iSMACONTROLLI

iSMA-B-AAC20

User Manual

BACnet
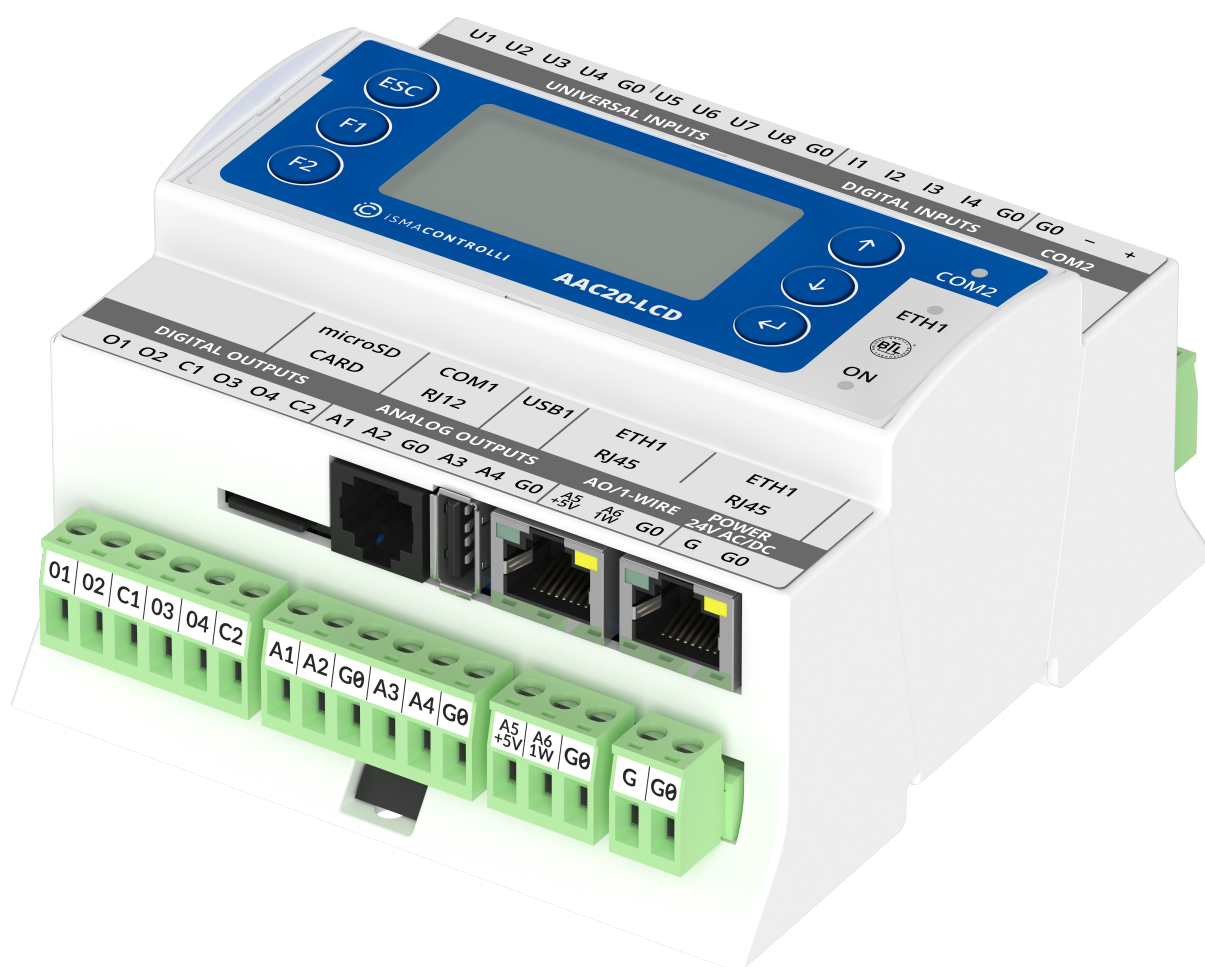
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Table of Contents

1 Introduction

This manual contains information about the BACnet protocol in the iSMA-B-AAC20 controller. The BACnet Local Device can be used in all AAC20 hardware versions with the firmware 3.4 version or higher.

The BACnet IP master can be used in all AAC20 hardware versions with the firmware version 4.5 or higher.

The BACnet MS/TP master can be used in AAC20 hardware version 1.1 or higher and with the firmware version 5.0 or higher.

It is recommended to update the firmware of iSMA-B-AAC20 to the latest version using any BACnet protocol.
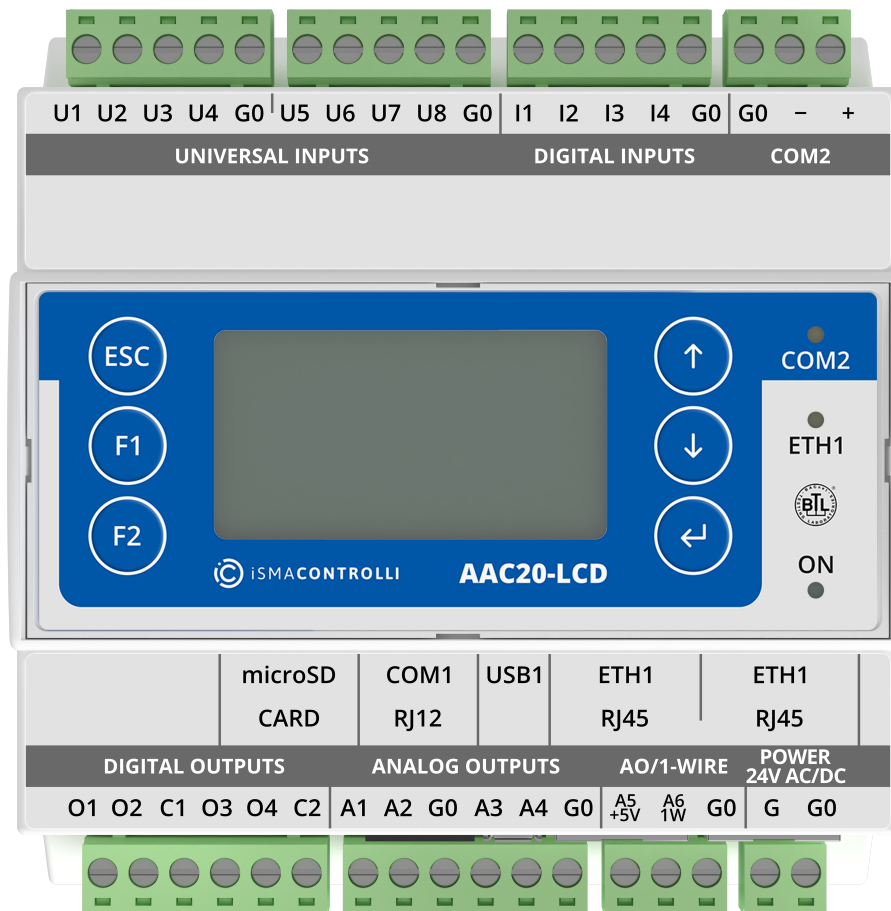
Figure 1. AAC20-LCD controller

1.1 Revision History

Rev.	Date	Description
1.7	19 Jun 2024	Added BACnet point discovery description for client IP and MS/TP devices
1.6	13 Jun 2023	Added Connecting AAC20 Controllers with BACnet MS/TP chapter
1.5	28 Feb 2022	• Rebranded • Corrected license points information

Rev.	Date	Description
1.4	27 Jan 2020	• Replaced environment of programming from Workplace to iSMA Tool • BTL compliance
1.3	5 Feb 2018	Added configurable parameters in MS/TP Network: • MAC address • Max. Master • Max. Frames Info
1.2	20 Apr 2017	• Added password option • Network configuration options change
1.1	10 Apr 2017	• Added - BACnet MS/TP chapter • Added - BACnet Local Device Alarm Event • Added - BACnet Local Device schedule special event information
1.0	28 Aug 2015	First edition

Table 1. Revision history

1.2 License and Limitation

The BACnet Local Device and the BACnet MS/TP client license are included in the standard AAC20 license. The BACnet IP client covers up to 500 BACnet objects (any type) in the standard license, and there is no limitation of the number of devices.

Type	Local Device	Remote IP Master	Remote MS/TP Master
Analog Input	-	Up to 500 in total*	Up to 500 in total
Analog Output	-	Up to 500 in total*	Up to 500 in total
Analog Value	200	Up to 500 in total*	Up to 500 in total
Binary Input	-	Up to 500 in total*	Up to 500 in total
Binary Output	-	Up to 500 in total*	Up to 500 in total
Binary Value	200	Up to 500 in total*	Up to 500 in total
Multistate Value	200	Up to 500 in total*	Up to 500 in total
Schedules	30	-	-
Trend Log	100	-	-
Notification Class	10	-	-

Table 2. BACnet object limitation

2 BACnet Terms

BACnet: Building Automation and Control NETworking protocol (ANSI/ASHRAE Standard 135-2004) are open communication protocol standards conceived by a consortium of manufacturers and system users under the auspices of ASHRAE. Data is created as a common set of "objects", which can be accessed using a standard set of "services."

BACnet client: operation mode for the BACnet system or device, where it makes use of the BACnet device for some particular purpose via a service request instance.

BACnet server: operation mode for the BACnet system or device, where it provides a service to a requesting client.

BACnet/Ethernet or **B/ETH**: BACnet over Ethernet, one of the original BACnet link-layer types. Since the introduction of the BACnet/IP, its usage has become less common.

BACnet/IP or **B/IP**: BACnet over Ethernet IP. Introduced in "Annex J" of the BACnet standard, it has become the most popular BACnet link-layer protocol.

BACnet MS/TP or **MS/TP**: BACnet link-layer protocol used by lower-cost devices, using master-slave/token-passing over RS485 multidrop networks.

Object Identifier or **Object ID:** BACnet method to identify a particular object within a device, using a combination of its *object type* and an *instance number* (unique for that type, within that device). In case of the single Device Object (type) per BACnet device, it must have a unique instance number across the BACnet network on which it is installed.

3 Installation of iSMA BACnet Kits

There are 3 BACnet kits available for the iSMA-B-AAC20 controller:

- **iSMA BACnet:** share AAC20 data points, alarm events, trend logs and schedules in BACnet IP network,
- **iSMA BACnet IP Master:** read/write data from the BACnet IP devices,
- **iSMA BACnet MS/TP Master:** read/write data from the BACnet MS/TP devices.

To install the BACnet kits, import the kits to the iSMA Tool software (possibly as part of the package of the various kits in a zip file). To do this, go to Import -> Import Framework Files.

After the successful import of the files, upload them to the device using the Kit Manager.

WARNING! Before programming the BACnet network, please check if the latest kit version is used. The latest kits are available at iSMA CONTROLLI support website: ismacontrolli.com
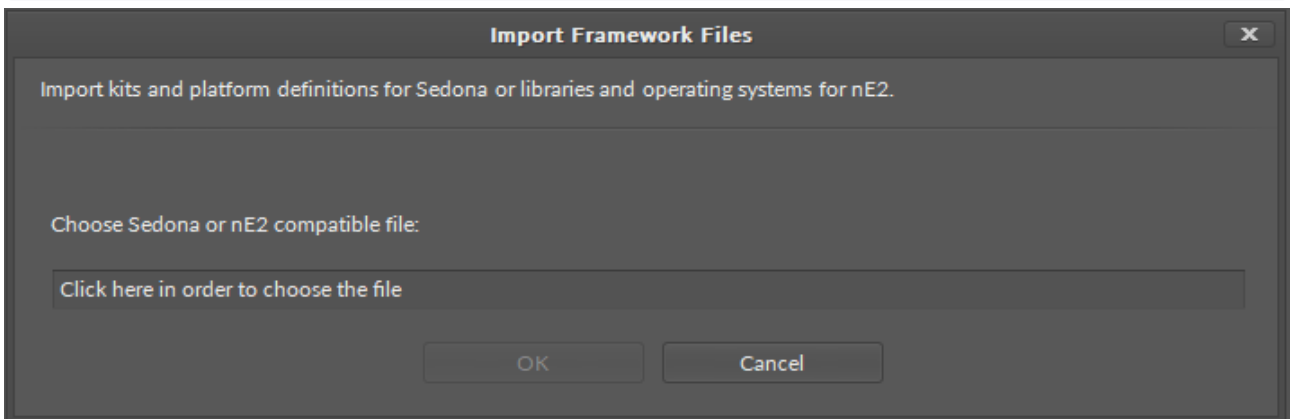

Figure 2. Importing files

4 BACnet Network

The BACnet Network is the main component that provides the BACnet protocol in the iSMA-B-AAC20 controller, and it should be placed under the Drivers folder.
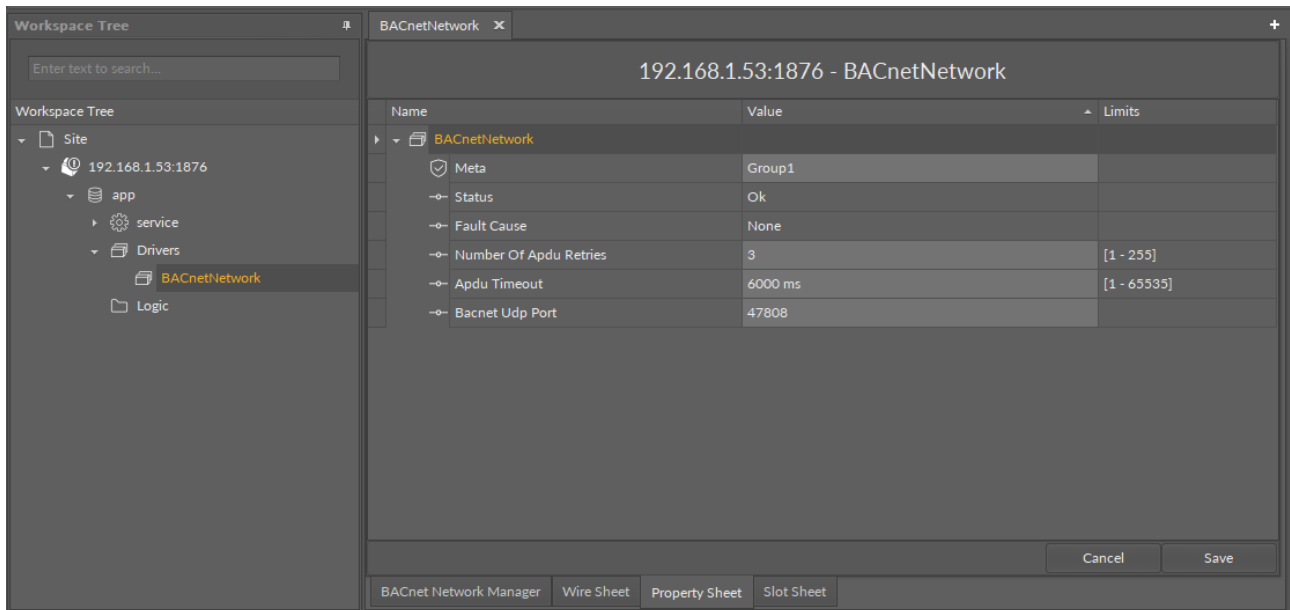

Figure 3. BACnet Network component

The BACnet Network component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Bacnet Udp Port:** Udp port number in IP network (default 47808);
- **Apdu Timeout:** time during which other BACnet devices should response to the AAC20 request (by default, 6000 ms);
- **Number Of Apdu Retries:** read/write objects retries number.

> **WARNING!** All other BACnet network components such as Local Device, Remote IP Master, Remote MS/TP Master, must be placed under this component.

4.1 LocalDevice

The BACnet LocalDevice is a part of the iSMA_BACnet kit. This component allows making the iSMA-B-AAC20 controller a BACnet IP device. This component must be placed under the BACnet Network component from the same kit. All BACnet LocalDevice objects and components must be placed under this component.

The component contains the BACnet configuration, such as controller the BACnet ID number and BACnet device description (Device Name, Location, and additional description). These values can be read by other devices in the BACnet network.

It is also responsible for reviewing time messages and updating local device system clock (more information in the BACnet time synchronization section).
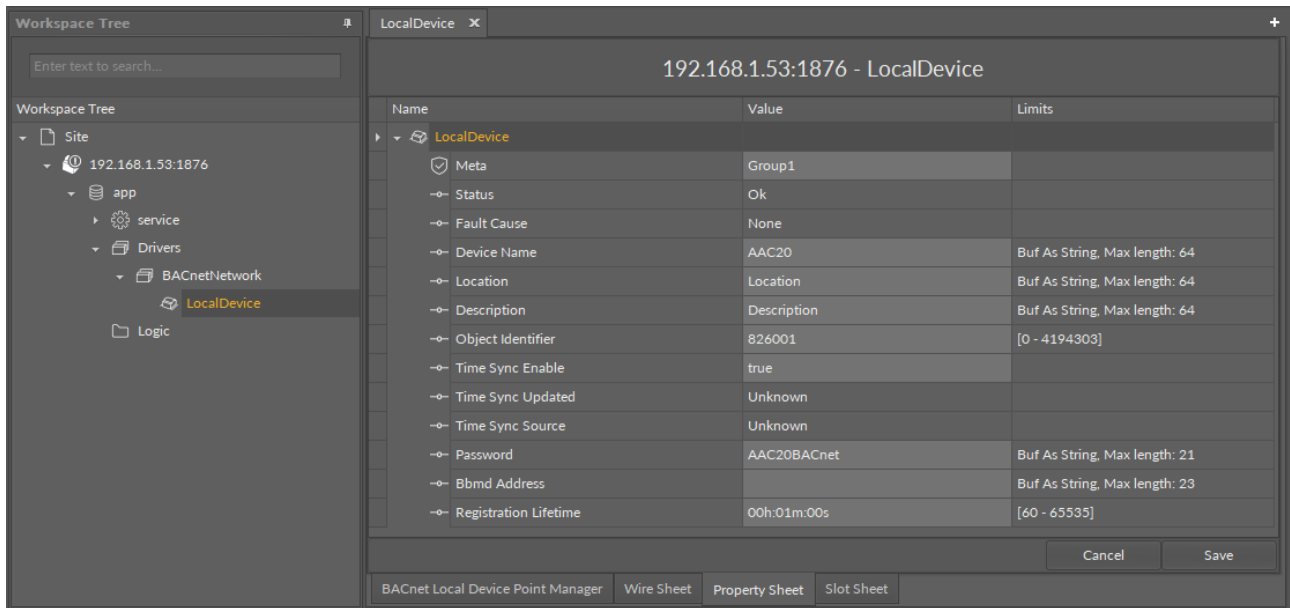
Figure 4. BACnet LocalDevice component

4.1.1 Slots

The BACnet LocalDevice component has the following slots:

- **Status:** component current status;
- **Fault Cause:** fault cause description;
- **Device Name:** BACnet device name;
- **Location:** BACnet description about the location of the device ;
- **Description:** additional BACnet description of the device;
- **Object Identifier:** BACnet address of the device, unique in the BACnet Network;
- **Time Sync Enable:** enable/disable time synchronization from the BACnet Master device;
- **Time Sync Updated:** last time sync message received;
- **Time Sync Source:** time sync source address;
- **Password:** device BACnet password protection for services DeviceCommunicationControl and ReinitializeDevice. By default, AAC20BACnet.

4.2 BACnet Local Device Data Points

The iSMA-B-AAC20 controller supports 3 types of BACnet data points:

- **AnalogValue:** to read/write the numeric values;
- **BinaryValue:** to read/write the Boolean values;
- **MultiState:** to read/write the integer and multistate values.

4.2.1 BACnet Object Integration (Link Back Forward)

In some cases, there is a need to synchronize the BACnet data from different sources such as the LCD display or the Modbus network. To do so in the iSMA-B-AAC20 controller, a special mechanism called link back forward needs to be used. This mechanism requires to use the NV component without connected In slot and in the auto mode. The NV component Out slot must be connected to one of the input slots in the BACnet object, and the BACnet data point component must have the slot Link Set in true state. Now, when the input slot of the BACnet data point, which is connected to the NV component,

will be changed from the BACnet protocol level, "Link back forward" action will be executed, and the value of the NV component will be set to the same value as the input slot of the BACnet data point, which is connected to NV component.

> WARNING! This mechanism works only if the value of the connected slot (priority input) to the NV component will be changed from the BACnet protocol level. If the value of different priority input will be changed from the BACnet protocol level, the action "Link back forward " will not be executed, and the output value will be chosen from object priority array.
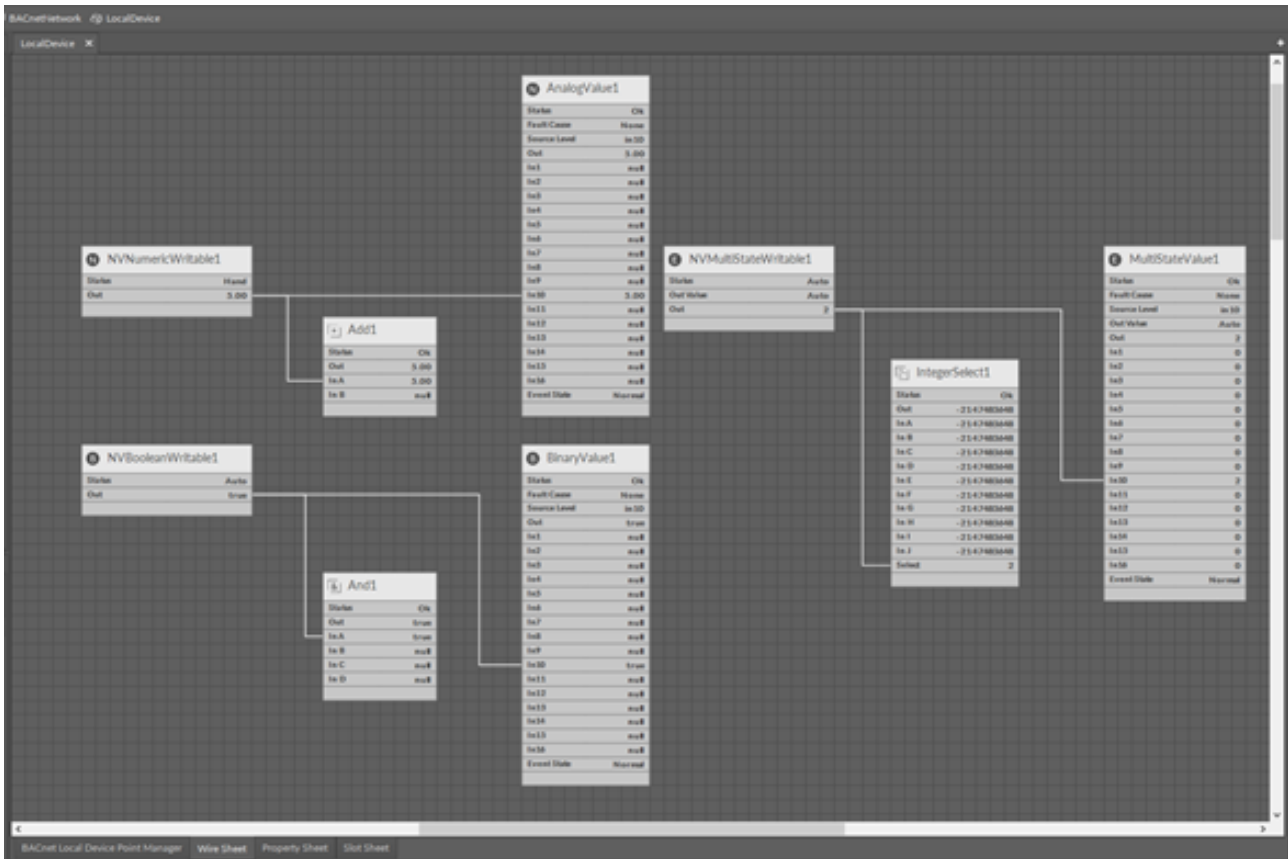
Figure 5. BACnet data synchronization

4.2.2 AnalogValue

The AnalogValue component is used to share a numeric value from the iSMA-B-AAC20 controller as the AnalogValue BACnet object. This component allows to read data from the controller (Out slot) or write data (input slots from 1 to 16) to the controller within the BACnet Network. The component has 16 prioritized input slots and one output slot. The output slot gets value from the input with the highest priority different from the null value. For example, if only In16, In13, and In9 have values different from null, the output slot will retrieve the value from In9, because it has the highest priority of all inputs with the value.
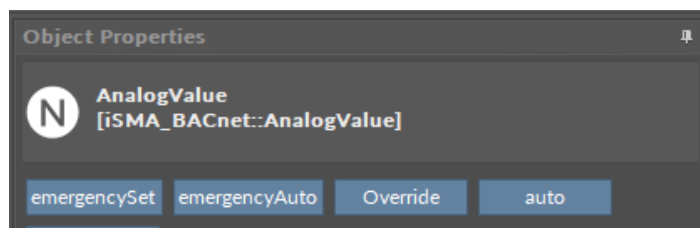
| Name	Value
▼ **Component**	
⊘ Meta	Group1
╺○╸ Status	Ok
╺○╸ Fault Cause	None
╺○╸ Bacnet Name	AnalogValue
╺○╸ Description	Description
╺○╸ Units	
╺○╸ Object Id	0
╺○╸ Link Set	false
╺○╸ Source Level	relinquishDefault
╺○╸ Out	0.00
╺○╸ In1	null
╺○╸ In2	null
╺○╸ In3	null
╺○╸ In4	null
╺○╸ In5	null
╺○╸ In6	null
╺○╸ In7	null
╺○╸ In8	null
╺○╸ In9	null
╺○╸ In10	null
╺○╸ In11	null
╺○╸ In12	null
╺○╸ In13	null
╺○╸ In14	null
╺○╸ In15	null
╺○╸ In16	null
╺○╸ Relinquish Default	0.00
╺○╸ Event State	Normal
╺○╸ Notification Class	-1
╺○╸ High Limit	0.00
╺○╸ Low Limit	0.00
╺○╸ Deadband	0.00
╺○╸ Limit Enable	None
╺○╸ Event Enable	None
╺○╸ High Limit Text	Goes to high limit
╺○╸ Low Limit Text	Goes to low limit
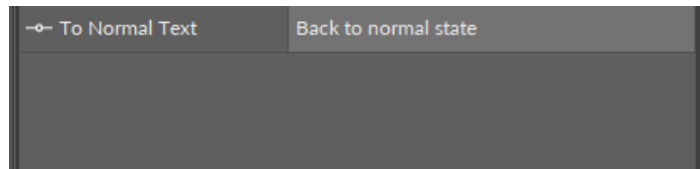
Figure 6. AnalogValue component

Slots

The AnalogValue component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **BACnet Name:** object name read by the remote device;
- **Description:** additional BACnet description of the data point;
- **Units:** BACnet data point facets;
- **Object ID:** BACnet data point object identification number;
- **Link Set:** enable\disable the Link Back Forward mechanism (see the BACnet Object Integration section below);
- **Source Level:** current read input name;
- **Out:** the output slot;
- **In1:** (read-only) the component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet protocol;
- **In8:** (read-only) the component input slot with medium priority, can be set by the Override action or by the BACnet protocol;
- **In2-In16:** writable component's inputs (In16 can be set by the Set action);
- **Relinquish Default:** object default value, the lowest priority.

Note: The slots below are used for alarm events configuration, to switch off the alarm event it is recommended to set "None" value in both slots: Limit Enable and Event Enable.

- **Event State:** data point object current alarm event state (read-only);
- **Notification Class:** notification Class BACnet Id Number (max. 10 class objects);
- **High Limit:** alarm event high limit;
- **Low Limit:** alarm event low limit;
- **Deadband:** alarm event deadband;
- **Limit Enable:** defines which alarm event states are active;
    - Available options: None, Low Limit, High Limit, Low and High Limit;
- **Event Enable:** defines which alarm events will be sent;
    - Available options: To Off normal, To Fault, To Normal, To Off normal and Normal, To Fault and Normal, To Off normal Fault and Normal (recommended option for alarms);
- **High Limit Text:** text message for high limit alarm stage;
- **Low Limit Text:** text message for low limit alarm stage;
- **To Normal Text:** text message when the data point comes back to normal stage.

Actions

The AnalogValue component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; In1 slot is read-only, and it can be set by the Emergency Set action or by the BACnet protocol);
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);

- **Override:** sets value on In8 slot (medium priority; In8 slot is read-only, and it can be set by the Override action or by the BACnet protocol);
- **Auto:** sets a null value on In8 slot ("switch off" the Override action);
- **Set:** sets value on In16 slot.

4.2.3 BinaryValue

The BinaryValue component is used to share the Boolean value from the iSMA-B-AAC20 controller as the BinaryValue BACnet object. This component allows to read data from the controller (Out slot) or write data (input slots form 1 to 16) to the controller within the BACnet Network. The component has 16 prioritized input slots and one output slot. Output slot retrieves the value from the input with the highest priority different from the null value. For example, if only In16, In13 and In9 have values different from null, the output slot will take value from In9, because it has the highest priority from all inputs with the value.

Figure 7. BinaryValue component

Slots

The BinaryValue component has the following slots:

- **Status:** Component's current status;
- **Fault Cause:** Fault cause description;
- **BACnet Name:** Object name read by the remote device;
- **Description:** Additional BACnet description of the data point,
- **Units:** BACnet data point facets;
- **Object ID:** BACnet data point object identification number;
- **Link Set:** Enable\Disable Link Back Forward mechanism (see the BACnet object integration chapter);l
- **Source Level:** Current read input name;
- **Out:** BinaryValue component Out slot;
- **In1:** (read-only) Component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet protocol;
- **In8:** (read-only) Component input slot with medium priority, can be set by the Override action or by the BACnet protocol;
- **In2-In16:** Writable components inputs (In16 can be set by theSet action);
- **Relinquish Default:** Object default value, the lowest priority.

Note: The slots below are used for alarm events configuration, to switch off the alarm event, set "None" value in slot Event Enable.

- **Event State:** Data point object current alarm event state (read-only);
- **Notification Class:** Notification Class BACnet ID Number (max. 10 class objects);
- **Alarm Value:** Defines data point value in Off Normal stage;
- **Event Enable:** Defines which alarm events will be sent;

- Available options: To Off normal, To Fault, To Normal, To Off normal and Normal, To Fault and Normal, To Off normal Fault and Normal (recommended option for alarms);
- **To Off Normal Text:** Text message for Off Normal stage;
- **To Normal Text:** Text message when the data point comes back to normal stage.

Actions

The BinaryValue component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; In1 slot is read-only, and it can be set by the Emergency Set action or by the BACnet protocol);
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; In8 slot is read-only, and it can be set by the Override action or by the BACnet protocol);
- **Auto:** sets a null value on In8 slot ("switch off" the Override action);
- **Set:** sets value on In 16 slot.

4.2.4 MultiStateValue

The MultiStateValue component is used to share the integer or multistate values data (integer with labels) of iSMA-B-AAC20 controller as the Multistate BACnet objects. The labels assigned to the values can be imported to the BACnet MultiStateValue component from the iSMA_platAAC20 NVMultiStateWritable component.

This component can send data to the BACnet device (when the component inputs in the application are used along with the master device read-only Out slot) or receive data from the BACnet IP master device (when the application uses only Out slot).

WARNING! The MultiStateValue objects use only integer values. which start from 1. Assigning labels to values the user cannot leave empty labels. For example, if the user leaves an empty label in Enum Val7 slot, the BACnet MultiStateValue object will read only the labels from Enum Val1 to Enum Val 6. The labels from slot Enum Val8 and above will be disregarded.

WARNING! In Niagara the labels are read while the database is being added to the system, and after that any label change will be disregarded. To update labels it is required to recall action Discover and use Match option between data points in Discovered and Niagara database.

This component allows to read data from the controller (out slot) or write data (input slots from 1 to 16) to the controller within the BACnet Network. The component has 16 prioritized inputs slots and one output slot. Output slot takes value from the input with the highest priority different from the null value. For example, if only In16, In13 and In9 have values different from null, the output slot will take value from In9, because it has the highest priority from all inputs with value.

Note: In order to avoid receiving the Fault Cause upon adding the point to the network, please follow the below steps:

- Create the outgoing link from the Out slot of the NVMultiStateWritable (iSMA_platAAC20) component to the In16slot of the MultiStateValue (iSMA_BACnet).

- Then, in the MultiStateValue component, change the Link Set value to true.
- In the NVMultiStateWritable component, enter the value in the Enum Val1-16 slots.

Figure 8. MultiStateValue component

Slots

The MultiStateValue component has the following slots:

· **Status:** component's current status;
· **Fault Cause:** fault cause description;
· **BACnet Name:** object name read by the remote device;
· **Description:** additional BACnet description of the data point;
· **Units:** BACnet data point facets;
· **Object ID:** BACnet data point object identification number;
· **Link Set:** enable\disable Link Back Forward mechanism (see the BACnet object integration chapter;
· **Source Level:** current read input name;
· **Out:** MultiStateValue component Out;
· **In1:** (read-only) the component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet protocol;
· **In8:** (read-only) the component input slot with medium priority, can be set by the Override action or by the BACnet protocol;
· **In2 – In16:** writable components inputs (In16 can be set by the Set action);
· **Relinquish Default:** object default value, the lowest priority.

Note: The slots below are used for alarm events configuration. To switch the alarm event off, set "None" value in the slot Event Enable.

- **Event State:** data point object current alarm event state (read only);
- **Notification Class:** notification class BACnet ID Number (max. 10 class objects);
- **Alarm Value 1 - Alarm Value 16:** slots defining up to 16 Off Normal data point stages;
- **Event Enable:** defines which alarm events will be sent;
  - Available options: To Off normal, To Fault, To Normal, To Off normal and Normal, To Fault and Normal, To Off normal Fault and Normal (recommended option for alarms);
- **To Off Normal Text:** text message for the Off Normal stage;
- **To Normal Text:** text message when the data point comes back to normal stage.

Actions

The MultiStateValue component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; In1 slot is read-only, and it can be set by the Emergency Set action or by the BACnet protocol);
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; In8 slot is read-only, and it can be set by the Override action or by the BACnet protocol);
- **Auto:** sets a null value on In8 slot ("switch off" the Override action);
- **Set:** sets value on In 16 slot.

4.3 BACnet Alarm Events

The BACnet data points under the LocalDevice can have defined alarm states. These alarms from BACnet data points can be collected and sent by the NotificationClass component to another BACnet IP device. Sending the alarm events between the devices requires configurating them in both devices: both in the transmitter (iSMA-B-AAC20) and in the receiver (Niagara receiver is used to show the configuration process).

4.3.1 NotificationClass Component

The NotificationClass component is the BACnet object which sends alarms to another BACnet device. As well as all BACnet objects, this object has the BACnet Object ID number which must be unique in the iSMA-B-AAC20 controller. This object defines alarm priority and sends alarm acknowledgement. The BACnet Network in the iSMA-B-AAC20 controller can have up to 10 NotificationClass objects.

To send alarm events, the user must enter the NotificationClass Object ID in all data points.
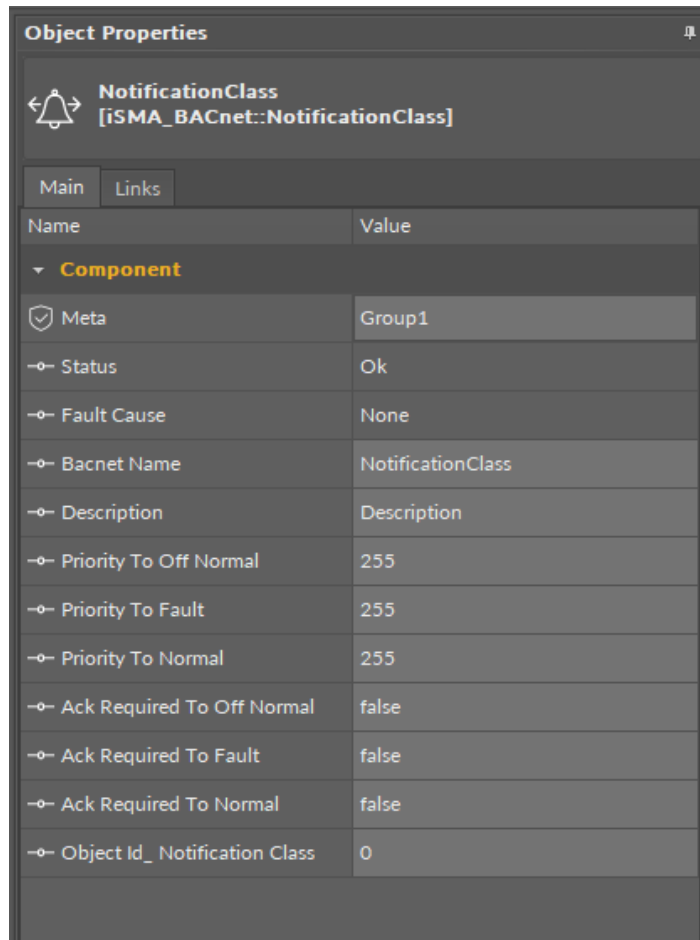
Figure 9. NotificationClass component

4.3.2 Alarm Events in BACnet Data Points

All alarm statuses and ranges are defined in the BACnet data point. For more information go to the BACnet Local Device Data Points section.

4.3.3 Receive Alarm Events in Niagara

It is possible to receive alarm events after adding all data points to the Niagara database system. NotificationClass in the iSMA-B-AAC20 controller is the main component responsible for sending the alarms to other BACnet IP devices. Receiving the alarm events by the device needs to be preceded by creating an entry in the list of recipients. It should be done by adding the NotificationClass configuration object to the BACnet database. In this object make an entry which contains the BACnet Device ID number (receiver number, in this case Niagara BACnet ID). From now on Niagara as BACnet device is able to receive the alarm event.

Figure 10. BACnet NotificationClass config object in the Property Sheet view

4.4 BACnet History Objects

The iSMA BACnet can share histories trends created in application over the BACnet network. The iSMA-B-AAC20 controller serves three types of the BACnet objects:

- **Boolean History:** shares binary trends in the BACnet network;
- **Integer History:** shares integer trends in the BACnet network;
- **Numeric History:** shares numeric (float) trends in the BACnet network.

To share trends log objects in the BACnet network, first the history trend log must be created in the application (for information, see the iSMA-B-AAC20_plat manual).

Next, the corresponding type of the trend log BACnet object component must be placed under the BACnet LocalDevice network.

> WARNING! The same object's type should have unique BACnet Name and Object ID values in the BACnet device.

Then make the link between histories component (from app->Service->history->db) to the corresponding BACnet history trend log object component. If everything works well, "Ok" label should appear in the Status slot, and from now on the trend should be visible in the BACnet network.

4.5 BACnet Schedule Objects

The iSMA BACnet can share schedules created in the application over the BACnet network. The schedules can be read and written over the BACnet network. The iSMA-B-AAC20 controller serves two types of the BACnet objects schedules:

- **Boolean schedule:** shares the Boolean schedule in the BACnet network;
- **Numeric schedule:** shares numeric (float) schedule in the BACnet network.

To share the schedule objects in the BACnet network, first the schedule must be created in the application (for information see the iSMA-B-AAC20_plat manual).

Next, the corresponding type of the BACnet schedule object component must be placed under the BACnet LocalDevice network.

> WARNING! In the BACnet device the same object type should have the unique BACnet Name and Object ID values.

Then, make the link between the schedule component to the corresponding BACnet component. If everything is ok, in the Status slot should appear "Ok" label, and from this moment trend should be enable to read/write by the BACnet network.

4.5.1 Schedule Special Events

Using the BACnet protocol, the user can send special events to the BACnet schedules (like holidays, etc.). During these events, the schedule can have a defined value, different than the one during normal working.

One schedule can have up to 10 special events with one value per day. It means that during the special event the user can define one value (in the hour range from 00.00 to 23.59). Another event that day will set up the default value at schedule output.

4.6 Time Synchronization

The BACnet Time Synchronization is a built-in function, which allows to receive the time message from the master device and synchronize the controller's RTC (Real Time Clock) with the master device clock. This function is available in the Local Device component. In this component, there is also the information when and who recently sent the packet time synchronization.
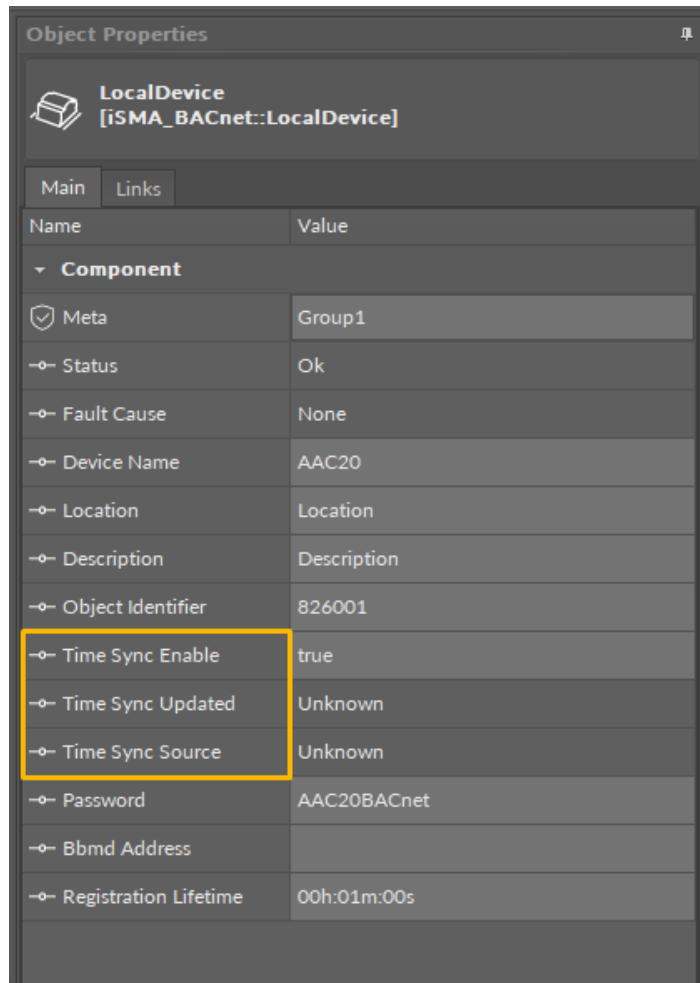
Figure 11. BACnet time synchronization

4.7 BACnet Folder

The BACnet Folder is a component which groups and organizes the BACnet points components. Additionally, the BACnet Folder has a Description slot, which describes the components inside by label up to 32 characters.

Note: The BACnet Folder is not visible over the BACnet Network.

5 BACnet RemoteIPNetwork

The BACnet RemoteIPNetwork is primarily used to extend the I/O of the iSMA-B-AAC20 controller by adding the devices IP module range. It can also be used to pick up the points from the 3rd party systems. The BACnet RemoteIPNetwork component must be placed under the BACnet Network component from the BACnet Network kit.

Note: Before setting up the BACnet RemoteIPNetwork, please add the LocalDevice component and enter the Object Identifier number. To work properly the iSMA-B-AAC20 controller should be also configured as the BACnet device.

The iSMA BACnet IP master in standard license covers up to 500 BACnet objects.
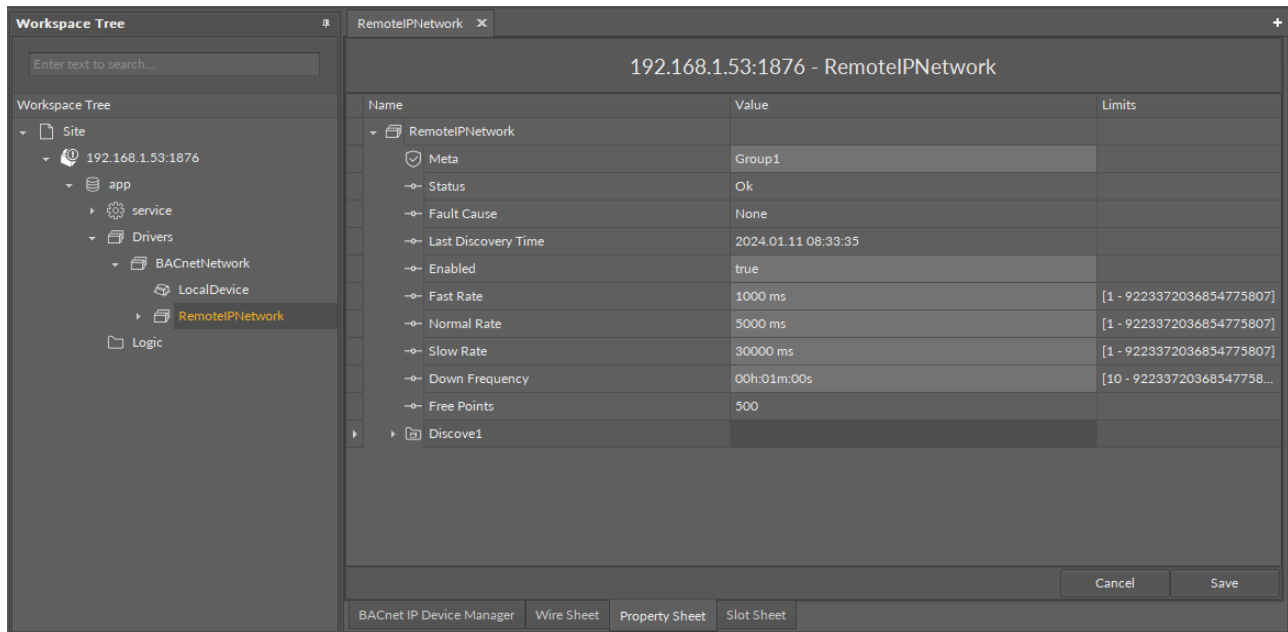

Figure 12. BACnet RemoteIPNetwork component

The RemoteIPNetwork component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Last Discovery Time:** last success discovery action time;
- **Enabled:** enable/disable the BACnet Remote IP network;
- **Fast Rate:** time between messages in Fast mode poll frequency;
- **Normal Rate:** time between messages in Normal mode poll frequency;
- **Slow Rate:** time between messages in Slow mode poll frequency;
- **Down Frequency:** time between testing message for the devices or points which have got status down;
- **Free Points:** number of available the BACnet objects in the BACnet Remote IP Network.

5.1 Devices in the Network

5.1.1 Discovering

The BACnet IP client network supports device discovering. This action is available in the context menu of the RemoteIPNetwork component or directly in the Object Properties window. The discovering process is shown in the Status slot. As a result of the process, a

Discove1 (numbered accordingly to the times the action was invoked) folder will be created and all found devices will be placed there.
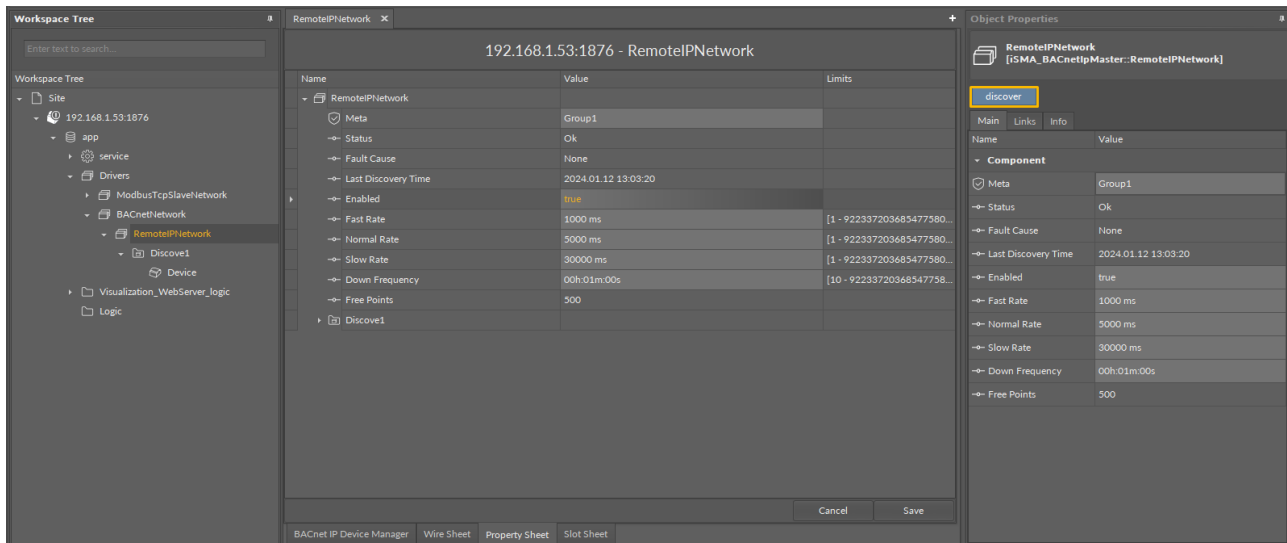

Figure 13. Device Discover in the Property Sheet view

5.1.2 Manual Adding

The BACnet RemoteIPNetwork allows also to add the device manually (offline). To do this, add the BACnet Device component under the Remote IP Network, enter the BACnet Device ID number and optional IP address (slot ADDR) in format xxx.xxx.xxx.xxx.

Note: If the BACnet IP Device is not in the same IP network (behind router) a device cannot be discovered automatically. The BACnet Device ID and IP address must be entered. The IP address is not required if the device is in the same network.

Set Enable to true and if the device is online, the status OK should appear. If the device status is down, check the connection and use action ping to refresh status.

5.2 BACnet IP Device

The BACnet IP Device component is a component, which is responsible for servicing a physical device connected to the iSMA-B-AAC20 controller by the BACnet protocol. Each device is represented by a unique BACnet device ID. The component has the ping action available under right-click which sends a test message to the device to check the device status (meaning "Monitor" ping requests). The ping requests are also generated at the network level, and the network's monitor periodically pings (queries) devices. While receiving any response from the device, including an exception response, it is considered proof of communication. All data points which are to be read from or written to the device must be placed under the Device component.
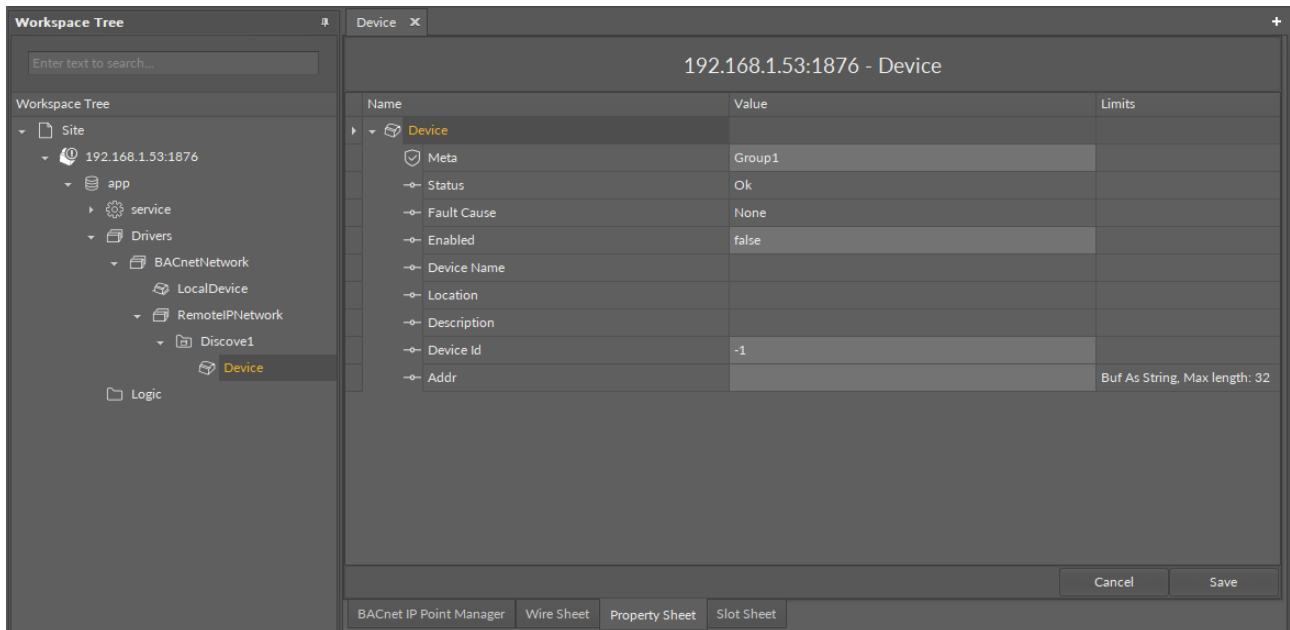
Figure 14. BACnet IPMasterDevice component

5.2.1 Slots

The BACnet IP Device component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing device;
- **Device Name:** read-only, the BACnet device name (read from device);
- **Location:** read-only, the BACnet device location description (read from device);
- **Description:** read-only, additional description label (read from device);
- **Device ID:** the BACnet device address (In Discover action this field is filled automatically);
- **Add:** additional field for the BACnet device IP address; the IP address should be entered for the devices installed out of local network range, behind the router (for the devices installed in the local network it can be empty).

5.2.2 Points in the Device

Similarly as the RemoteIPNetwork component supports discovering devices, the Device component in the BACnet client network supports discovering points. The action is available in the context menu of the Device component or directly in the Object Properties window. As a result of the process, all points added in the device will be listed as children components. Use the BACnet IP Point Manager to manage the discovered points.
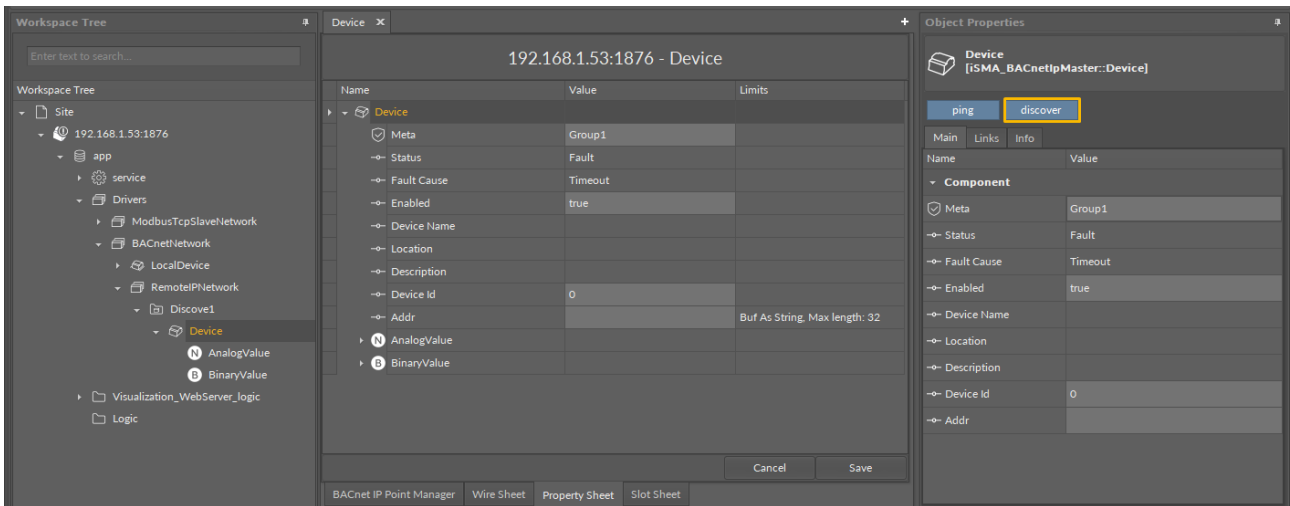
Figure 15. Points discovering action

5.3 BACnet IP Data Objects

The iSMA-B-AAC20 controller supports 7 types of data points:

- **Analog Input:** to read numeric values;
- **Analog Output:** to read/write numeric values;
- **Analog Value:** to read/write numeric values;
- **Binary Input:** to read/write Boolean values;
- **Binary Output:** to read/write Boolean values;
- **Binary Value:** to read/write Boolean values;
- **MultiStateValue:** to read/write integer and multistate values with labels.

5.3.1 AnalogInput

The AnalogInput component is used to read the Analog Input BACnet object type from the remote IP devices. This component allows to read data with the defined poll frequency (defined in the network component).
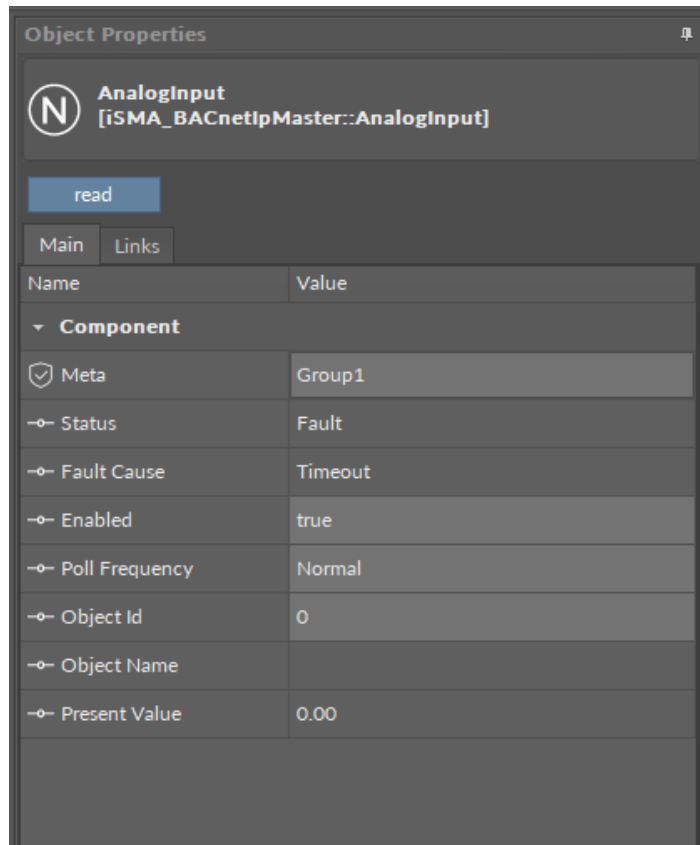
Figure 16. AnalogInput component

Slots

The AnalogInput component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing object;
- **Poll Frequency:** object read frequency group assign;
- **Object ID:** the BACnet data point object identification number;
- **Object Name:** object name read from the remote device (read-only);
- **Present Value:** the BACnet data point object Present Value property (Output).

Action

This component has only the Read action, which forces to read object's Present Value.

5.3.2 AnalogOutput

The AnalogOutput component is used to serve the Analog Output BACnet object type from the remote IP devices. This component allows to read data with the defined poll frequency (defined in the network component) and to write (send) data with the defined Write Type (On Change or On Change and Poll Frequency). The component has 16 prioritized input slots and one output slot.

Figure 17. AnalogOutput component

Slots

The AnalogOutput component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing object;
- **Poll Frequency:** object read frequency group assign;
- **Object ID:** the BACnet object identification number;

- **Object Name**: object name read from the remote IP device;
- **Write Type:** sending value to device definition: On Change or On Change and Poll Frequency;
- **Out:** the BACnet Analog Output object Out,
- **In1:** (read-only) the component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet device;
- **In8:** (read-only) the component input slot with medium priority, can be set by the Override action or by the BACnet device;
- **In2 – In16:** writable components inputs (In16 can be set by the Set action);
- **Relinquish Default:** object default value, the lowest priority.

Actions

The AnalogOutput component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; slot In1 is read only and it can be set by the Emergency Set).
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; slot In8 is read only and it can be set by the Override action).
- **Auto:** sets null value on In8 slot ("switch off" the Override action),
- **Set:** sets value on In16 slot;
- **Read:** forces object Present Value read.

5.3.3 AnalogValue

The AnalogValue component is used to serve the Analog Value BACnet object type from the remote IP devices. This component allows to read data with the defined poll frequency (defined in the network component) and to write (send) data with the defined Write Type (On Change or On Change and Poll Frequency). The component has 16 prioritized input slots and one output slot.
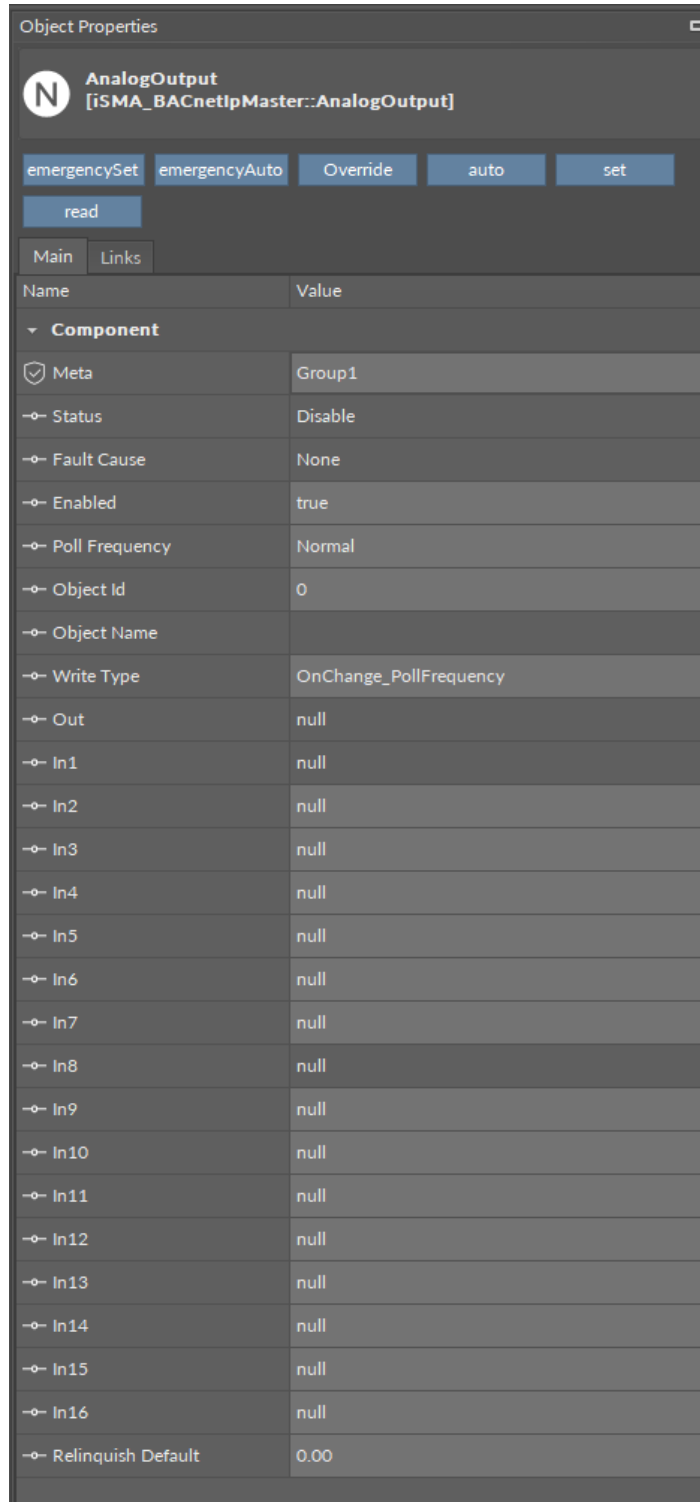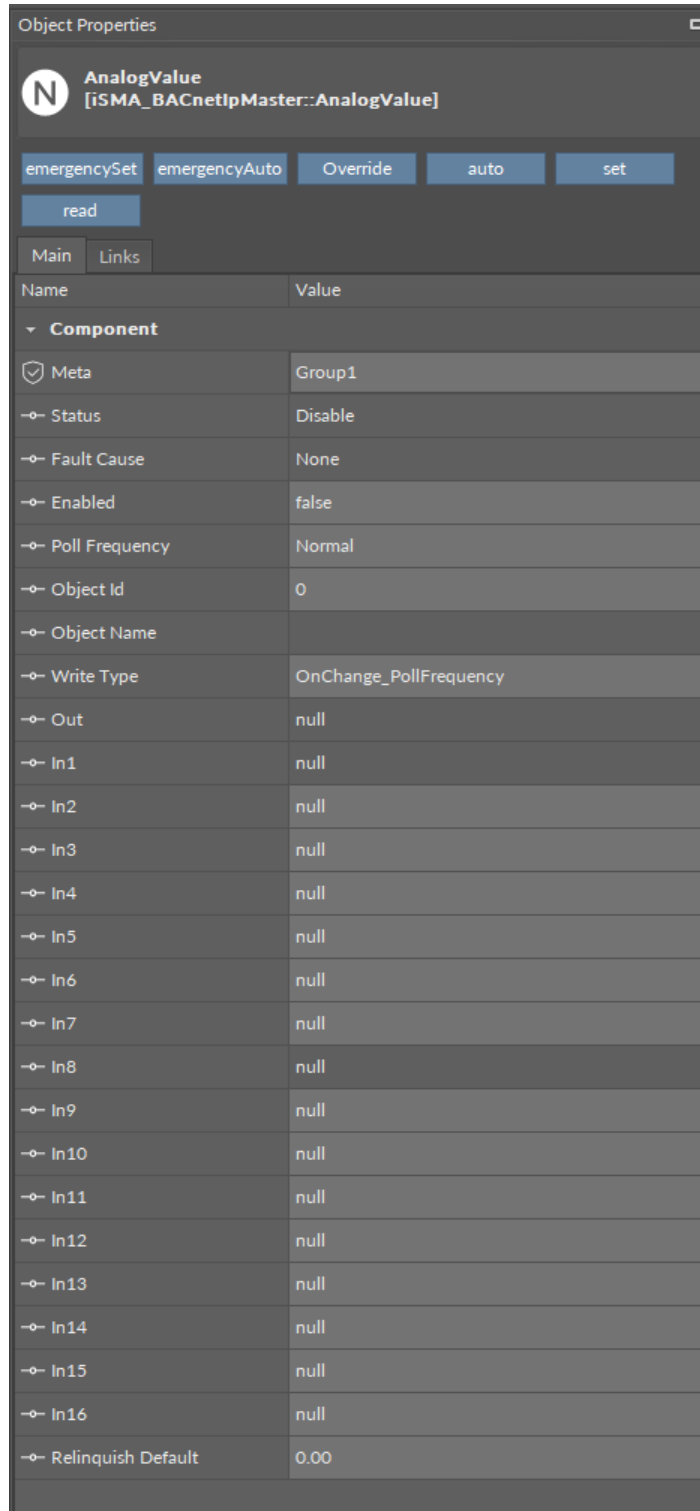
Figure 18. AnalogValue component

Slots

The AnalogValue component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing object;
- **Poll Frequency:** object read frequency group assign;
- **Object ID:** the BACnet object identification number;

- **Object Name:** object name read from the remote IP device;
- **Write Type:** sending value to device definition: On Change or On Change and Poll Frequency;
- **Out:** the AnalogValue component Out;
- **In1:** (read-only) the component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet device;
- **In8:** (read-only) the component input slot with medium priority, can be set by the Override action or by the BACnet device;
- **In2 – In16:** writable components inputs (In16 can be set by the Set action);
- **Relinquish Default:** object default value, the lowest priority.

Actions

The AnalogValue component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; slot In1 is read only and it can be set by the Emergency Set action);
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; slot In8 is read only and it can be set by the Override action);
- **Auto:** sets a null value on In8 slot ("switch off" the Override action);
- **Set:** sets value on In16 slot;
- **Read:** forces object Present Value read.

5.3.4 BinaryInput

The BinaryInput component is used to read the Binary Input BACnet object type from the remote IP devices. This component allows to read data with the defined poll frequency (defined in network component).
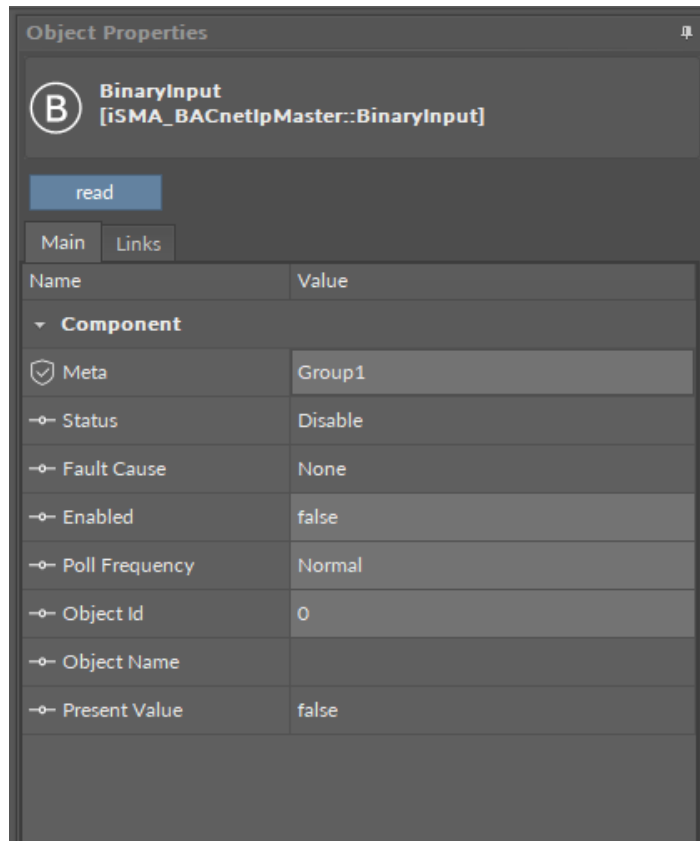
Figure 19. BinaryInput component

Slots

The BinaryInput component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing object;
- **Poll Frequency:** object read frequency group assign;
- **Object ID:** the BACnet object identification number;
- **Object Name:** object name read from the remote IP device;
- **Present Value:** the BACnet data point object Present Value property (Output).

Actions

This component has only the Read action, which forces object Present Value read.

5.3.5 BinaryOutput

The BinaryOutput component is used to serve the Binary Output BACnet object type from the remote IP devices. This component allows to read data with the defined poll frequency (defined in the network component) and write (send) data with the defined Write Type (On Change or On Change and Poll Frequency). The component has 16 prioritized input slots and one output slot.

Figure 20. BinaryOutput component

Slots

The BinaryOutput component has the following slots:

· **Status:** component's current status;
· **Fault Cause:** fault cause description;
· **Enabled:** enable/disable servicing object;
· **Poll Frequency:** object read frequency group assign;
· **Object ID:** the BACnet object identification number;

- **Object Name**: object name read from the remote IP device;
- **Write Type:** send value to device definition: On Change or On Change and Poll Frequency;
- **Out:** the BinaryOutput component Out;
- **In1:** (read-only) the component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet device;
- **In8:** (read-only) the component input slot with medium priority, can be set by the Override action or by the BACnet device;
- **In2 – In16:** writable components inputs (In16 can be set by the Set action);
- **Relinquish Default:** object default value, the lowest priority.

Actions

The BinaryOutput component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; slot In1 is read only, and it can be set by the Emergency Set action);
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; slot In8 is read only, and it can be set by Override action);
- **Auto:** sets a null value on In8 slot ("switch off" the Override action);
- **Set:** sets value on In16 slot;
- **Read:** forces object Present Value read.

5.3.6 BinaryValue

The BinaryValue component is used to serve Binary Value BACnet object type from the remote IP devices. This component allows to read data with the defined poll frequency (defined in the network component) and write (send) data with the defined Write Type (On Change or On Change and Poll Frequency). The component has 16 prioritized input slots and one output slot.
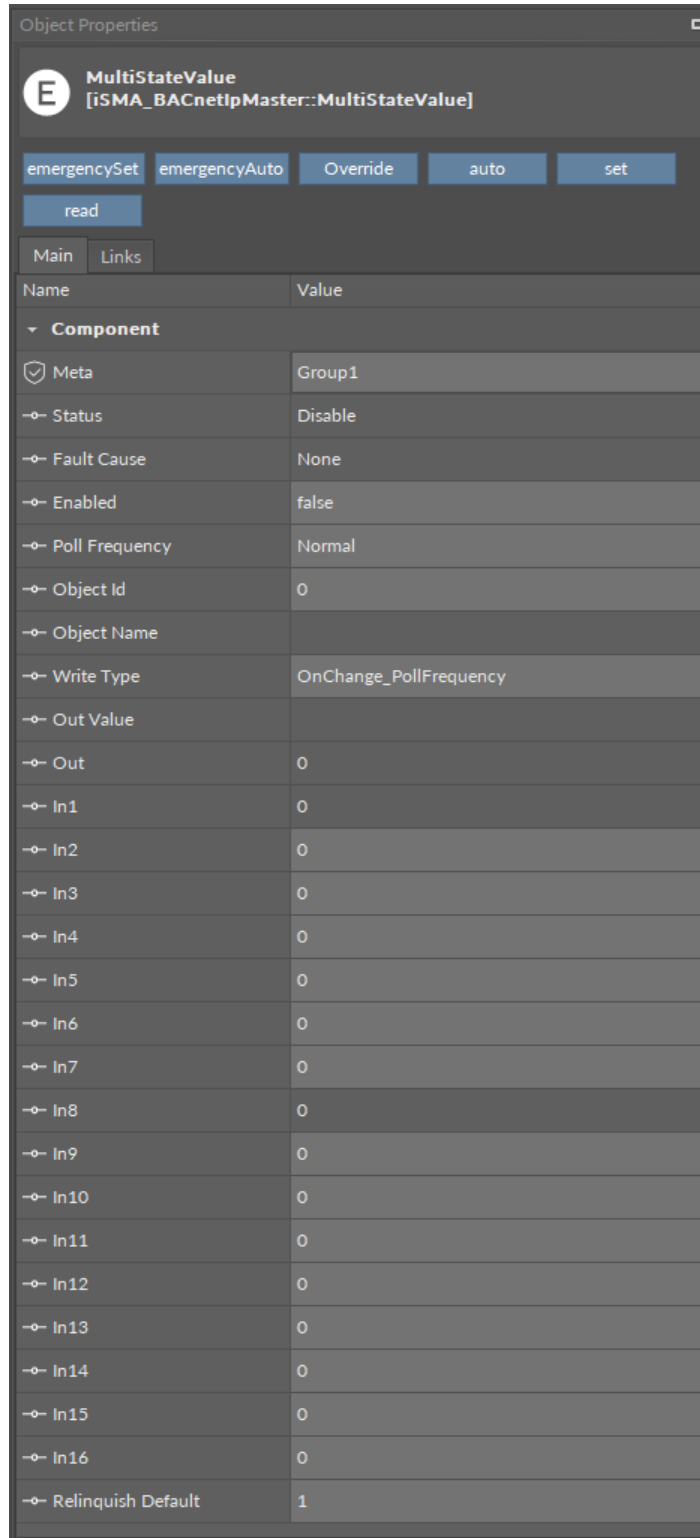
Figure 21. BinaryValue component

Slots

The BinaryValue component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing object;
- **Poll Frequency:** object read frequency group assign;

- **Object ID:** the BACnet object identification number;
- **Object Name:** object name read from the remote IP device;
- **Write Type:** sending value to device definition: On Change or On Change and Poll Frequency;
- **Out:** the BinaryValue component Out slot;
- **In1:** (read-only) the component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet device;
- **In8:** (read-only) the component input slot with medium priority, can be set by the Override action or by the BACnet device;
- **In2-In16:** writable components inputs (In16 can be set by the Set action);
- **Relinquish Default:** object default value, the lowest priority.

Actions

The BinaryValue component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; slot In1 is read only, and it can be set by the Emergency Set action);
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; slot In8 is read only, and it can be set by the Override action or by the BACnet device);
- **Auto:** sets a null value on In8 slot ("switch off" the Override action);
- **Set:** sets value on In 16 slot;
- **Read:** forces object Present Value read.

5.3.7 MultiStateValue

The MultiStateValue component is used to serve Multistate BACnet objects from the remote IP devices. This component uses only integer values and can read assigned text labels. This component allows to read data with the defined poll frequency (defined in the network component) and write (send) data with the defined Write Type (On Change or On Change and Poll Frequency). The component has 16 prioritized input slots and one output slot.

Note: In order to avoid receiving the Fault Cause upon adding the point to the network, please follow the below steps:

- Create the outgoing link from the Out slot of the NVMultiStateWritable (iSMA_platAAC20) component to the In16slot of the MultiStateValue (iSMA_BACnet).
- Then, in the MultiStateValue component, change the Link Set value to true.
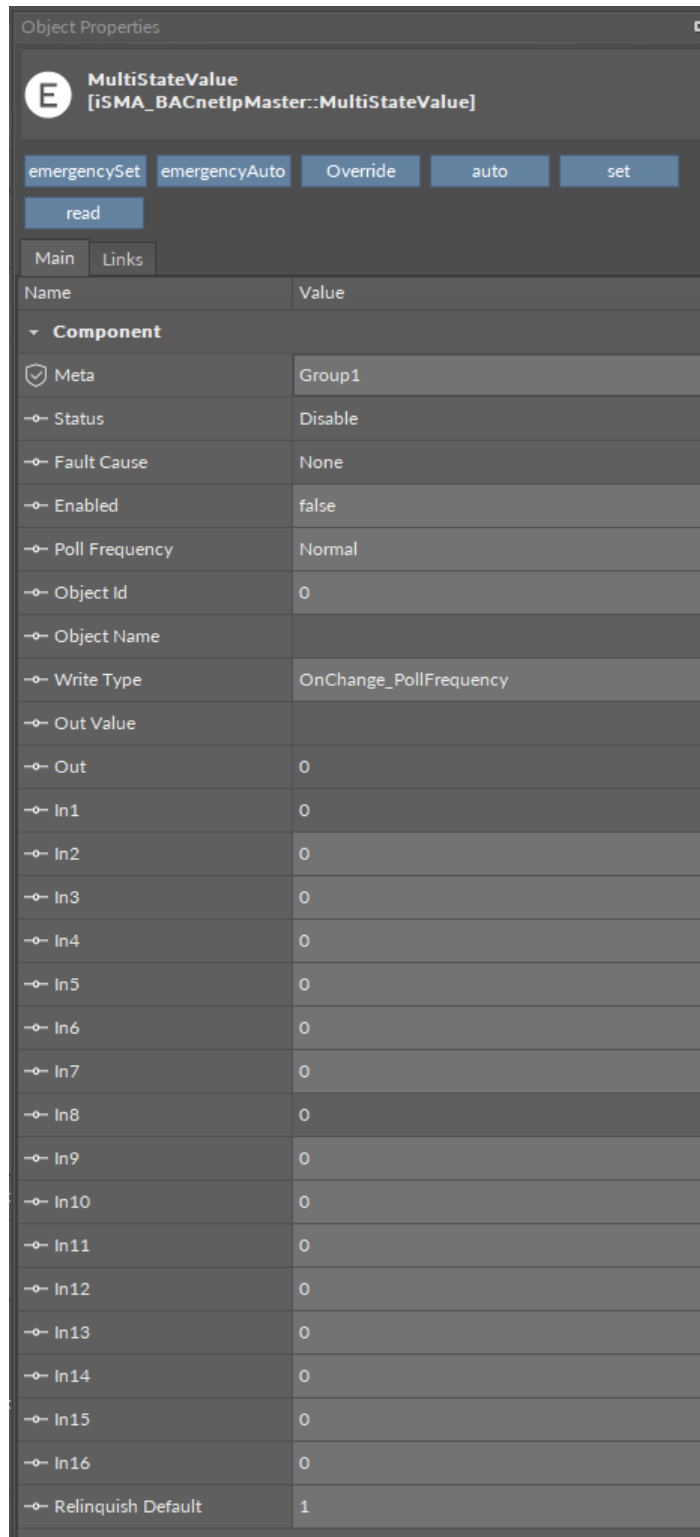- In the NVMultiStateWritable component, enter the value in the Enum Val1-16 slots.

Figure 22. MultiStateValue component

Slots

The MultiStateValue component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **BACnet Name:** object name read from remote object;
- **Object ID:** the BACnet data point object identification number;

- **Write Type:** sending value to device definition: On Change or On Change and Poll Frequency;
- **Out Value:** out value label;
- **Out:** the MultiStateValue component Out;
- **In1:** (read-only) the component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet device,
- **In8:** (read-only) the component input slot with medium priority, can be set by the Override action or by the BACnet device;
- **In2 – In16:** writable component's inputs (In16 can be set by the Set action);
- **Relinquish Default:** object default value, the lowest priority.

Actions

The MultiStateValue component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; slot In1 is read only and it can be set by the Emergency Set action),
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; slot In8 is read only, and it can be set by the Override action);
- **Auto:** sets a null value on In8 slot ("switch off" the Override action);
- **Set:** sets value on In16 slot;
- **Read:** forces object Present Value read.

6 BACnet RemoteMSTPNetwork

The RemoteMSTPNetwork component is the main component that provides the BACnet protocol via RS485 bus in the iSMA-B-AAC20 controller. The BACnet RemoteMSTPNetwork component must be placed under the BACnetNetwork component from the iSMA BACnet kit.

Note: Before setting up the BACnet RemoteMSTPNetwork, please add the LocalDevice component and enter the Object Identifier number. To work properly the iSMA-B-AAC20 controller should be also configured as the BACnet device.

The BACnet RemoteMSTPNetwork is limited up to 500 BACnet objects and it cannot be extended.

Note: The iSMA-B-AAC20 controller has only one RS485 port which can be used to connect the remote MS/TP BACnet devices. The BACnet MS/TP network or Modbus Async network can be used at one moment in the iSMA-B-AAC20 controller.
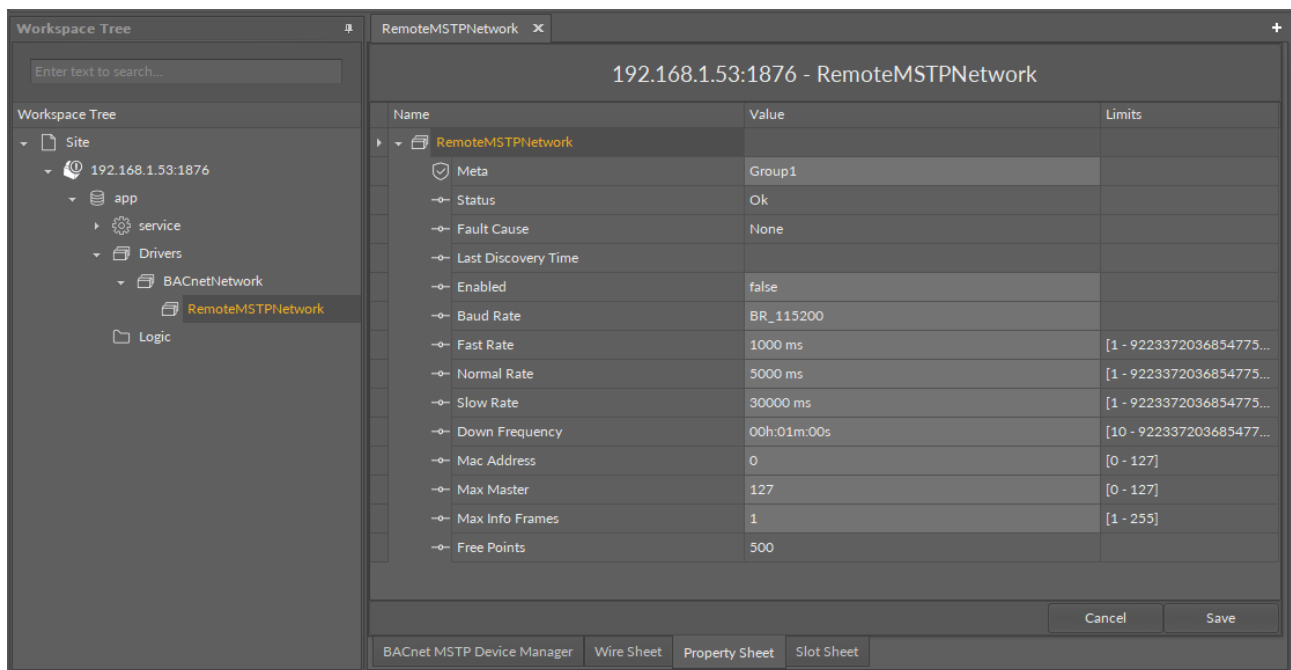

Figure 23. BACnet RemoteMSTPNetwork component

The BACnet RemoteMSTPNetwork component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Last Discovery Time:** last success discovery action time;
- **Enabled:** enable/disable the remote MS/TP network;
- **Baud Rate:** the RemoteMSTPNetwork RS485 port baud rate;
  - Available options: 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200 bps;
- **Fast Rate:** time between the messages in „Fast" mode poll frequency;
- **Normal Rate:** time between the messages in „Normal" mode poll frequency;
- **Slow Rate:** time between the messages in „Slow" mode poll frequency;
- **Down Frequency:** time between the testing messages for devices or points which have got status down;
- **Mac Address:** unique address of the device on the MS/TP network;
- **Max Master:** maximum master device address on the MS/TP network;

- **Max Info Frames:** controls how many frames can be sent by the master device before passing the token;
- **Free Points:** number of available physical points in the RemoteMSTPNetwork (max. 500 points).

Each BACnet device on MS/TP network segment mast have a unique MAC address. Typically, the default MS/TP MAC address is "0". If there is more than one device on the network, there is a need to give them unique addresses. In that case the unique address could be set in the MAC address slot (valid range is from 0 to 127).

In order to optimize the network traffic there are the Max Master and Max Info Frames parameters. Every master has the job of periodically polling for a new master. Each master device recognizes the next master on the network, because that is where the token will be passed to. If in a particular network there will be only five masters, the maximum master value can be restricted. In this case the last master (with the address 5) on the network will not be trying to find the master with address higher than five but will give the token to the master with address "0". Such restriction will help to save time and traffic on the network.

Note: If any new master will be added to the network with the address higher than the Max master value, it will never receive the token, and it would be impossible to discover that device.

The Max Info Frames parameter specifies how many frames the master can send to other controllers, when it has the token on the network. That parameter gives the user a possibility to distribute time given for this controller on the network.

6.1 Devices in the Network

6.1.1 Discovering

The BACnet MS/TP client network supports device discovering. This action is available in the context menu of the RemoteMSTPNetwork component or directly in the Object Properties window. The discovering process is shown in the Status slot. As a result of the process, a Discove1 (numbered accordingly to the times the action was invoked) folder will be created and all found devices will be placed there.
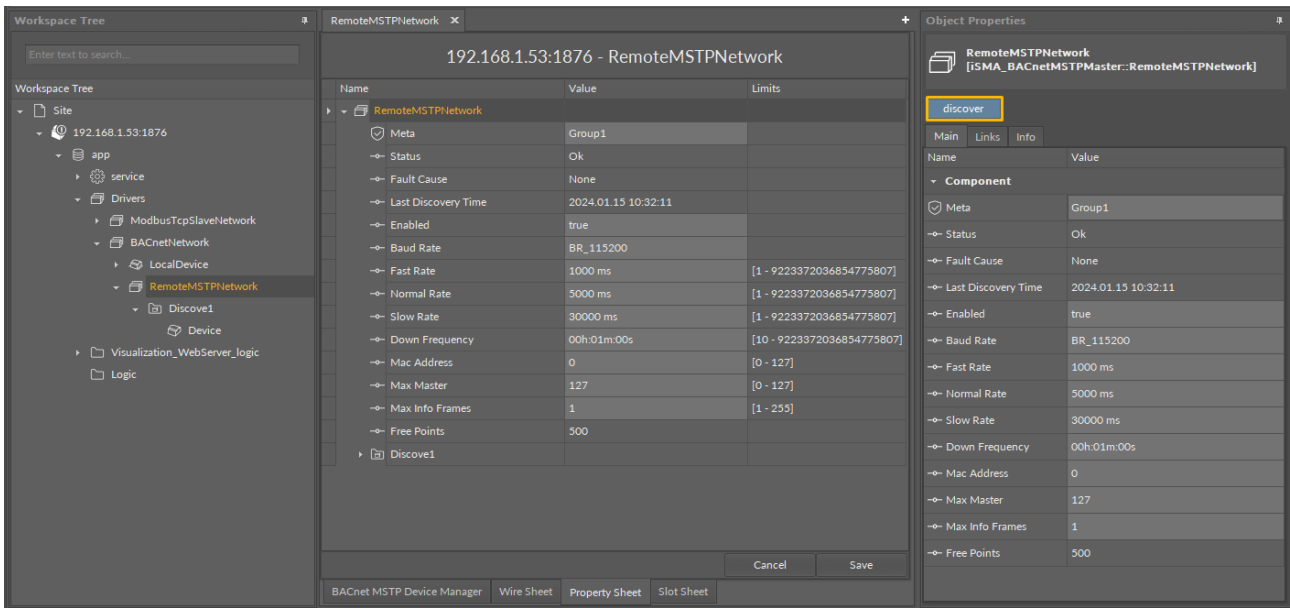
Figure 24. Device Discover in the Property Sheet view

6.1.2 Manual Adding

The BACnet RemoteMSTPNetwork allows also to add the device manually (offline). To do this, add the BACnet Device component under the RemoteMSTPNetwork, enter the BACnet Device ID number.

Set Enable to true and if the device is online, the status OK should appear. If the device status is down, check the connection and use action ping to refresh status.

6.2 BACnet MS/TP Device

The BACnet remote MS/TP Device is a component which is responsible for servicing a physical device connected to the iSMA-B-AAC20 controller by the BACnet RS485 bus. Each device is represented by a unique BACnet Device ID. The component has a ping action available under right-click, which sends a test message to the device to check the device status (meaning Monitor ping requests). Ping requests are also generated at the network-level, and the network's monitor periodically pings (queries) devices. If any response from the device is received, including an exception response, it is considered a proof of communication. All data points which are to be read from or written to the device must be placed under the Device component.
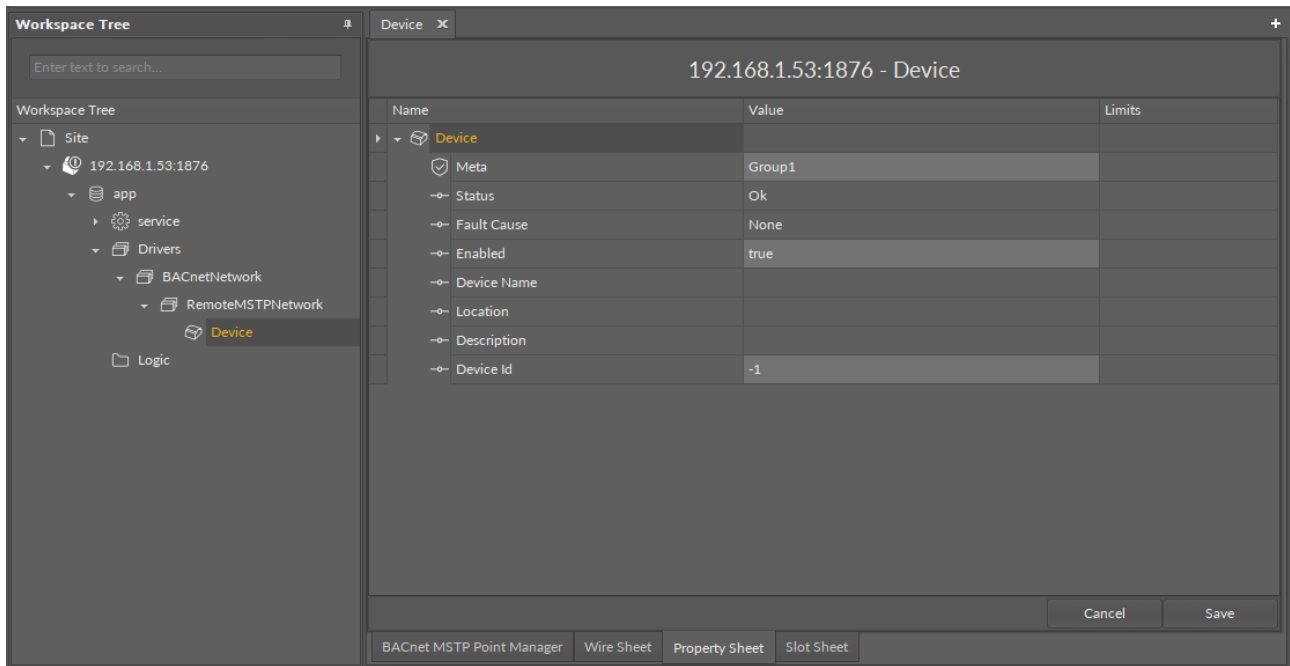
Figure 25. BACnet RemoteMSTPDevice component

6.2.1 Slots

The Device component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing device;
- **Device Name:** read-only, the BACnet device name (read from device);
- **Location:** read-only, the BACnet device location description (read from device);
- **Description:** read-only, additional description label (read from device);
- **Device ID:** the BACnet device address (In Discover action this field is filled automatically).

6.2.2 Points in the Device

Similarly as the RemoteMSTPNetwork component supports discovering devices, the Device component in the BACnet client network supports discovering points. The action is available in the context menu of the Device component or directly in the Object Properties window. As a result of the process, all points added in the device will be listed as children components. Use the BACnet MSTP Point Manager to manage the discovered points.
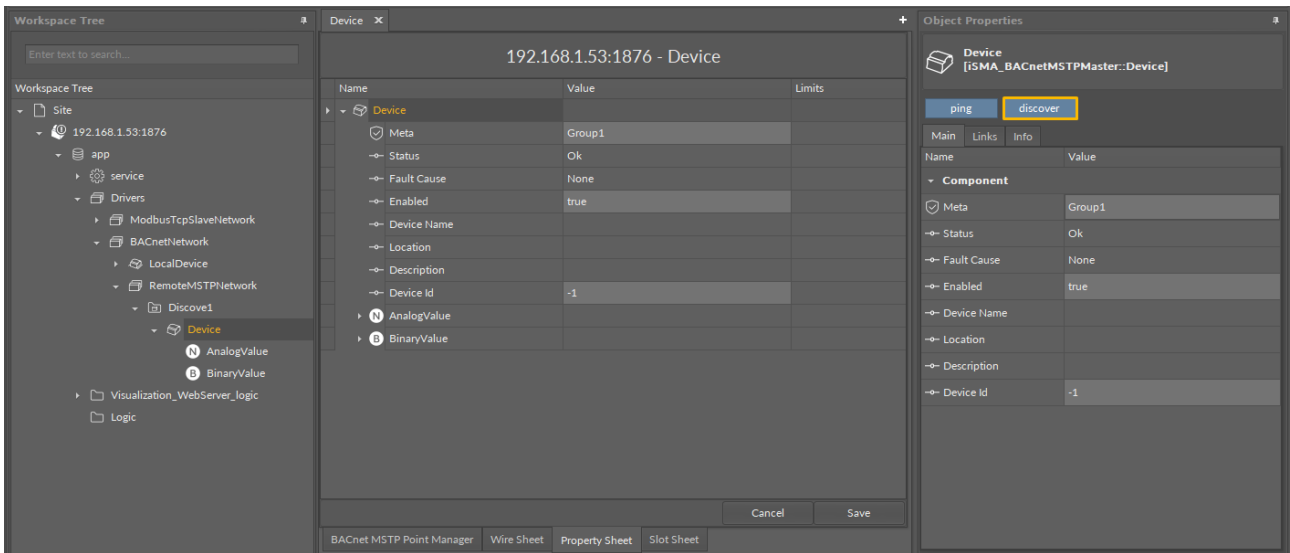
Figure 26. Device Discover in the Property Sheet view

6.3 BACnet MS/TP Device Data Objects

6.3.1 Analog Input

The AnalogInput component is used to read the Analog Input BACnet MS/TP object type from the remote devices. This component allows to read data with the defined poll frequency (defined in the network component).
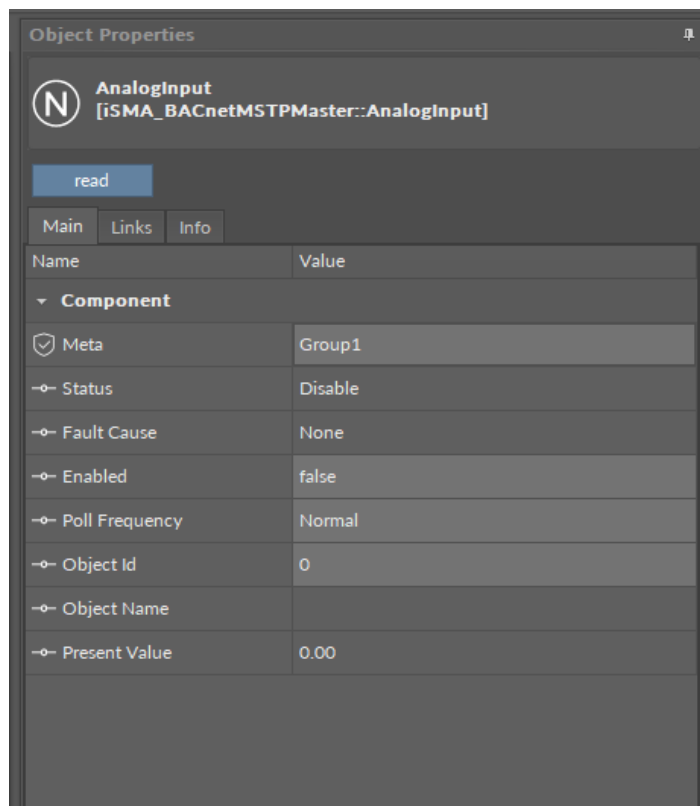
Figure 27. AnalogInput component

Slots

The AnalogInput component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing object;
- **Poll Frequency:** object read frequency group assign;
- **Object ID:** the BACnet MS/TP object identification number;
- **Object Name:** object name read from the remote device;
- **Present Value:** the BACnet data point object Present Value property (output).

Action

This component has only the Read action, which forces object Present Value read.

6.3.2 AnalogOutput

The AnalogOutput component is used to serve the Analog Output BACnet MS/TP object type from the remote devices. This component allows to read data with the defined poll frequency (defined in the network component) and write (send) data with the defined Write Type (On Change or On Change and Poll Frequency). The component has 16 prioritized input slots and one output slot.

Figure 28. AnalogOutput component

Slots

The AnalogOutput component has the following slots:

· **Status:** component's current status;
· **Fault Cause:** fault cause description;
· **Enabled:** enable/disable servicing object;
· **Poll Frequency:** object read frequency group assign;
· **Object ID:** the BACnet MS/TP object identification number;

- **Object Name**: object name read from the remote device;
- **Write Type:** sending value to the device definition: On Change or On Change and Poll Frequency;
- **Out:** the AnalogOutput component Out;
- **In1:** (read-only) component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet device;
- **In8:** (read-only) component input slot with medium priority, can be set by the Override action or by the BACnet device;
- **In2-In16:** writable component inputs (In16 can be set by the Set action);
- **Relinquish Default:** object default value, the lowest priority.

Actions

The AnalogOutput component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; In1 slot is read-only, and it can be set by the Emergency Set);
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; In8 slot is read-only, and it can be set by the Override action);
- **Auto:** sets a null value on In8 slot ("switch off" the Override action);
- **Set:** sets value on In16 slot;
- **Read:** forces object Present Value read.

6.3.3 AnalogValue

The AnalogValue component is used to serve the Analog Value BACnet MS/TP object type from the devices. This component allows to read data with the defined poll frequency (defined in the network component) and to write (send) data with the defined Write Type (On Change or On Change and Poll Frequency). The component has 16 prioritized input slots and one output slot.
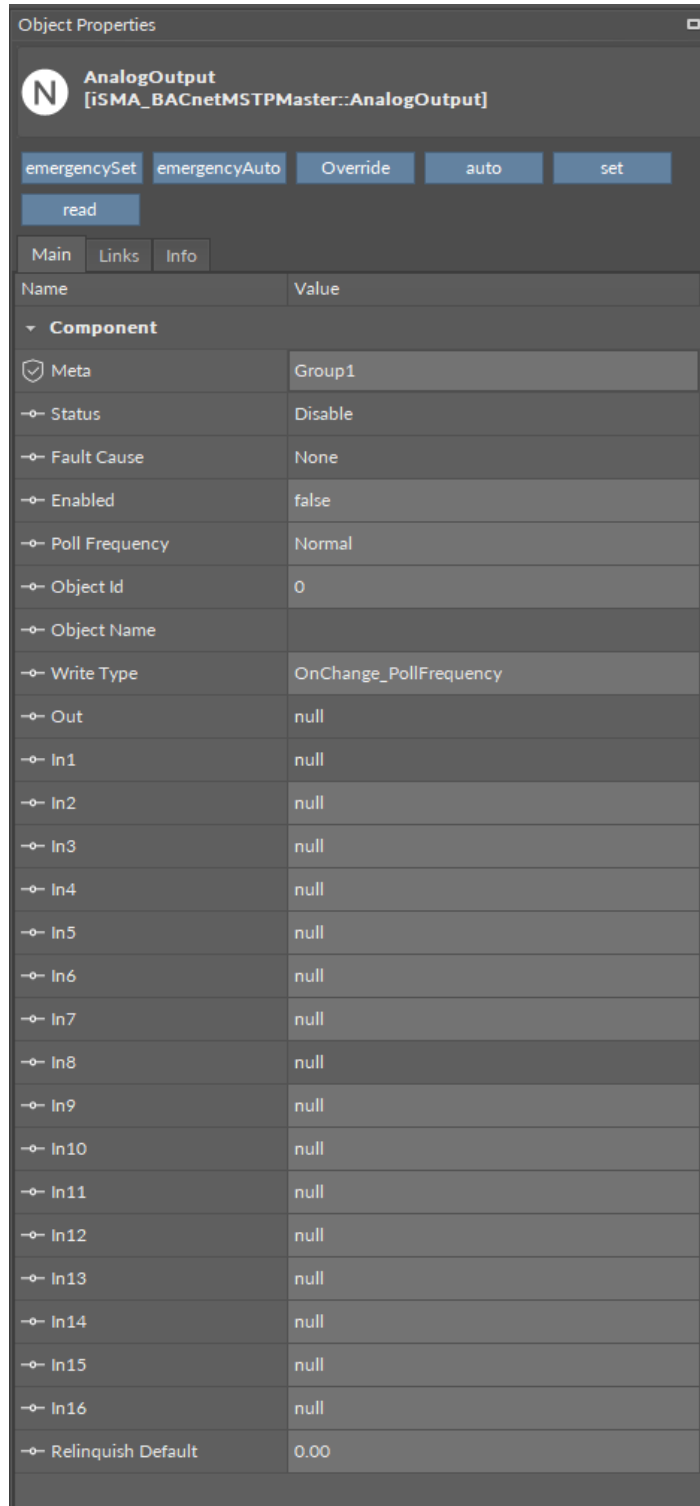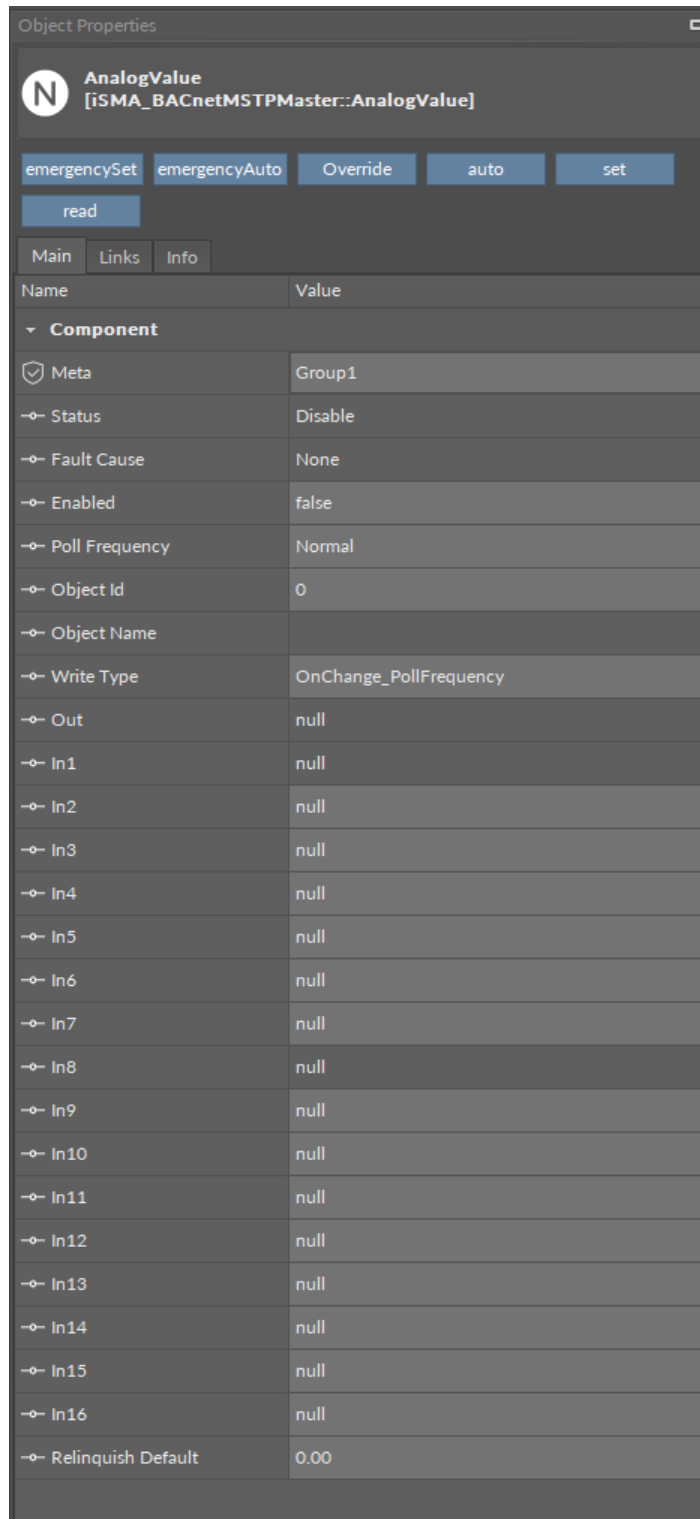
Figure 29. AnalogValue component

Slots

The AnalogValue component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing object;
- **Poll Frequency:** object read frequency group assign;
- **Object ID:** the BACnet MS/TP object identification number;

- **Object Name:** object name read from the remote device;
- **Write Type:** sending value to the device definition: On Change or On Change and Poll Frequency;
- **Out:** the AnalogValue component Out;
- **In1:** (read-only) component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet MS/TP device;
- **In8**: (read-only) component input slot with medium priority, can be set by the Override action or by the BACnet MS/TP device;
- **In2-In16:** writable components inputs (In 16 can be set by the Set action);
- **Relinquish Default:** object default value, the lowest priority.

Actions

The AnalogValue component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; In1 slot is read-only, and it can be set by the Emergency Set action);
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; In8 slot is read-only, and it can be set by the Override action);
- **Auto:** sets a null value on In8 slot ("switch off" the Override action);
- **Set:** sets value on In16 slot;
- **Read:** forces object Present Value read.

6.3.4 BinaryInput

The BinaryInput component is used to read the Binary Input BACnet MS/TP object type from the remote devices. This component allows reading data with the defined poll frequency (defined in the network component).
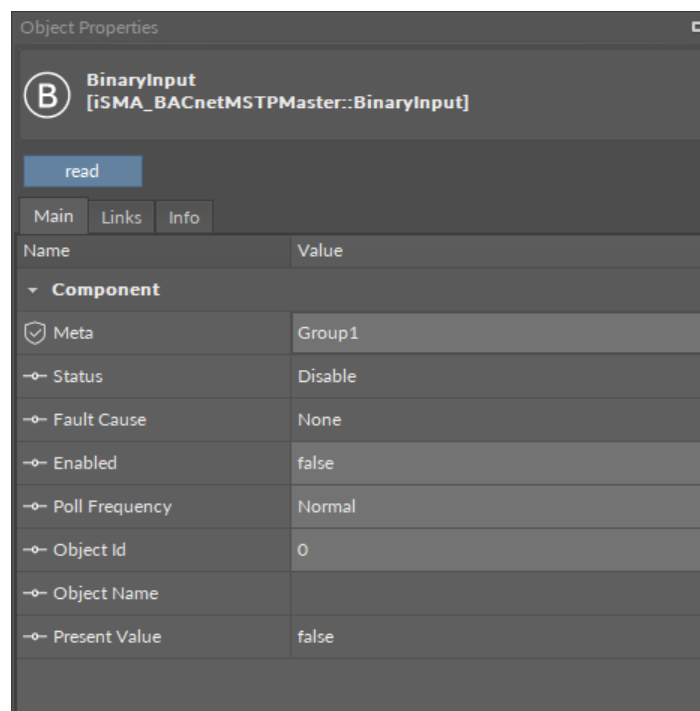

Figure 30. BinaryInput component

Slots

The BinaryInput component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing device;
- **Poll Frequency:** object read frequency group assign;
- **Object ID:** the BACnet MS/TP object identification number;
- **Object Name:** object name read from the remote device;
- **Present Value:** the BACnet data point object Present Value property (output).

Actions

This component has only the Read action, which forces object Present Value read.

6.3.5 BinaryOutput

The BinaryOutput component is used to serve the Binary Output BACnet MS/TP object type from the remote devices. This component allows to read data with the defined poll frequency (defined in the network component) and to write (send) data with the defined Write Type (On Change or On Change and Poll Frequency). The component has 16 prioritized input slots and one output slot.
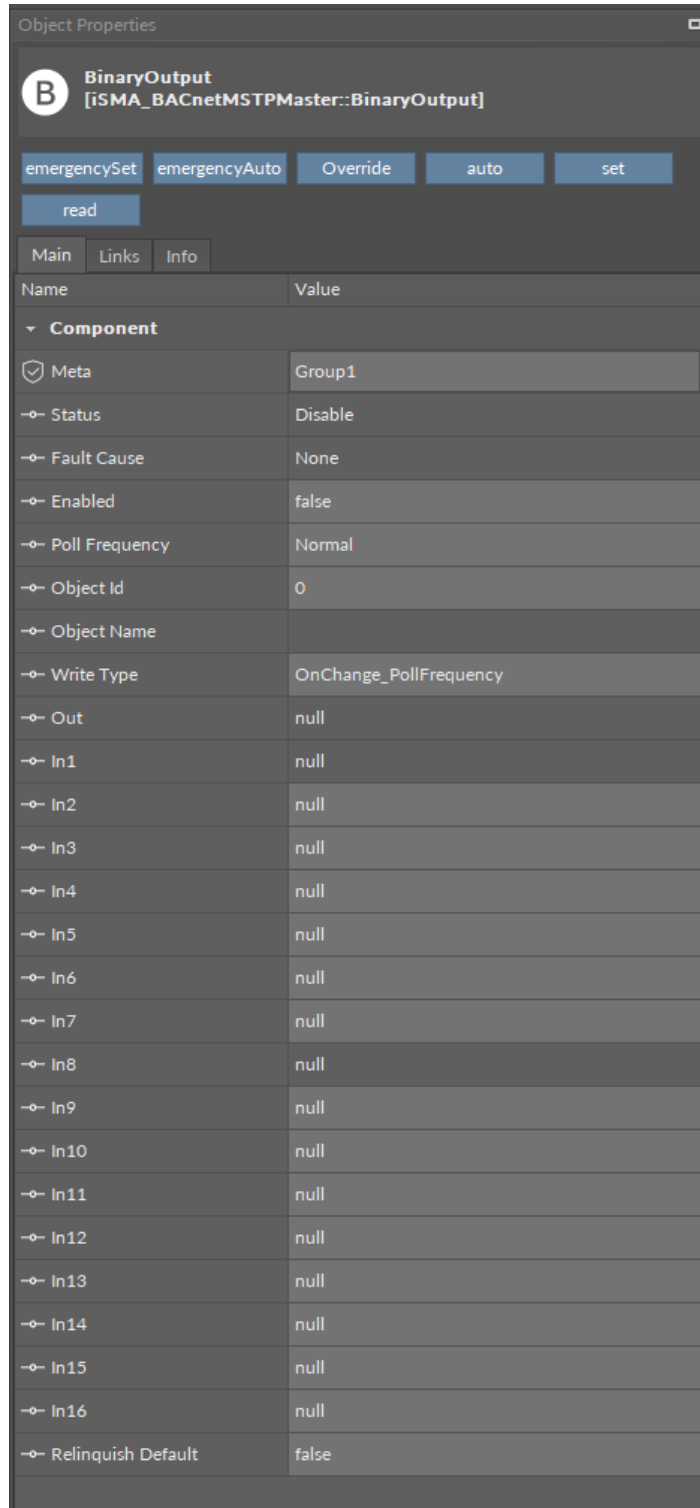

Figure 31. BinaryOutput component

Slots

The BinaryOutput component has the following slots:

· **Status:** component's current status;
· **Fault Cause:** fault cause description;
· **Enabled:** enable/disable servicing object;
· **Poll Frequency:** object read frequency group assign;
· **Object ID:** the BACnet MS/TP object identification number;

- **Object Name:** object name read from the remote device;
- **Write Type:** sending value to the device definition: On Change or On Change and Poll Frequency;
- **Out:** the BinaryOutput component Out;
- **In1:** (read-only) component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet MS/TP device;
- **In8:** (read-only) component input slot with medium priority, can be set by the Override action or by the BACnet MS/TP device;
- **In2-In16:** writable component inputs (In16 can be set by the Set action);
- **Relinquish Default:** object default value, the lowest priority.

Actions

The BinaryOutput component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; In1 slot is read-only, and it can be set by the Emergency Set action);
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; In8 slot is read-only, and it can be set by the Override action);
- **Auto:** sets a null value on In8 slot ("switch off" Override action);
- **Set:** sets value on In16 slot,
- **Read:** forces object Present Value read.

6.3.6 BinaryValue

The BinaryValue component is used to serve the Binary Value BACnet object type from the devices. This component allows to read data with the defined poll frequency (defined in the network component) and to write (send) data with the defined Write Type (On Change or On Change and Poll Frequency). The component has 16 prioritized input slots and one output slot.
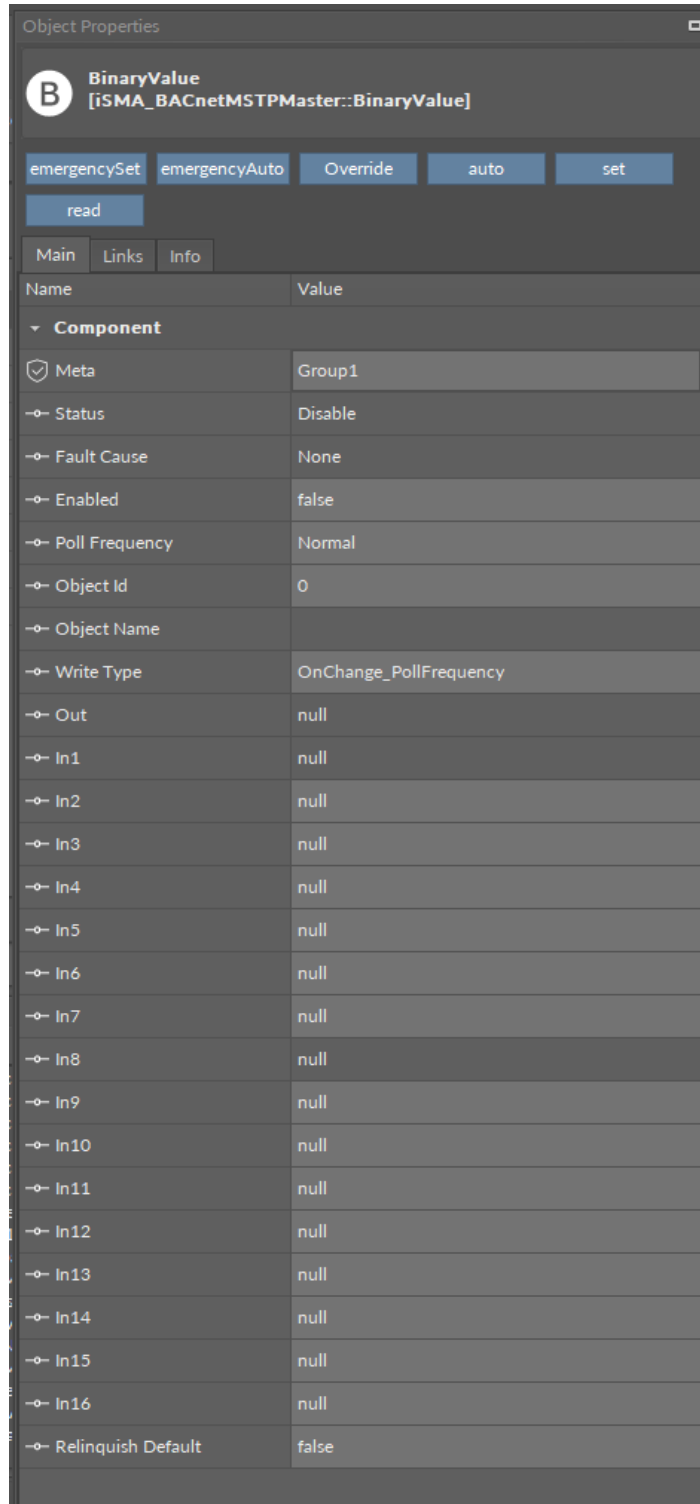
Figure 32. BinaryValue component

Slots

The BinaryValue component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing object;
- **Poll Frequency:** object read frequency group assign;
- **Object ID:** the BACnet MS/TP object identification number;

- **Object Name:** object name read from the remote device;
- **Write Type:** sending value to the device definition: On Change or On Change and Poll Frequency;
- **Out:** the BinaryValue component Out;
- **In1:** (read-only) component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet MS/TP device;
- **In8:** (read-only) component input slot with medium priority, can be set by the Override action or by the BACnet MS/TP device;
- **In2-In16:** writable component inputs (In16 can be set by the Set action);
- **Relinquish Default:** object default value, the lowest priority.

Actions

The BinaryValue component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority; In1 slot is read-only, and it can be set by the Emergency Set action);
- **Emergency Auto:** sets a null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; In8 slot is read-only, and it can be set by the Override action);
- **Auto:** sets a null value on In8 slot ("switch off" the Override action);
- **Set:** sets value on In16 slot;
- **Read:** forces object Present Value read.

6.3.7 MultiStateValue

The iSMA BACnet MultiStateValue is a component to serve the Multistate BACnet MS/TP objects from the remote devices. This component uses only Integer values. This component can also read the text labels assigned to numbers. It also allows to read data with the defined poll frequency (defined in the network component) and to write (send) data with defined the Write Type (On Change or On Change and Poll Frequency). The component has 16 prioritized input slots and one output slot.

Note: In order to avoid receiving the Fault Cause upon adding the point to the network, please follow the below steps:

- Create the outgoing link from the Out slot of the NVMultiStateWritable (iSMA_platAAC20) component to the In16slot of the MultiStateValue (iSMA_BACnet).
- Then, in the MultiStateValue component, change the Link Set value to true.
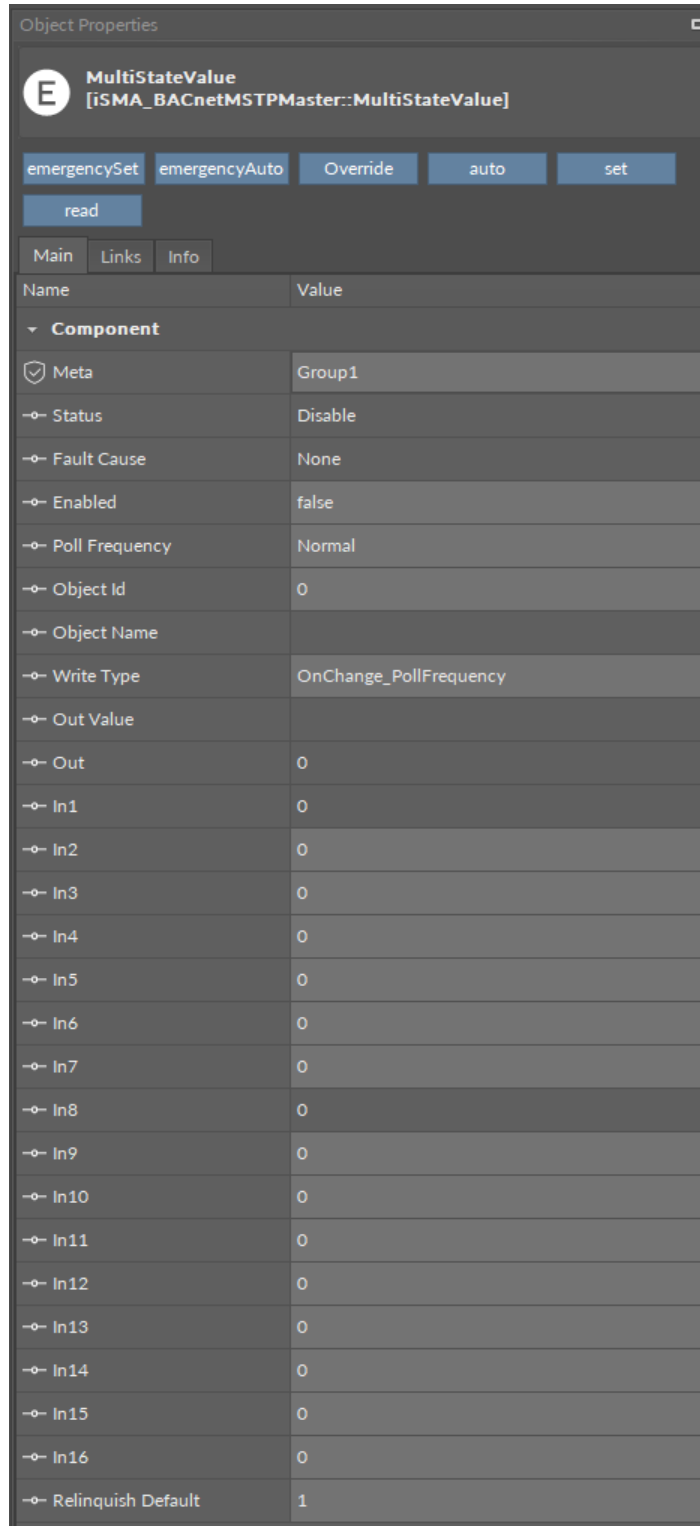- In the NVMultiStateWritable component, enter the value in the Enum Val1-16 slots.

Figure 33. MultiStateValue component

Slots

The MultiStateValue component has the following slots:

- **Status:** component's current status;
- **Fault Cause:** fault cause description;
- **Enabled:** enable/disable servicing object;
- **Poll Frequency:** object read frequency group assign;
- **Object ID:** the BACnet data point object Identification number;

- **BACnet Name:** object name read from the remote device;
- **Write Type:** sending value to the device definition: On Change or On Change and Poll Frequency;
- **Out:** the MultiStateValue component Out;
- **In1:** (read-only) component input slot with the highest priority, can be set by the Emergency Set action or by the BACnet device;
- **In8:** (read-only) component input slot with medium priority, can be set by the Override action or by the BACnet device;
- **In2-In16:** writable components inputs (In16 can be set by the Set action);
- **Relinquish Default:** object default value, the lowest priority.

Actions

The MultiStateValue component has the following actions:

- **Emergency Set:** sets value on In1 slot (the highest priority In1 slot is read-only, and it can be set by the Emergency Set action);
- **Emergency Auto:** sets the null value on In1 slot ("switch off" the Emergency Set action);
- **Override:** sets value on In8 slot (medium priority; slot In8 is read-only, and it can be set by the Override action);
- **Auto:** sets a null value on In8 slot ("switch off" the Override action);
- **Set:** sets value on In16 slot;
- **Read:** forces object Present Value read.

6.4 Connecting AAC20 Controllers with BACnet MS/TP

Two or more AAC20 controllers can be connected together by the BACnet MS/TP protocol on one RS485 bus. To accomplish this, follow the steps below:

- Install the iSMA_BACnet and iSMA_BACnetMSTPMaster kits on all controllers to be connected.

On Device	Name	Latest Local	Installed	Action	St
✓	datetime	1.2.28.105	1.2.28.105	1.2.28.105	
Kit cannot be uninstalled because its components are used in the application					
✓	inet	1.2.28.102	1.2.28.102	1.2.28.102	
✓	iSMA_BACnet	1.2.28.114	1.2.28.111	1.2.28.111	
Kit cannot be uninstalled because its components are used in the application					
✓	iSMA_BACnetMSTPMaster	1.2.28.108	1.2.28.108	1.2.28.108	
Kit cannot be uninstalled because its components are used in the application					
✓	iSMA_control	1.2.28.113	1.2.28.113	1.2.28.113	
Kit cannot be uninstalled because its components are used in the application					
✓	iSMA_controlApi	1.2.28.115	1.2.28.106	1.2.28.106	
Kit cannot be uninstalled because its components are used in the application					
✓	iSMA_NativeLibs	1.2.28.101	1.2.28.101	1.2.28.101	
✓	iSMA_platAAC20	1.2.28.111	1.2.28.109	1.2.28.109	
Kit cannot be uninstalled because its components are used in the application					
✓	sox	1.2.28.103	1.2.28.103	1.2.28.103	
Kit cannot be uninstalled because its components are used in the application					
✓	sys	1.2.28.108	1.2.28.108	1.2.28.108	
Kit cannot be uninstalled because its components are used in the application					

Figure 34. A list of basic kits necessary to connected AAC20 controllers

- Having installed the kits, continue to editing of the application. Add the BACnetNetwork component to Drivers in all controllers to be connected along with the LocalDevice and the RemoteMSTPNetwork components beneath.
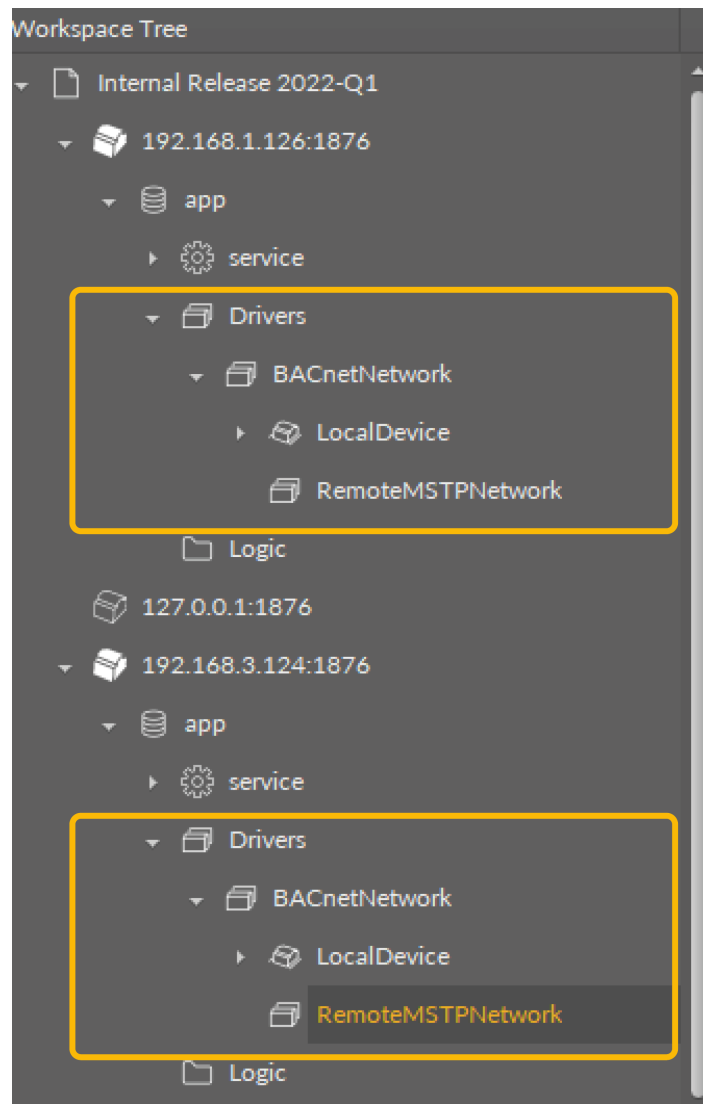
Figure 35. Network configuration components in Drivers

- Add and address local points in all controllers (or at least in one of them).
- Configure the LocalDevice component in all controllers. It is required to use unique values in the following slots:
    - Device Name;
    - Object Identifier;
- Next, configure the following slots in the RemoteMSTPNetwork components with the values below:
    - Enabled: true;
    - Baud Rate: the same for all controllers on the bus;
    - Mac Address: a unique value for each controller connected to the RS485 bus;
- Then, invoke the Discover action of the RemoteMSTPNetwork components on one of the connected controllers. The action initiates searching the RS485 bus for client devices on the BACnet MS/TP network. The results are saved in the Discove folder.
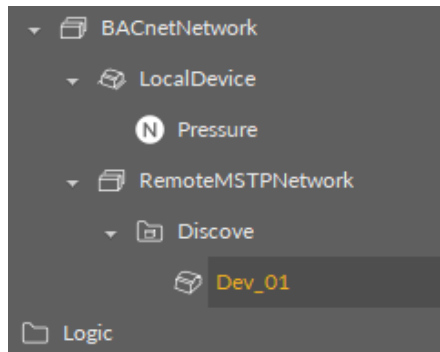
Figure 36. The AAC20 controller discovered on another AAC20

- Select required devices in the Discove folder and drag them directly to the RemoteMSTPNetwork component. Remove the Discove folder.
- Make sure the the BACnet network is enabled on each device. The basic parameters will be read from the device.
- Go to the iSMA_BACnetMSTPMaster kit and add points to the discovered device. Address and enable the points.
- The Object Name will be filled automatically, and if the value changes in one controller, a new value will be visible in the connected controller.
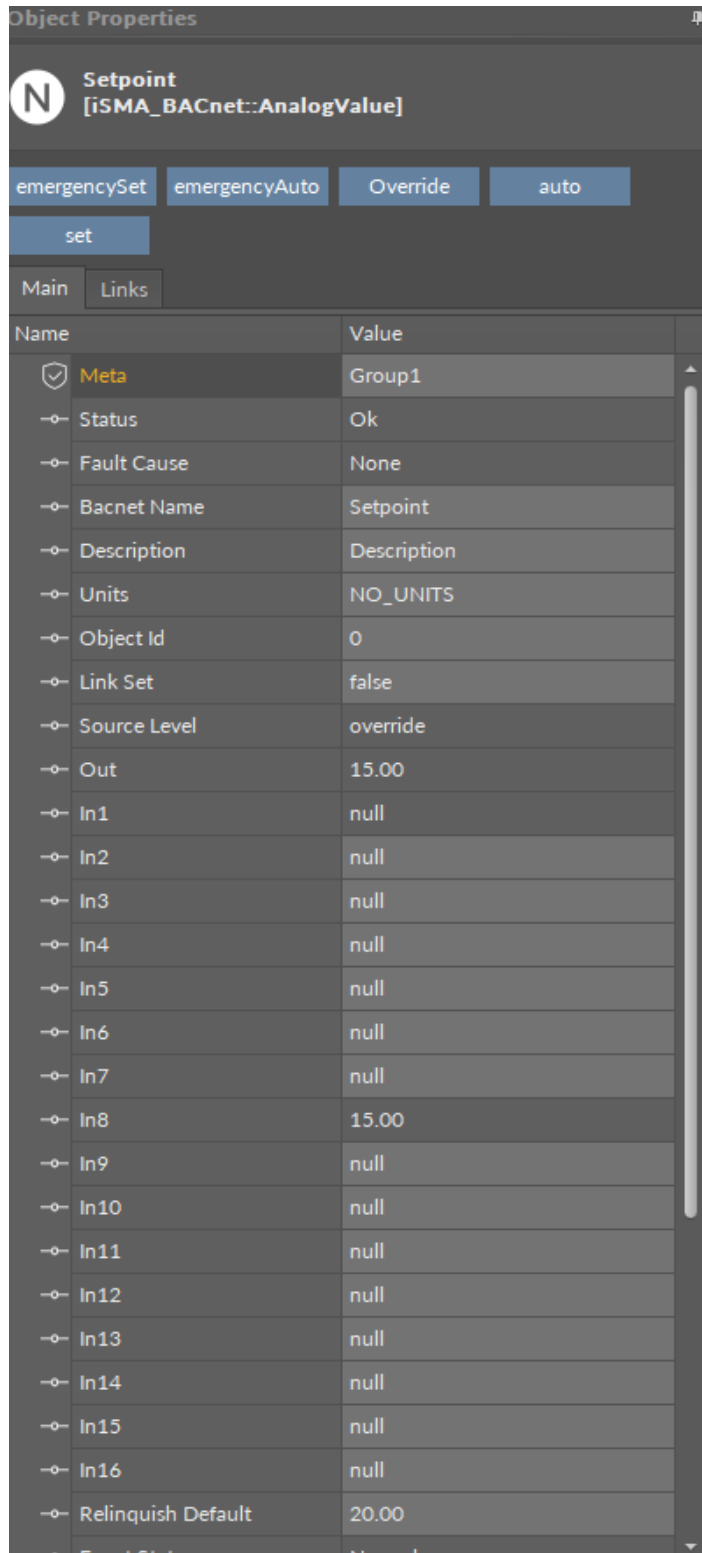
Figure 37. Overriding values in the first controller

Figure 38. Updating values in the second controller