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Application note

EXIWAY POWER CONTROL connected to Ecostruxure Building Operation via SpaceLYnk

A smart configuration to share data between EXIWAY POWER CONTROL and EBO solution.

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Safety Information

Important Information

Read these instructions carefully before trying to install, configure, or operate this software. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠DANGER
DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING
WARNING indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.

⚠CAUTION
CAUTION indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury.

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Table of Contents

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1 Introduction

This application note describes method to connect EXIWAY POWER CONTROL(EXW-P-C) to EBO (Ecostruxure Building Operation) solution with a spaceLYnk.

A glossary is available in the appendix chapter 10 of this document. Please refer to it whenever necessary.

Added value of this application note

The customer value proposition corresponds to a real use case, connect a EXW-P-C (Exiway Power Control) and a EBO solution.

EXW-P-C manages emergency lighting in a building. All information of the installation are transmitted by spaceLYnk to EBO.

SpaceLYnk is used like a gateway, it converts information received from EXW-P-C for EBO solution.

Competencies

This document is intended for readers who have been trained on spaceLYnk, EXW-P-C and EBO products. The integration should not be attempted by someone who is new to the installation of each product. In addition we recommend that you be familiar with:
- The concepts of KNX technology
- Basic technical knowledge of BACnet, Modbus TCP/IP & RTU, LUA scripting
- Basic technical knowledge of EXW-P-C product
- Basic technical knowledge of EBO product

System prerequisites

Before you begin, ensure you have the proper software. You can download the latest versions here:

Software	Version	Download
spaceLYnk	2.6.0 and newer	http://www.schneider-electric.com
Building Operation Workstation	3.2.3 and newer	http://buildings.schneider-electric.com
Entreprise Server	Latest version	http://buildings.schneider-electric.com
EBO License		
Exiway Power Control	Latest version	http://www.schneider-electric.com
EXW_P_C Modbus license		
Firefox	33.0 and newer	http://www.mozilla.org

Table 1: System prerequisites

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2 Design

spaceLYnk is used as a gateway between EXW-P-C and EBO.

This gateway converts the Modbus RTU protocol, coming from EXW-P-C, to BACnet and Modbus TCP protocol for EBO.
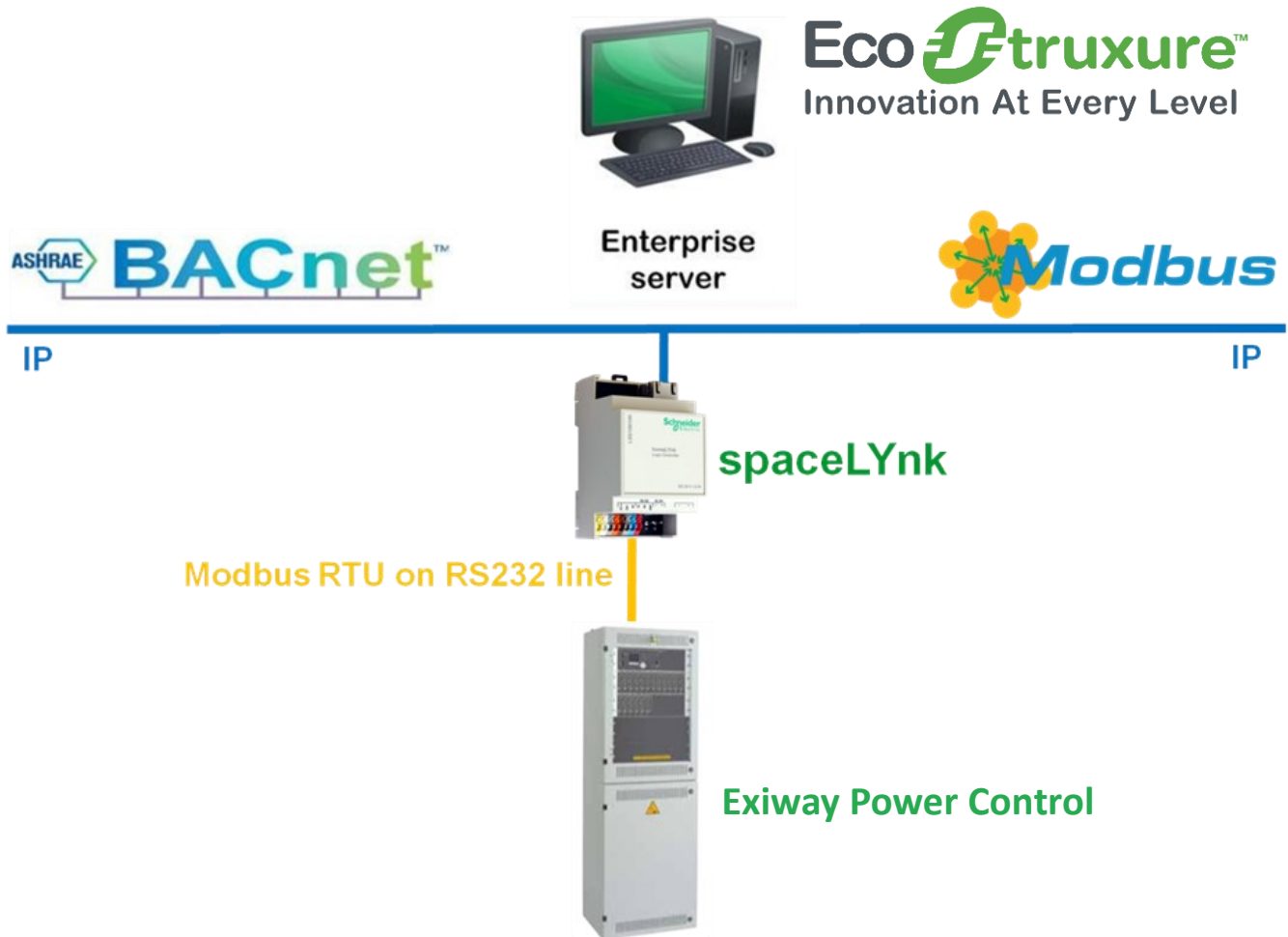

Figure 1: Architecture of spaceLYnk integration between EXW_P_C and Ecostruxure Building Operation

What is Modbus?

Modbus is a serial communication protocol originally published by Modicon (now Schneider Electric) in 1979 for use with its programmable logic controllers (PLCs). Simple and robust, it has since become a de facto standard communication protocol, and it is now a commonly available means of connecting industrial electronic devices.[1] The main reasons for the use of Modbus in the industrial environment are:

- developed with industrial applications in mind

- openly published and royalty-free

- easy to deploy and maintain

- moves raw bits or words without placing many restrictions on vendors

What is Modbus TCP?

Modbus TCP/IP (also Modbus-TCP) is simply the Modbus RTU protocol with a TCP interface that runs on Ethernet.

The Modbus messaging structure is the application protocol that defines the rules for organizing and interpreting the data independent of the data transmission medium.

TCP/IP refers to the Transmission Control Protocol and Internet Protocol, which provides the transmission medium for Modbus TCP/IP messaging.

Simply stated, TCP/IP allows blocks of binary data to be exchanged between computers. It is also a world-wide standard that serves as the foundation for the World Wide Web. The primary function of TCP is to ensure that all packets of data are received correctly, while IP makes sure that messages are correctly addressed and routed. Note that the TCP/IP combination is merely a transport protocol, and does not define what the data means or how the data is to be interpreted (this is the job of the application protocol, Modbus in this case).

So in summary, Modbus TCP/IP uses TCP/IP and Ethernet to carry the data of the Modbus message structure between compatible devices. That is, Modbus TCP/IP combines a physical network (Ethernet), with a networking standard (TCP/IP), and a standard method of representing data (Modbus as the application protocol). Essentially, the Modbus TCP/IP message is simply a Modbus communication encapsulated in an Ethernet TCP/IP wrapper.

What is BACnet?

Building Automation and Control Network (BACnet) is a data communication protocol for building automation and control through networks. This protocol is supported by:

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- American National Standards Institute (ANSI)
- International Organization for Standardization protocol (ISO)

BACnet was designed to allow communication of building automation and control systems for application such as heating, ventilation, air - conditioning control, lighting control, access control, fire detection systems and their associated equipment. BACnet protocol provides exchange information for building automation devices, regardless of the particular building service they perform.

The Enterprise Server manages data from BACnet protocol. This includes:

- centralized logging
- display
- application version of a Ecostruxure Building operation
- data management

The Enterprise Server also serves as a single point of administration through your WorkStation or your WebStation for Ecostruxure Building Operation

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3 Connect spaceLYnk

- Connect **24VDC**[1] and **0VDC**[2] from 24V supply.

- Connect **Tx**[3] to RXD in EXW COM1 (see the "User Manual" of EXW).

- Connect **Rx**[4] to TXD in EXW COM1 (see the "User Manual" of EXW).

- Connect **GND**[5] to DCD in EXW COM1 (see the "User Manual" of EXW).

- Connect **Ethernet RJ45 socket**[6] to your PC (for the first step).
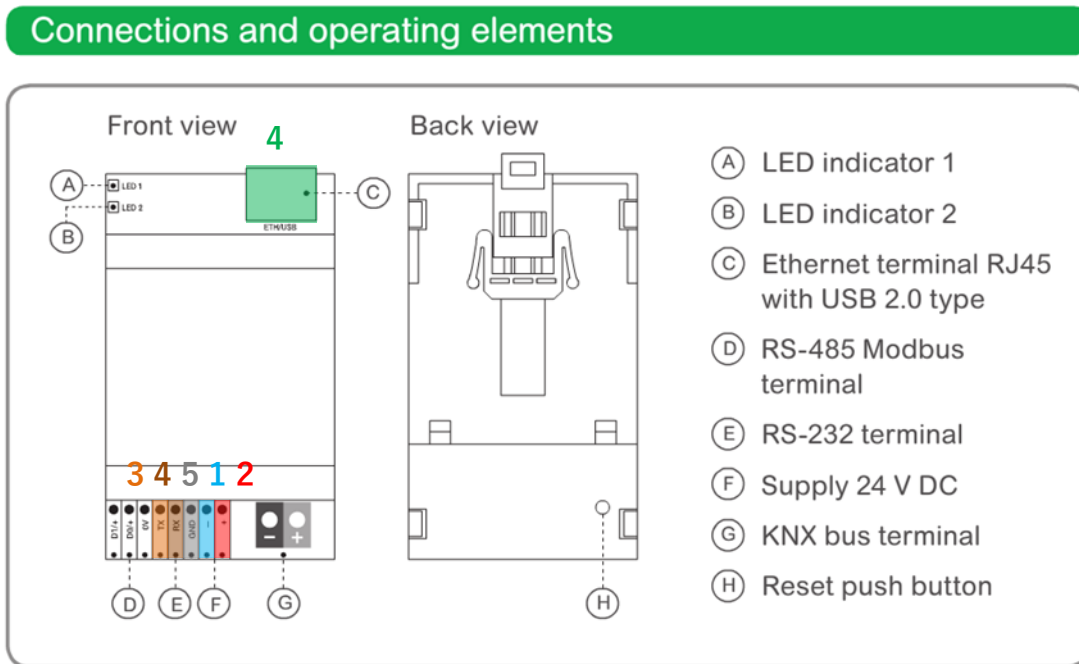

Figure 2: spaceLYnk connections

- Power ON spaceLYnk.

4 spaceLYnk network setting

4.1 Open spaceLYnk Web IDE

Run Mozilla Firefox (with Windows, OS X, Linux) or Safari (if iOS) with SL URL containing SL IP address (in our example: http://192.168.0.10) to access the SL start page:

- Left click on **Configurator**[1].

Figure 3: homeLYnk start page

You get a Login page:
The default login and password are:
- Login: "admin"
- Password : "admin"
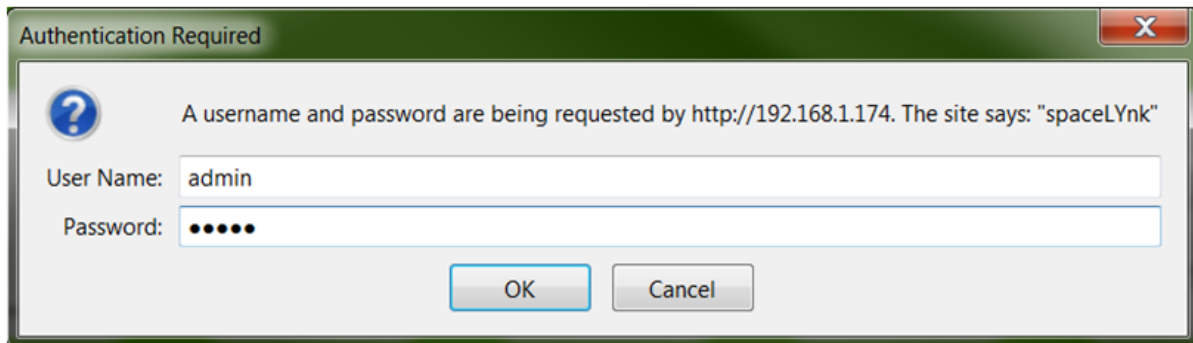
Figure 4: spaceLYnk configurator login page

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4.2 Change network setting

- Left click on **System**[1]
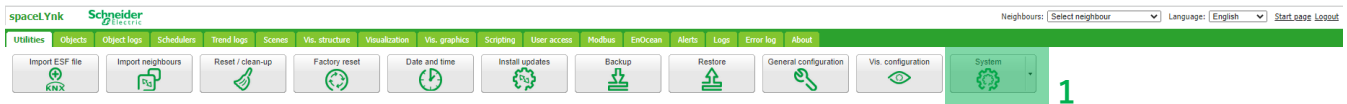
Figure 5: spaceLYnk configurator home page

- System opens a new page.

- On the Network tab, Left click on **Interfaces**[2]
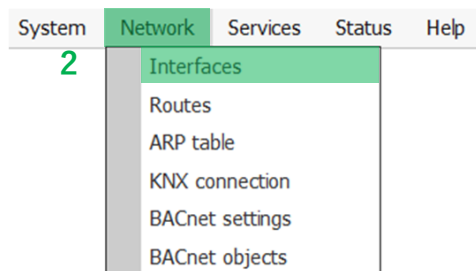
Figure 6: System window

- System opens the Interfaces setting window
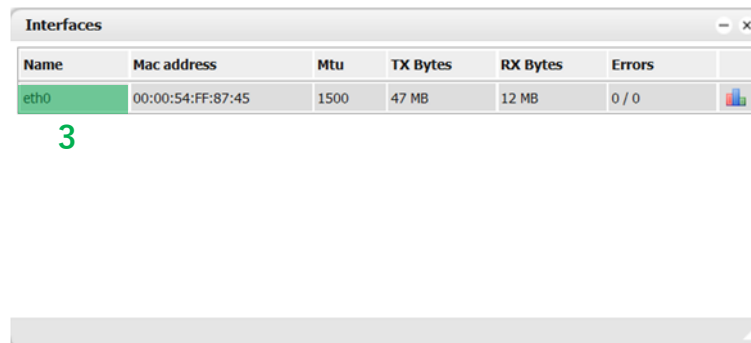
- Left click on **eth0**[3]

Figure 7: Interfaces setting window

- System opens the Interfaces eth0 setting window.

- Select "Static IP" in **Protocol**[4] combobox.

- Set the static IP address in **IP address**[5].

- Set the **Network Mask**[6].

- Set the **Gateway IP**[7].

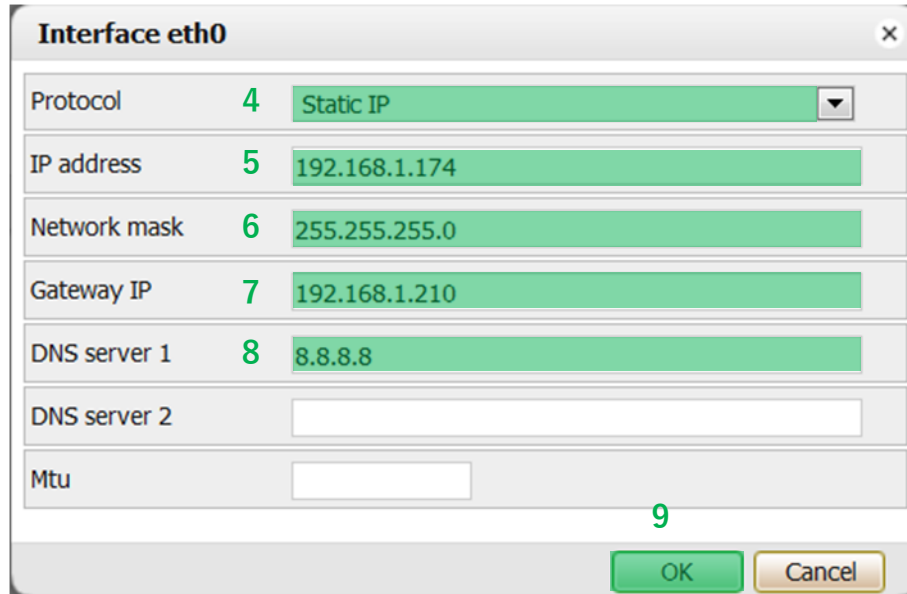- Set the **PDNS server**[8].

- Left click on **OK**[9]

Figure 8: Interfaces eth0 setting window

- Left click on **Apply changes**[10] in the upper right of the window. The spaceLYnk will be restarted.

Figure 9: Apply changes

- Disconnect the Ethernet cable between spaceLYnk and your PC.
- Connect spaceLYnk to your network with Ethernet cable.
- Access to the spaceLYnk with new address IP to check the network configuration.

The spaceLYnk network is configured.

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5 SpaceLYnk solution configuration

To integer spaceLYnk between EXW and a local compagny server, it is necessary to follow next steps.

1) Import backup in spaceLYnk
2) BACnet configuration

Run Mozilla Firefox (with Windows, OS X, Linux) or Safari (if iOS) with SL URL containing SL IP address to access the SL start page:

5.1 Import backup in spaceLYnk.

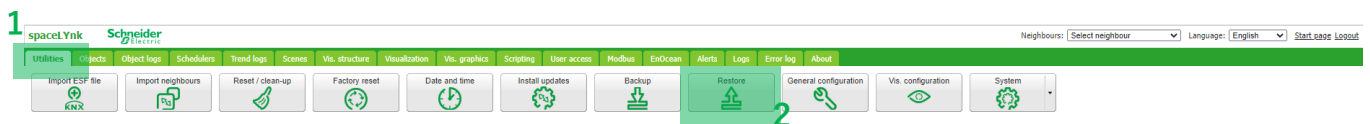- Left click on **Utilities**[1]

- Left click on **Restore**[2]

Figure 10: spaceLYnk configurator home page

- Left click on **Browse…**[3] and select *"AN019_v1-3_EXW&EBOViaSpaceLYnk.tar.gz"* file stored on your PC in unzipped Application Note package (in SL_Backup folder)
  - o **The restoration backup will be deleting and replacing all information in spaceLYnk. Think out make a backup before if you need to conserve information actually in spaceLYnk.**
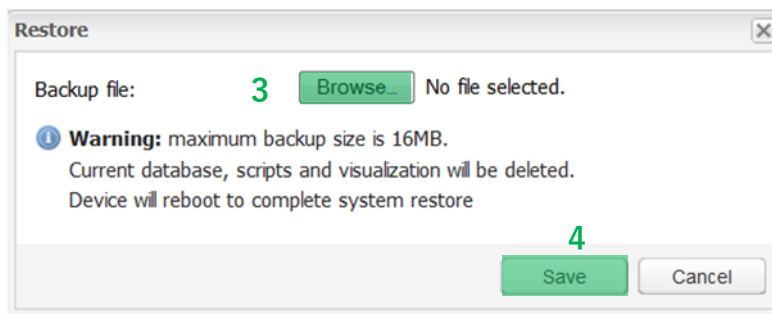
- Then, left click on **Save**[4]

Figure 11: spaceLYnk backup restore window

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- You must get following window notifying you the restore has been well carried out
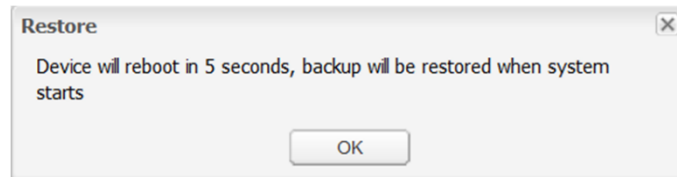

Figure 12: spaceLYnk backup restore success window

Check the following scripts have been installed:

- In Resident scripting part:
    - AN019_EXW-P-C_SCRIPT_1_ENABLE_GATEWAY
    - AN019_EXW-P-C_SCRIPT_2
    - AN019_EXW-P-C_SCRIPT_3
    - For all script:
        - Do not modify sleep interval.
        - Script is disabled by default.
- In User libraries scripting part:
    - AN019_libEXW-P-C
    - For all script:
        - Don't modify sleep interval.
        - Script is active by default and it is to be permanently active.
- In Objects part:
    - Copy of all EXW registers in KNX objects
        - Do not modify information

5.2 Setting spaceLYnk BACnet configuration
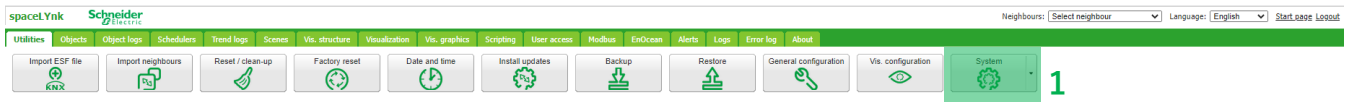
- Left click on **System**[1]

Figure 13: spaceLYnk configurator home page

- System opens a new page

- Move the pointer of the mouse on **Network**[2]
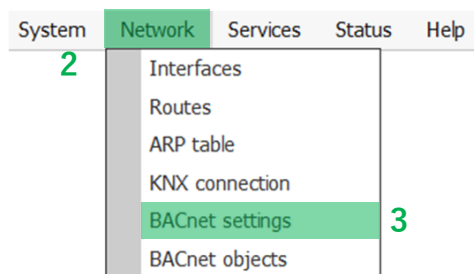
- Left click on **BACnet setting**[3]

Figure 14: System window

- System opens the BACnet setting window

Internal

- Check **Server enable**[4] checkbox is enable

- Set the **Device ID**[5] of the spaceLYnk BACnet device.
    - BACnet device ID which must be unique on BACnet network. Range 0 - 4194302

- Set the **Password**[6]

- Set the **Object priority**[7]
    - Define to which priority array spaceLYnk will write to. By default spaceLYnk doesn't write to a priority array, it only writes to the Relinquish Default Property.

- Set the **Port**[8] number
    - BACnet port, default 47808.
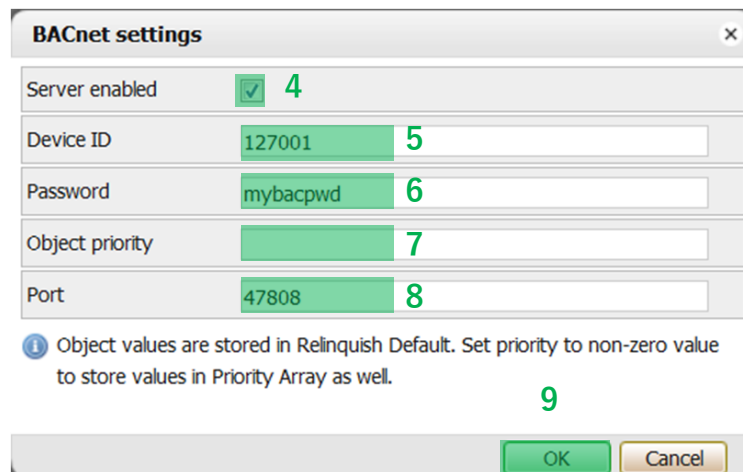
- Left click on **OK**[9]

BACnet settings   ✕

Server enabled	☑	**4**
Device ID	127001	**5**
Password	mybacpwd	**6**
Object priority		**7**
Port	47808	**8**

ⓘ Object values are stored in Relinquish Default. Set priority to non-zero value to store values in Priority Array as well.

9

OK   Cancel

Figure 15: BACnet setting window

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Shared data are shown on Network -> BACnet object
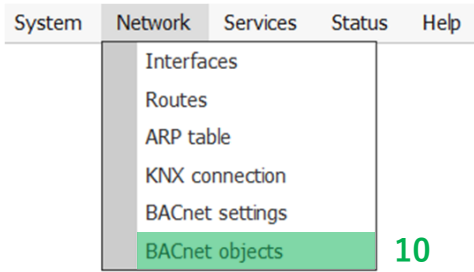
- Left click on **BACnet object**[10]

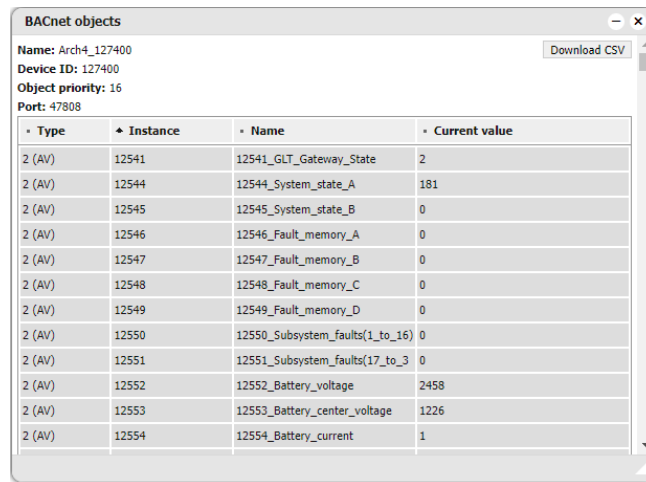Figure 16: System window

- System opens the BACnet objects window

Figure 17: BACnet objects window

Property	Description
Device name	Device name is combined from hostname and device ID
Download	Download BACnet objects in CSV file

Table 2: BACnet objects properties

Note: spaceLYnk always write to Relinquish Default Priority. Writing to priority array is optional. We recommend using object priority 16 in Ecostruxure Building Operation. Downloaded file name and format is depending of the browser, not spaceLYnk itself.

5.3 Enable gateway

To enable gateway between EXW-P-C and EBO, it's necessary to enable the script "AN019_EXW-P-C_SCRIPT_1_ENABLE_GATEWAY"

- Left click on **Scripting**[1]

- Left click on **Resident**[2]

- Left click on the red button on **Active**[3] colon of the script "AN019_EXW-P-C_SCRIPT_1_ENABLE_GATEWAY"
    - Others scripts are automatically enable.
- System opens a new page and left click on "Yes"
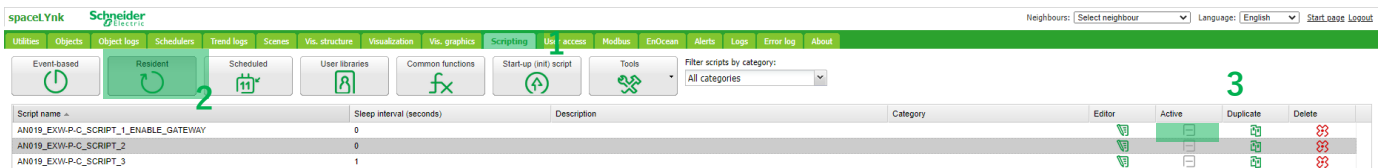   - The button is set to green

Figure 18: spaceLYnk Resident script

Check in alert display, if the EXW-P-C Gateway is enabling.

Warning: If you use the LCD display of EXW-P-C, the function test or the duration test of EXW-P-C, the Modbus RTU communication between EXW-P-C and spaceLYnk is stopped during this time.

The spaceLYnk is configurated: SL configuration is finished.

After SpaceLYnk configuration is completed the EXW-P-C needs to be restarted.

6 EBO BACnet configuration

Schneider Electric Ecostruxure (EBO) is a BACnet certified Building Management System capable of discovering values exported from spaceLYnk (SL). Exported data can be used for information, control, or visualization. Communication between EBO and SL is bi-directional.

Enterprise server acts as a BACnet client.

To configure the Building Operation WorkStation follow these five steps:
1) Log into EBO
2) Add BACnet interface into Automation Server
3) Configure IP
4) Discover devices and upload BACnet objects
5) Set required priority to reveal actual exported values

Note: Server name in this application note is **Automation Server**. *In case of change this name following steps must reflect this change.*
Note: To use BACnet functionality, your Enterprise/Automation Server and your spaceLYnk need to connected in the same level network.

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Step 1: Log into EBO

1) Open your EBO workstation and enter your user name and password.
   - Main page of EBO program opens.

Step 2: Add BACnet interface into Automation Server

1) Right click **Automation server**
2) Click **New**
3) Click **Interface**
4) Click **BACnet interface**
5) Type your BACnet interface **Name**. You can leave preset name "BACnet interface"
6) Type your **Location**. You can leave the preset location
7) Click **Create**
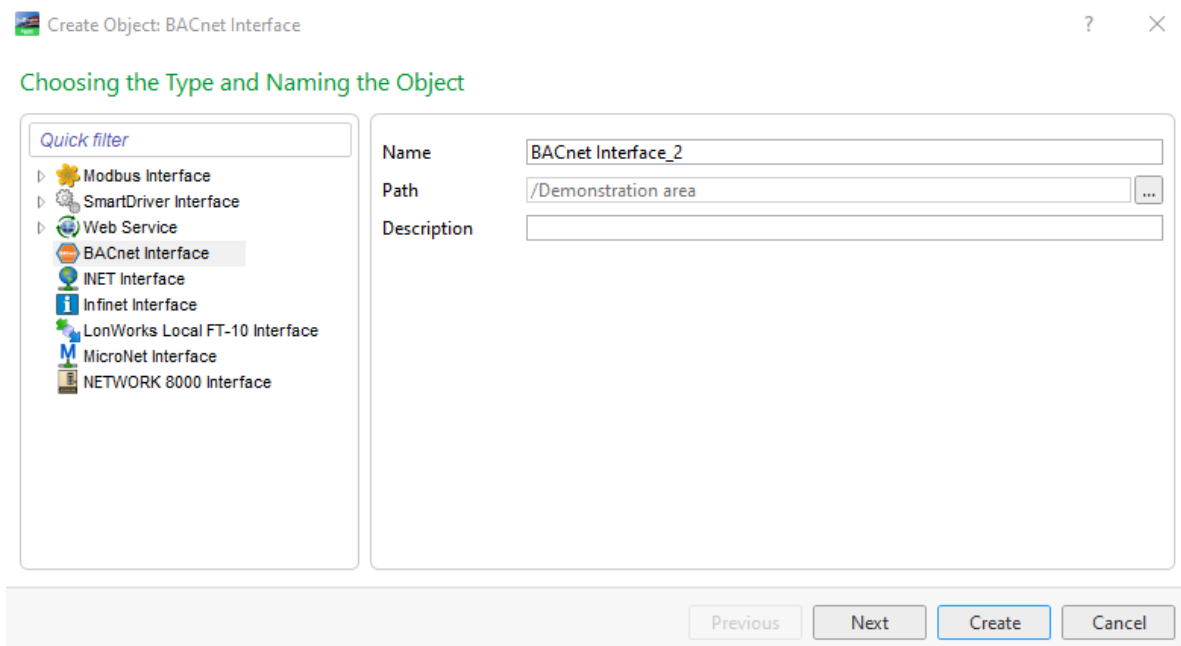   - Your BACnet interface is now available in system menu.

Figure 19: Add BACnet Interface into Automation Server

Note: If BACnet interface must be added to additional servers

1) Create your new server
2) Change **Location** for BACnet Interface object
3) Select your new location

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Step 3: Configuring IP

Configuring EBO IP network allows you to establish connection between spaceLYnk and EBO to use Device discovery function to discover spaceLYnk device on the network.

Important : To use Device Discovery, you must set the IP settings of EBO to the same IP range as spaceLYnk.

1) Go to **Automation server**
2) Expand **BACnet Interface**
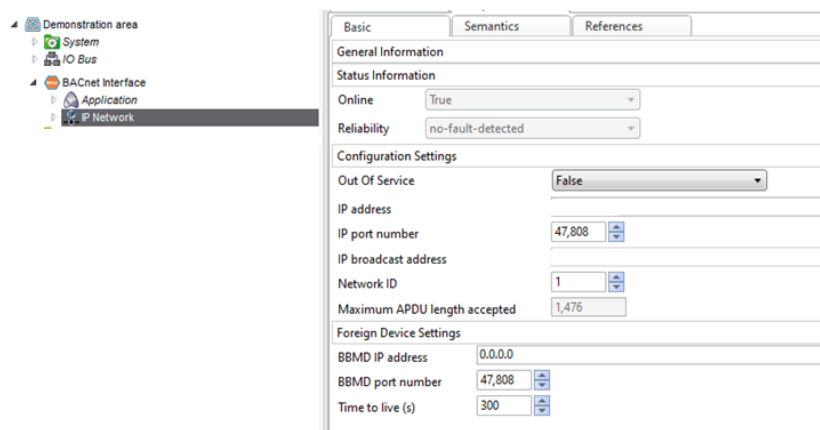3) Click **IP Network**
4) Type your IP configuration

Figure 20: BACnet Interface configuration

IP address of your EBO is now set.

Note: In case of network collision change the value of the EBO IP port number.

Step 4: Discovering devices and uploading BACnet objects

1) Click **Automation Server**
2) Click **Device Discovery** and select **BACnet devices** from pull down menu
   - List of all discovered devices displays
3) Drag and drop your **spaceLYnk** to **BACnet Interface**
   - IP network is displayed in System Tree
   - A pop up message informs you, that objects have to be uploaded to the database in EBO
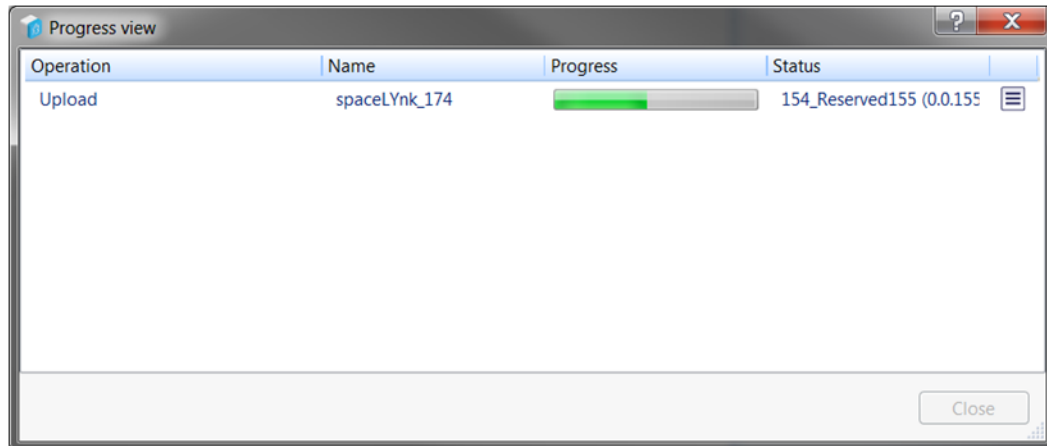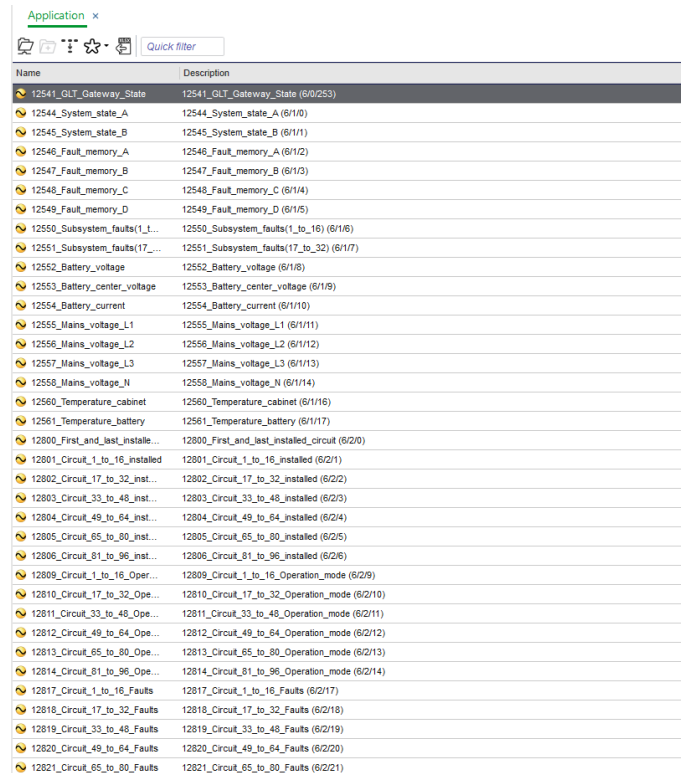4) Right click your **spaceLYnk** and then select **Device** and then select **Upload all objects**

Figure 21: Uploaded BACnet objects with values

Objects from your spaceLYnk are now synchronized with your EBO application

Step 5: Setting required priority to reveal live exported values

1) Click your **spaceLYnk** in System Tree
2) Expand spaceLYnk to show the **Application** folder
3) Click **Application** folder
    - Sub window with list of spaceLYnk objects appears
4) Right click on Description to see a list of possible BACnet properties to be displayed such as priority, data type, etc.
5) Select the check box of properties of your BACnet object to display them

Figure 22: BACnet objects

Application tab collects all exported values from spaceLYnk to BACnet. Values of BACnet objects are dynamically changed according to their current values. Live update of your spaceLYnk proves successfully established connection between HL and EBO. You can manually change values of your data to test the connection.

7 EBO Modbus TCP/IP configuration

Schneider Electric Ecostruxure (EBO) is a Modbus TCP/IP client certified Building Management System capable of exchanging values with spaceLYnk (SL). Exported data can be used for information, control, or visualization. Communication between EBO and SL is bi-directional.

Enterprise server acts as a Modbus TCP/IP client.

To configure the Building Operation WorkStation follow these five steps:
1) Log into EBO
2) Add Modbus TCP Gateway interface into Automation Server
3) Configure IP
4) Import Modbus TCP registers
5) Set required priority to reveal actual exported values

Note: Server name in this application note is **Automation Server**. In case of change this name following steps must reflect this change.

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Step 1: Log into EBO

1) Open your EBO program and enter your user name and password.
   - Main page of EBO program opens.

Step 2: Add Modbus TCP Gateway into Automation Server

1) Right click Enterprise/**Automation server → Import**
2) Select on your PC the file "**EBO_Modbus_TCP_Gateway_Configuration_For_EXW-P-C.xml**".
3) Click on **Import** and **Close**.
4) Select **Modbus TCP Gateway → Properties → Basic**
5) Set IP address of the spaceLYnk
6) Set the IP port of the spaceLYnk (502)
7) Click on the disk in the Modbus TCP Gateway tab to save the information.
8) Click on List View and double click Modbus Device and select Properties
9) Set Device Address to 1
10) Click on the disk to save the information.

Step 3: Optional: Import extended Modbus TCP registers

1) Right click on Modbus Device →   Import..

2) Select on your PC the file "**EBO_Modbus_TCP_Extended_Registers_For_EXW-P-C.xml**".

3) Click on **Import** and **Close**.

Modbus registers from your spaceLYnk are now synchronized with your EBO.

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8 Enable Modbus RTU communication in EXW-P-C

All the Exiway Power Control produced from January 2023 have the MODBUS/RTU protocol already enabled. Please consider this procedure only for Exiway Power Control produced before this date.

The MODBUS/RTU protocol is enabled in the web interface using the feature key (4 digits) which is based on the system number.

The key is entered on page "Administration / options" in the option **GLT Gateway**[1].

After saving and reloading the page the key is validated.
A positive key validation is indicated with a green bullet or the text "OK" behind the input field (meaning that the key is valid).
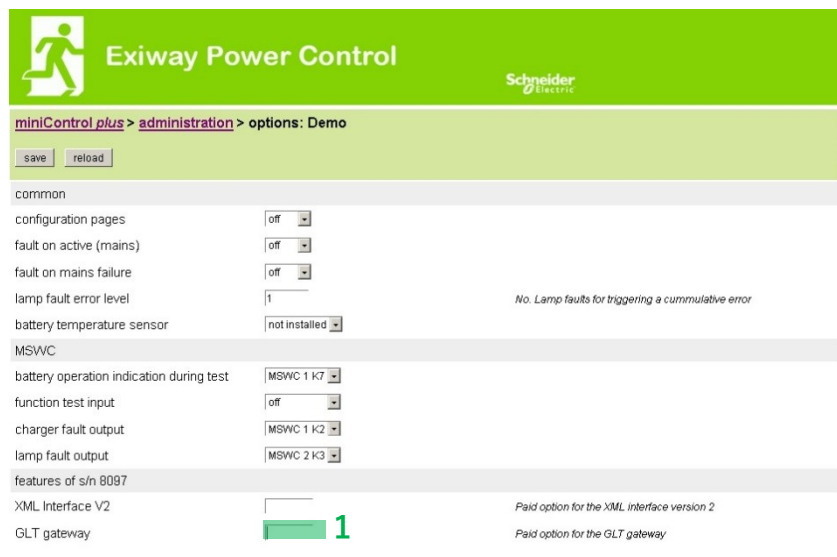
Figure 23: Administration frame of EXW-P-C web interface

9 Conclusion

Procedures contained in this application note describe integration of spaceLYnk into a Enterprise server using BACnet. SpaceLYnk functionality described in this application note brings benefits to system integrator to create robust automation system complying with international standards.

10 Appendix

10.1 Glossary

The following table describes the acronyms and defines the specific terms used in this document.

Abbrevation	Description
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ANSI	American National Standards Institute
BACnet	A data Communication Protocol for Building Automation and Control Networks
ISO	International Organization for Standardization protocol.
SL	spaceLYnk
EXW-P-C	Exiway Power Control is an emergency power supply system from Schneider Electric which supplies escape route and exit sign luminaires.
EBO	EcoStruxure Building Operation

Table 3: Glossary

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10.2 Annex

BACnet ID	Modbus TCP register	EXW register description
12541	0x30FD	**GLT Gateway State** 0 Gateway error (0=ok, 1=error). Read by the EXW 1 Gateway has been initialized (0=not initialized, 1=initialized). Set by the EXW. 2 – 15 Reserved
12544	0x3100	**System state A** 0 Operating mode (0=charging, 1=operational) 1 Emergency lighting blocked (0=yes, 1=no) 2 Mains operation (0=no, 1=yes) 3 Battery operation (0=no, 1=yes) 4 Cumulative failure (0=no, 1=yes) 5 Charger (0=not active, 1=active) 6 Deep discharge (0=no, 1=yes) 7 Active (mains) / mod. stand-by (0=no, 1=yes) 8 Critical circuit (0=closed, 1=open) 9 – 15 Reserved
12545	0x1101	**System state B** 0 – 15 Reserved
12546	0x3102	**Fault memory A** (fault: 0=inactive, 1=active) 0 Maintenance required (0=no, 1=yes) 1 Battery earth fault (0=OK, 1=battery earth fault detected) 2 Battery fuse (0=OK, 1=fuse has blown) 3 Battery current (0=OK, 1=invalid range) 4 Battery voltage (0=OK, 1=invalid range) 5 Battery center voltage (0=OK, 1= valid range) 6 DCM / MLD fault 7 LDM / MCHG fault 8 IOM / MSWC fault 9 SAM / MMO fault 10 Fan failure 11 Luminary fault (collective luminary monitoring faults) 12 Current fault (collective current monitoring faults) 13 Circuit fault (collective circuit faults) 14 – 15 Reserved
12547	0x3103	**Fault memory B** 0 – 15 Reserved
12548	0x3104	**Fault memory C** 0 – 15 Reserved
12549	0x3105	**Fault memory D** 0 – 15 Reserved
12550	0x3106	**Subsystem faults** (1 to 16) 0 Subsystem 1 (0=OK, 1=errors present) ... **15 Subsystem 16 (0=OK, 1=errors present)**
12551	0x3107	**Subsystem faults** (17 to 32) 0 Subsystem 17 (0=OK, 1=errors present) ... **15 Subsystem 32 (0=OK, 1=errors present)**
12552	0x3108	**Battery voltage** (Resolution 0.1V) (signed int)
12553	0x3109	**Battery center voltage** (Resolution 0.1V) (signed int)
12554	0x310A	**Battery current** (Resolution 0.1V) (signed int)

Table 4: Objects list (part 1/2)

Internal

Schneider Electric

BACnet ID	Modbus RTU register	EXW register description
12555	0x310B	**Mains voltage L1** (Resolution 0.1V) (signed int)
12556	0x310C	**Mains voltage L2** (Resolution 0.1V) (signed int)
12557	0x310D	**Mains voltage L3** (Resolution 0.1V) (signed int)
12558	0x310E	**Mains voltage N** (Resolution 0.1V) (signed int)
12560	0x3110	**Temperature cabinet** (Resolution 0.1° C) (signed int)
12561	0x3111	**Temperature battery** (Resolution 0.1° C) (signed int)
12800	0x3200	**First and last installed circuit** 0..7 First circuit number (1..96) 8..15 Last circuit number (1..96)
12801	0x3201	**Circuit 1 to 16 installed** 0 Circuit 1 (0=empty, 1=installed) 1 Circuit 2 (0=empty, 1=installed) … 15 Circuit 16 (0=empty, 1=installed)
12802 ⋯ 12806	0x3202 ⋯ 0x3206	**Circuit 17 to 96 installed** Bit 3202.0: circuit 17, etc. (0=empty, 1=installed)
12809 ⋯ 12814	0x3209 ⋯ 0x320E	**Circuit 1 to 96 Operation mode** 0=maintained mode (BS), 1=non-maintained mode (DS)
12817 ⋯ 12822	0x3211 ⋯ 0x3216	**Circuit 1 to 96 Faults** Bit 3211.0: faults on circuit 1, etc. (0=OK, 1=Fault: fuse blown or earth fault)
12825 ⋯ 12830	0x3219 ⋯ 0x321E	**Circuit 1 to 96: Fuse state** Bit 3219.0: fuse state on circuit 1, etc. (0=OK, 1=fuse has blown)
12833 ⋯ 12838	0x3221 ⋯ 0x3226	**Circuit 1 to 96: Earth fault** Bit 3221.0: earth fault on circuit 1, etc. (0=OK, 1=earth fault)
12841 ⋯ 12846	0x3229 ⋯ 0x322E	**Circuit 1 to 96: Current monitoring faults** (on circuit level) Bit 3229.0: current fault on circuit 1, etc. (0=OK, 1=current fault)
12849 ⋯ 12944	0x3231 ⋯ 0x3290	**Circuit 1 to 96: Circuit power** Measured power during the last test (resolution 1W) Register 3231: circuit 1, etc.
13138 ⋯ 13143	0x3352 ⋯ 0x3357	**Circuit 1 to 96: Luminary faults** (collective fault on circuit level) Bit 3352.0: luminary faults on circuit 1, etc. (0=no faults, 1=faults)
13145 ⋯ 13146	0x3359 ⋯ 0x335A	**Circuit 1: Luminary failure** (on luminary level 1-20) Bit 3359.0: lamp 1, Bit 3359.1: Lamp 2, … Bit 335A.3: Lamp 20 (0=OK, 1=fault)
13147 ⋯ 13334	0x335B ⋯ 0x3416	⋯
13335 ⋯ 13336	0x3417 ⋯ 0x3418	**Circuit 96: Luminary failure** (on luminary level 1-20) (Bit 3417.0: lamp 1, Bit 3417.1: lamp 2, …Bit 3418.3: lamp 20)
13501 ⋯ 13522	0x34BD ⋯ 0x34D2	**System name** (43 chars) (22 registers)
13544 ⋯ 13545	0x34E8 ⋯ 0x34E9	**System number** (32 bit) (2 registers)
13546	0x34EA	**NLSR firmware version** (16 bit)
13548 ⋯ 13549	0x34EC ⋯ 0x34ED	**System IP address** (32 bit) (2 registers)

Table 5: Objects list (part 2/2)

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