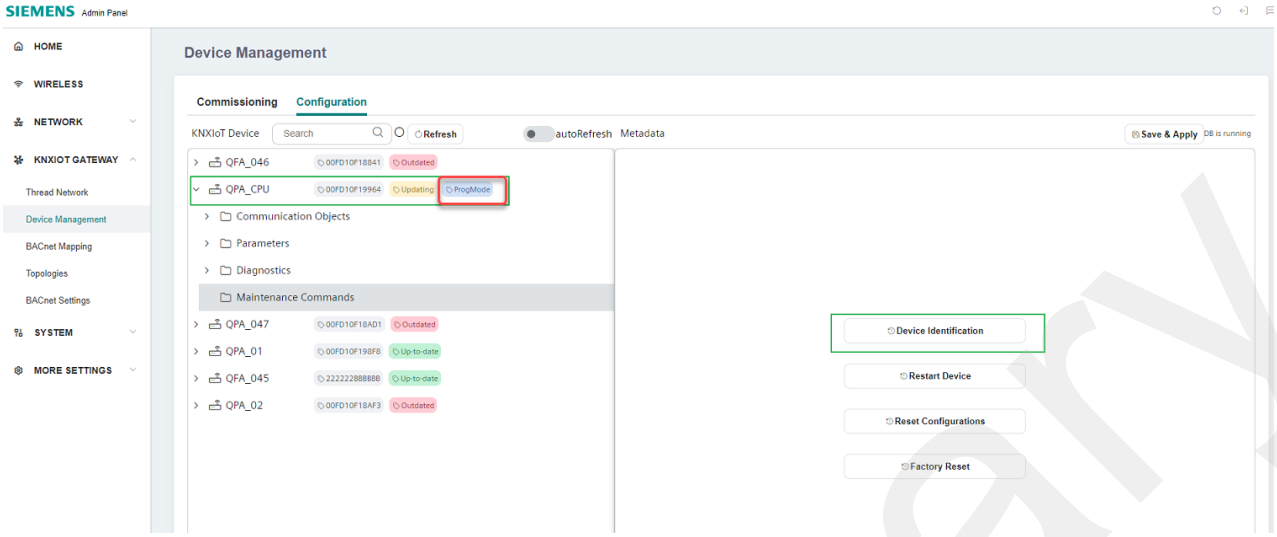
Sensor is sleepy device; the value can only be displayed when sensor awakes after wake-up cycle. To wake up sensor, press push button twice or click identification to enter programming mode (LED turns red for 4 minutes).
Note: In programming mode, the sensor keeps awake, consumes more power than in sleeping mode.

5.7 Why cannot programming mode be entered after sensor joins Thread network?

If programming mode cannot be entered after clicking **Device identification** on gateway web UI:

Preliminary

- Make sure sensor is connected. After one wake-up cycle, check if **ProgMode** is displayed on gateway web UI.



- If not, power off sensor and power on again. LED green fast flashes and then constant on, it indicates sensor joins Thread network automatically. Click **Device identification** on gateway web UI and wait for one wake-up cycle.
- If the issue persists, long press sensor push button for 20 s to reset sensor.

If programming mode cannot be entered after double press sensor push button:

- Make sure sensor is connected and short press sensor push button once (LED green constant on) and press again within 8 s. Then LED red constant on and sensor enters programming mode.
- If entering programming mode still cannot be entered, power off sensor and power on again.
- If the issue persists, long press sensor push button for 20 s to reset sensor.

5.8 What is Gateway web UI refresh rates?

10 seconds in gateway web UI

5.9 Why cannot offset of temperature, humidity and CO2 be applied after users change in programming mode?

Offset takes effect after the next wake-up cycle.

5.10 Why does LED C flash red on gateway?

This means all devices are disconnected. Check device status and initiate the rejoining process for all devices.

5.11 Why does it fail after clicking "Start join"?

Check if Thread network is created and applied.

5.12 Do users need reconfigure parameters after sensor factory reset if sensor joins Thread network before?

No, gateway reassigns configuration automatically after sensor factory reset.

Preliminary

5.13 What should users do, if device is added/removed/modified in allow-list?

In BACnet mapping, a pop-up window appears after any operation.

Click **OK** on configuration tab, then click **OK** and **Save** on mapping tab.

5.14 What should users do, if device is replaced in allow-list?

In BACnet mapping, a pop-up window appears after operation on configuration tab. Click **OK** to confirm the operation.

On commissioning tab, no need of any user operation.

5.15 In the same BACnet network, should device instance be unique?

Yes, in BACnet setting, the device instance needs to be unique.

5.16 What BACnet services are supported?

The supported services for BACnet are Read property-B, Read propertyMultiple-B, Write property-B, Write propertyMultiple-B, Who-is, Who-has, subscribe COV-B, subscribe COVP-B, etc.

For details, see BTL official website.

5.17 Not recommended operations

- Do not disable and apply thread network repeatedly during network connection.
- Do not power off sensor during parameters mapping, backup, restore, firmware upgrade.
- Do not press sensor push button aimlessly. For push button operations, see Thread room sensor [→ 6].
- Do not remove batteries frequently as it may cause configuration error or network parameters missing.
  - If configuration error occurs, reconfigure sensor.
  - If network parameters are missing, rejoin Thread network.

Preliminary

6 Appendix

6.1 Cyber security disclaimer

Siemens provides a portfolio of products, solutions, systems and services that includes security functions that support the secure operation of plants, systems, machines and networks. In the field of Building Technologies, this includes building automation and control, fire safety, security management as well as physical security systems. In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art security concept. Siemens' portfolio only forms one element of such a concept.

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