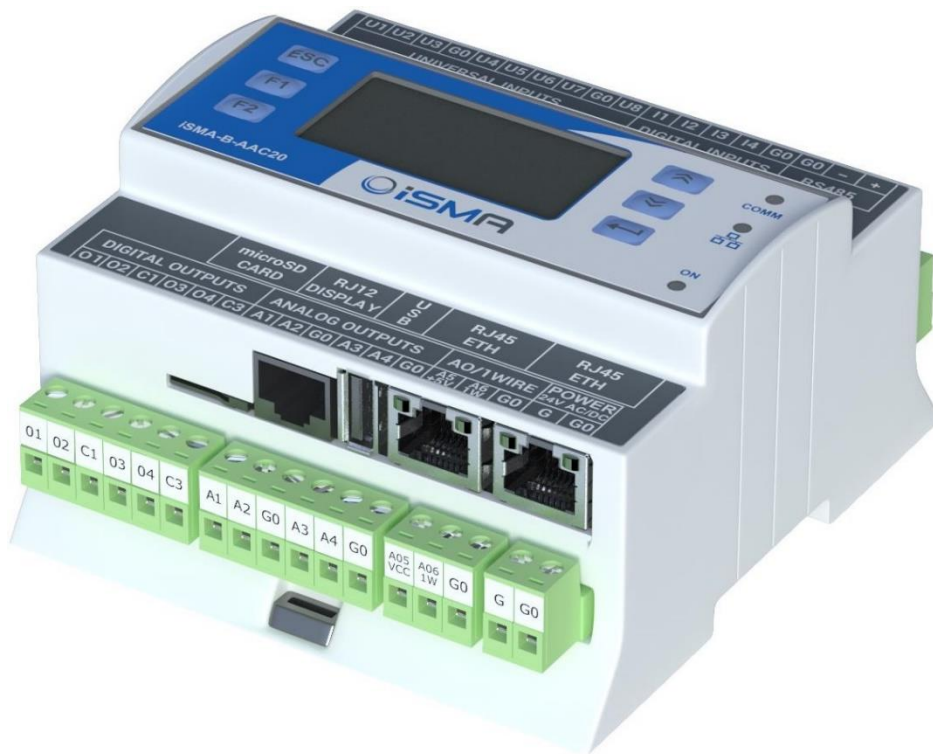


iSMA-B-AAC20

User Manual

BACnet Driver



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FRAMEWORK™

Global Control 5 Sp. z o.o.
Warsaw, Poland
www.gc5.pl

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1. Sedona BACnet

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

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

BACnet MSTP 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 firmware of iSMA-B-AAC20 to the latest version using any BACnet protocol..

1.1.Revision history

Rev	Date	Description
1.1	28.08.2015	First edition
1.1	10.04.2016	<ul style="list-style-type: none"> • Added - BACnet MSTP chapter • Added - BACnet Local Device Alarm Event • Added - BACnet Local Device schedule special event information
1.2	20.04.2017	<ul style="list-style-type: none"> • Added password option • Network configuration options change
1.3	05.02.2018	<ul style="list-style-type: none"> • Added configurable parameters in MSTP Network: <ul style="list-style-type: none"> - MAC address - Max Master - Max Info Frames

1.2.License and limitation

BACnet Local Device and BACnet MSTP Master license are included in the standard AAC20 license. BACnet IP Master is up to 15 BACnet objects (any type) in the standard license and there is no number of devices limitation. BACnet IP Master can be extended by license file up to 500 objects. BACnet object limitation to each protocol type is provided in table below.

Type	Local Device	Remote IP Master	Remote MSTP 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	-	-
Type	Local Device	Remote IP Master	Remote MSTP Master
Trend Log	100	-	-
Notication Class	10	-	-

*Max. object number with BACnet IP Master, for older version an additional license is required.

2. Installations of the iSMA BACnet kits

There are 3 BACnet kits available for 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 BACnet IP devices,
- iSMA BACnet MSTP Master – read/write data from BACnet MSTP devices.

To install BACnet kits, import the kits to the WorkPlace software (possibly as part of the package of the various kits in a zip file). To do this, use an application from the Tools menu -> Sedona Installer.

After successful import of the files, upload them to your device using e Kit Manager Application from Sedona Tools package.

WARNING! Before programming BACnet Network, please check if you use the latest kit version. The latest kits are available at GC5 support web site: www.support.gc5.pl

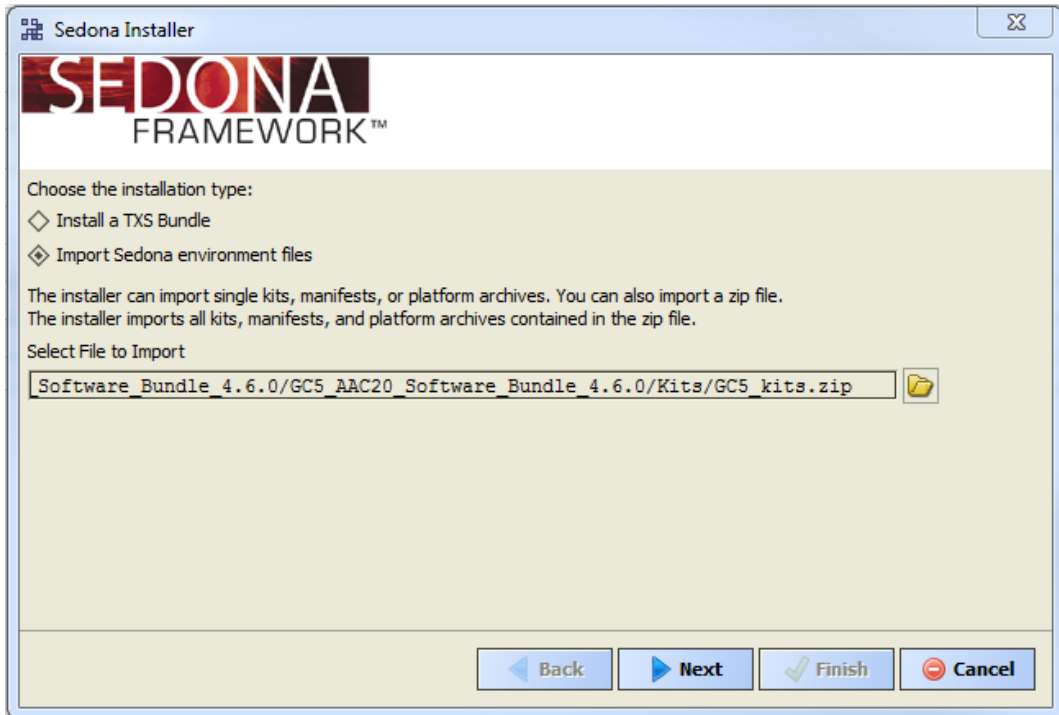


Figure 1 - Sedona Installer

3. BACnet Network and Local Device

BACnet Network is the main component that provides BACnet protocol in iSMA-B-AAC20 controller and it should be placed under the Drivers folder. All other BACnet network components like Local Device, Remote IP Master, Remote MSTP Master **MUST BE placed under this component**.

The component has the following slots:

- Status – component current status,
- Fault Cause – fault cause description,
- Bacnet Udp Port – Udp Port number in IP network (default 47808),
- Number Of Apdu Retries – Read/write objects retries number.

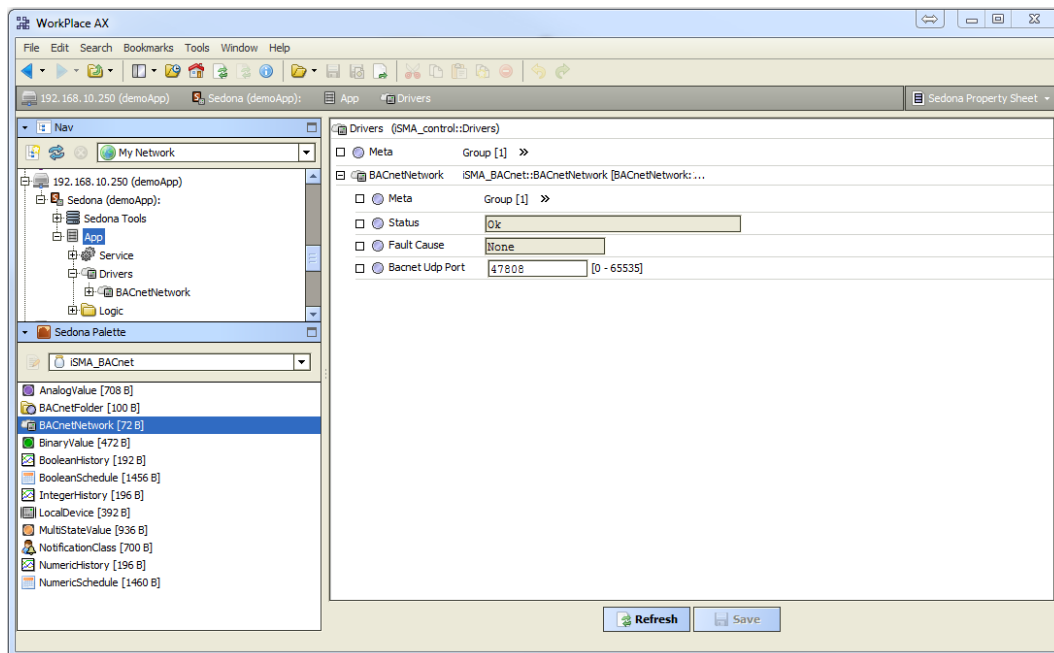


Figure 2 - BACnet Network component Property Sheet view

BACnet Local Device is the part of iSMA_BACnet kit. This component allows to make iSMA-B-AAC20 controller a BACnet IP device. This component must be placed under BACnet network component from the same kit. All BACnet Local Device objects components must be placed under this component.

This component contains BACnet configuration like controller BACnet ID number and BACnet device description (Device Name, Location and additional description). These values can be read by another devices in BACnet network.

This component is also responsible for reviewing time messages and updating local device system clock (more information in BACnet time synchronization chapter).

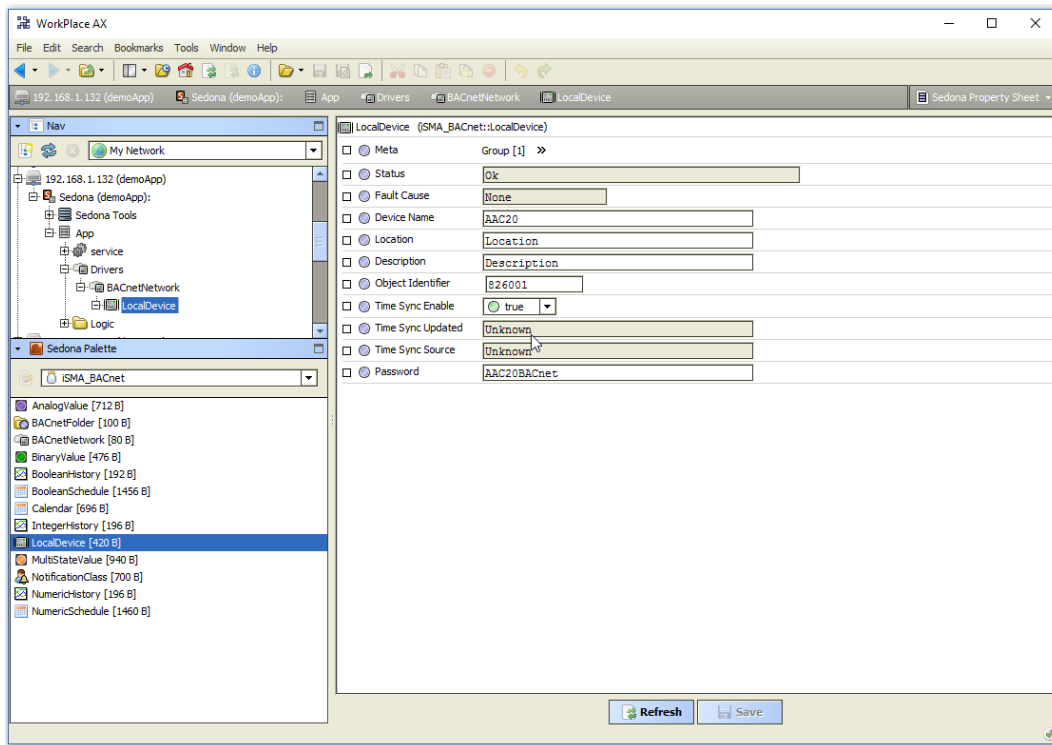


Figure 3 - BACnet Local Device Property Sheet view

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Device Name – BACnet device name,
- Location – BACnet description about device localization,
- Description – Additional BACnet description about device,
- Object Identifier – Device BACnet address, unique in BACnet network,
- Time Sync Enable – Enable/Disable time synchronization from BACnet master device,
- Time Sync Updated – Last time sync message receive,
- Time Sync Source – Time sync source address,
- Password – Device BACnet password protection for services DeviceCommunicationControl and ReinitializeDevice. In default “AAC20BACnet”.

3.1. BACnet Local Device data points components

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

- Analog Value – to read/write the Numeric values,
- BinaryValue – to read/write the Boolean values,

- MultiState – to read/write the Integer and MultiState values.

3.1.1. Local Device Analog Value

Analog Value component is used to share Numeric value of iSMA-B-AAC20 controller as Analog Value BACnet object. This component allows to read from controller (out slot) or write data (input slots from 1 to 16) to controller within BACnet network. The component has a 16 prioritized inputs slots and one output slot. The output slot gets value from the input with the highest priority different from null value. For example, if only In16, In13 and In9 have value different from null, output slot will retrieve value from In9 because it has the highest priority of all inputs with the value.

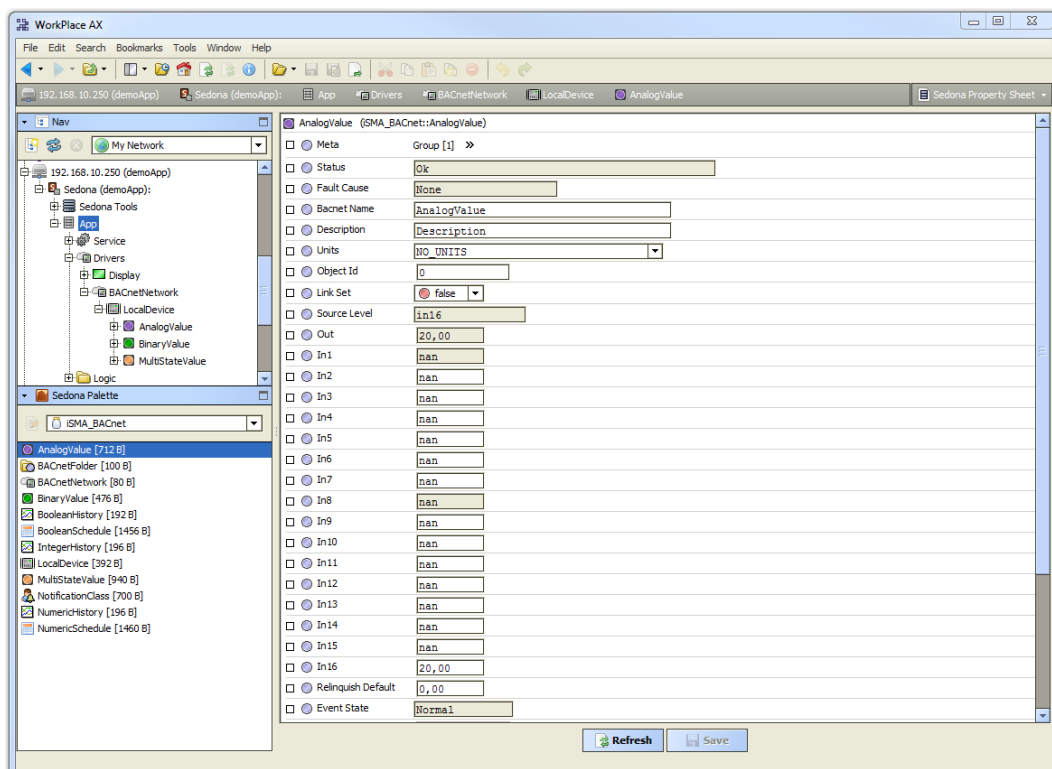


Figure 4 - Local Device Analog Value Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by Emergency Set action or by BACnet protocol),
- Emergency Auto – This action set null value on In1 slot ("switch off" Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action or by BACnet protocol),

- Auto – This action set null value on In8 slot (switch off" Override action),
- Set – This action set value on In 16 slot.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- BACnet Name - Object name read by the remote device,
- Description – Additional BACnet description about data point,
- Units – BACnet data point facets,
- Object ID – BACnet data point object identification number,
- Link Set – Enable\Disable Link Back Forward mechanism (see BACnet object integration chapter),
- Source Level – Current read input name,
- Out – Analog Value component Out,
- In1 – (read only) The component input slot with the highest priority, can be set by Emergency Set action or by BACnet protocol,
- In8 – (read only) The component input slot with medium priority, can be set by Override action or by BACnet protocol,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

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

- Event State – 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 – Define which alarm event states are active, available options:
 - None
 - Low Limit
 - High Limit
 - Low and High Limit
- Event Enable – Define 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 point comes back to normal stage.

3.1.2. Local Device Binary Value

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

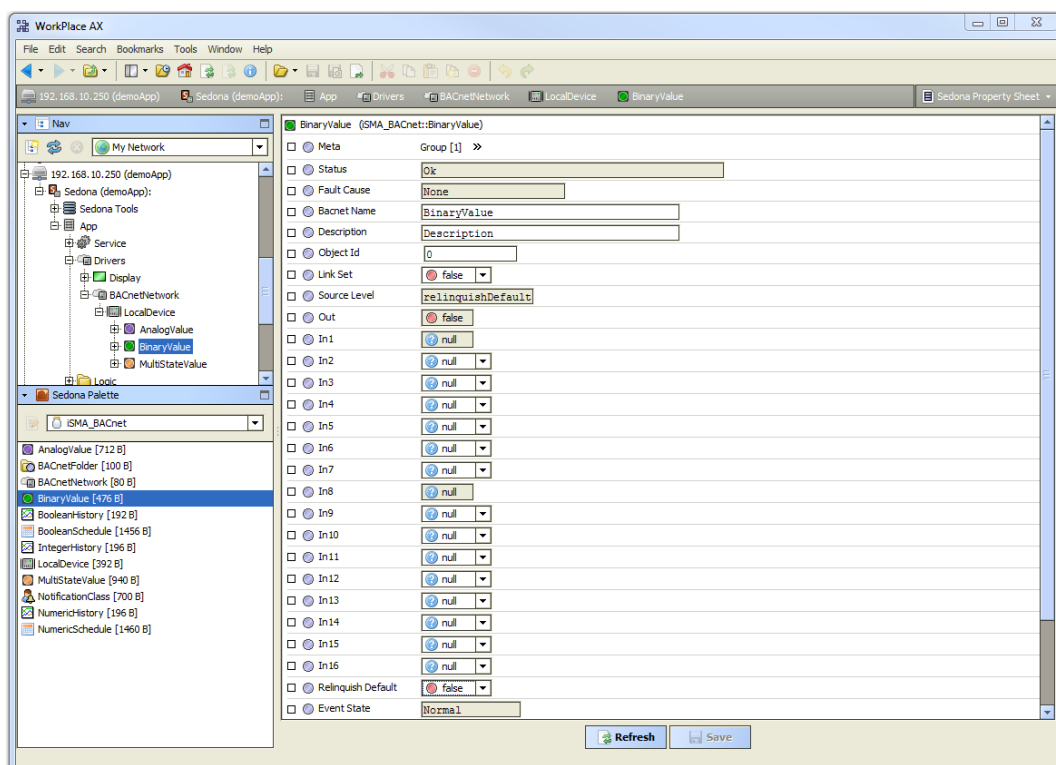


Figure 5 - Local Device Binary Value Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by Emergency Set action or by BACnet protocol),
- Emergency Auto – This action set null value on In1 slot (“switch off” Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action or by BACnet protocol),
- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- BACnet Name - Object name read by remote device,
- Description – Additional BACnet description about data point,
- Units – BACnet data point facets,
- Object ID – BACnet data point object identification number,
- Link Set – Enable\Disable Link Back Forward mechanism (see BACnet object integration chapter),
- Source Level – Current read input name,
- Out – Binary Value component Out slot,
- In1 – (read only) Component input slot with the highest priority, can be set by Emergency Set action or by BACnet protocol,
- In8 – (read only) Component input slot with medium priority, can be set by Override action or by BACnet protocol,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

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

- Event State – Point object current alarm event state (read only),
- Notification Class – Notification Class BACnet ID Number (max. 10 class objects),
- Alarm Value – Define point value in Off Normal stage,
- Event Enable – Define 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 point comes back to normal stage.

3.1.3. Local Device Multistate Value

Multistate Value 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 values can be imported to BACnet MultiState Value component from iSMA_platAAC20 NVMultiStateWritable component.

This component can send data to BACnet device (when you use component inputs in application and master device read only out slot) or receive data from BACnet IP Master device (when application uses only Out slot).

WARNING! Multistate Value objects use only integer values and they start from 1. Assigning labels to values, user cannot leave empty labels. For example, if user leaves an empty label in Enum Val7 slot, BACnet MultistateValue object will read only 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 during adding to the system database process, and after that any label change will be disregarded. To update labels it is required to recall action Discover and use Match option between points in Discovered and Niagara database.

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

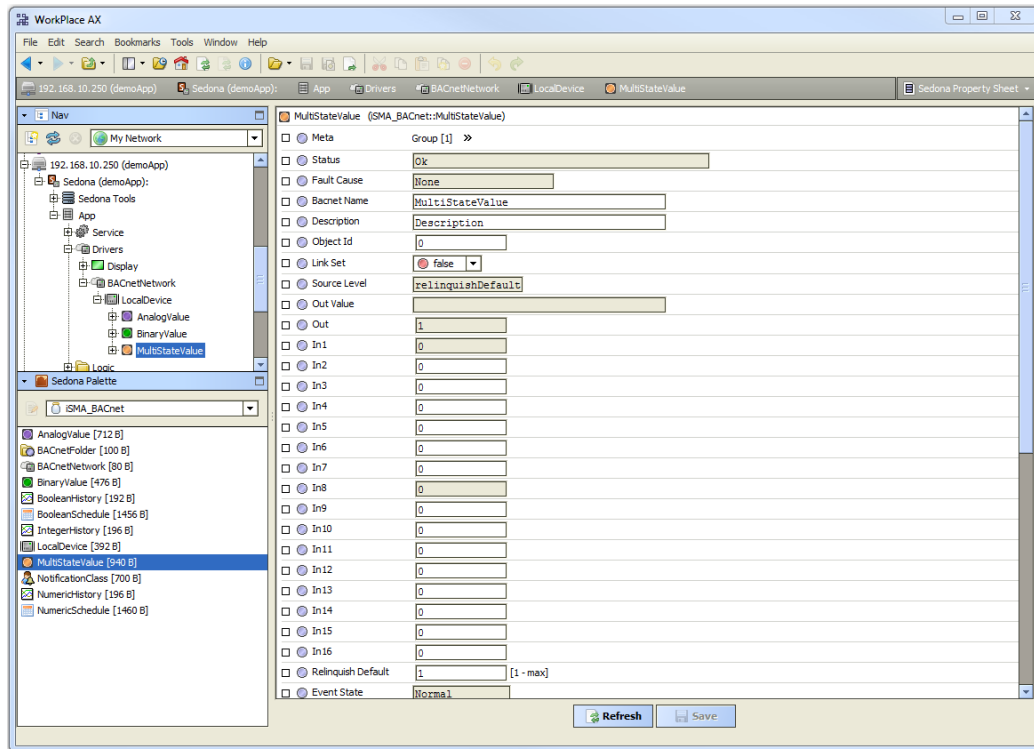


Figure 6 - Local Device Multistate Value Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by Emergency Set action or by BACnet protocol),
- Emergency Auto – This action set null value on In1 slot (“switch off” Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action or by BACnet protocol),
- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- BACnet Name - Object name read by the remote device,
- Description – Additional BACnet description about data point,
- Units – BACnet data point facets,
- Object ID – BACnet data point object identification number,
- Link Set – Enable\Disable Link Back Forward mechanism (see BACnet object integration chapter),
- Source Level – Current read input name,

- Out – Multistate Value component Out,
- In1 – (read only) The component input slot with the highest priority, can be set by Emergency Set action or by BACnet protocol,
- In8 – (read only) The component input slot with medium priority, can be set by Override action or by BACnet protocol,
- In2 – In16 – Writable components inputs (In 16 can be set by 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 – 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 define up to 16 Off Normal point stage,
- Event Enable – Define 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 point comes back to normal stage.

3.1.4. BACnet object integration (link back forward)

In some cases, there is a need to synchronize BACnet data from different sources like LCD display or the Modbus Network. To do so in iSMA-B-AAC20 controller, please use a special mechanism called link back forward. This mechanism requires to use NV component without connected In slot and in auto mode. The NV component Out slot must be connected to the one of inputs slot in BACnet object and BACnet point component must have slot “Link Set” in true state. Now, when the input slot of BACnet data point which is connected to the NV component will be changed from BACnet protocol level, “Link back forward ” action will be executed and the value of NV component will be set to the same value as input slot of BACnet data point which is connected to NV component.

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

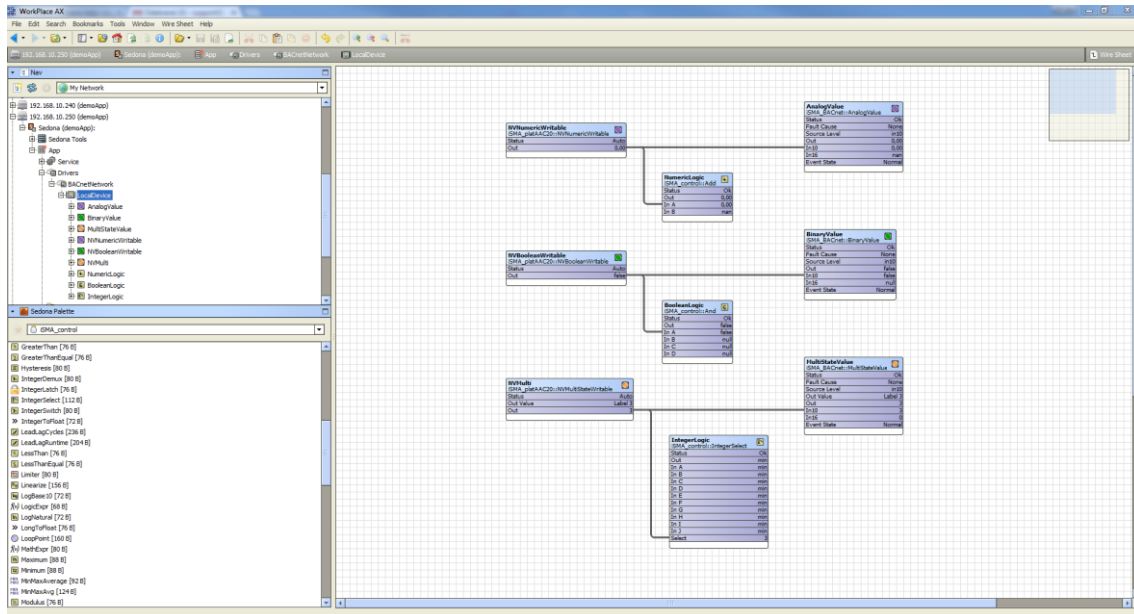


Figure 7 - BACnet data synchronisation

3.2. BACnet alarm events

BACnet points under LocalDevice can have defined alarm's states. These alarms from BACnet data points can be collected and send by Notification Class object to another BACnet IP device. Sending the alarm's events between the devices requires the configuration in both devices: both in the transmitter (iSMA-B-AAC20) and in the receiver (we will use Niagara as receiver to show configuration process).

3.2.1. Notification Class

Notification Class component is BACnet object which serves sending alarms to another BACnet device. As well as all BACnet objects, this object has Object ID number which must be unique in iSMA-B-AAC20 controller. This object defines alarm priority and sends alarm's acknowledge. BACnet network in iSMA-B-AAC20 controller can have up to 10 Notification class objects.

To send alarm's events, in all data points user must enter Notification Class Object ID.

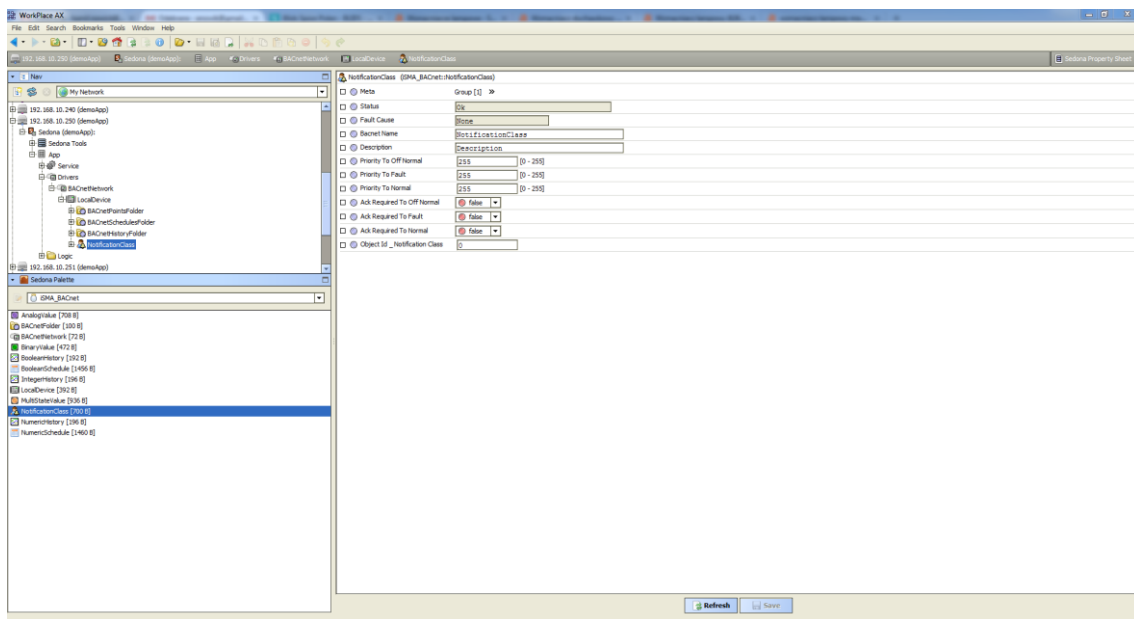


Figure 8 - Notification Class component Property Sheet view

3.2.2. Alarm Events in BACnet points

All alarm's statuses and ranges are defined in BACnet data point. For more information go to BACnet Local Device data points chapter.

3.2.3. Receive Alarm Events in Niagara

It is possible to receive alarm events after adding all data points to Niagara database system. Notification Class in iSMA-B-AAC20 controller is the main component responsible for sending the alarms to another 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 to BACnet database Notification Class configuration object. In this object make entry which contains BACnet Device ID number (receiver number, in this case Niagara BACnet ID). From now on Niagara as BACnet device is able to receive alarm's event.

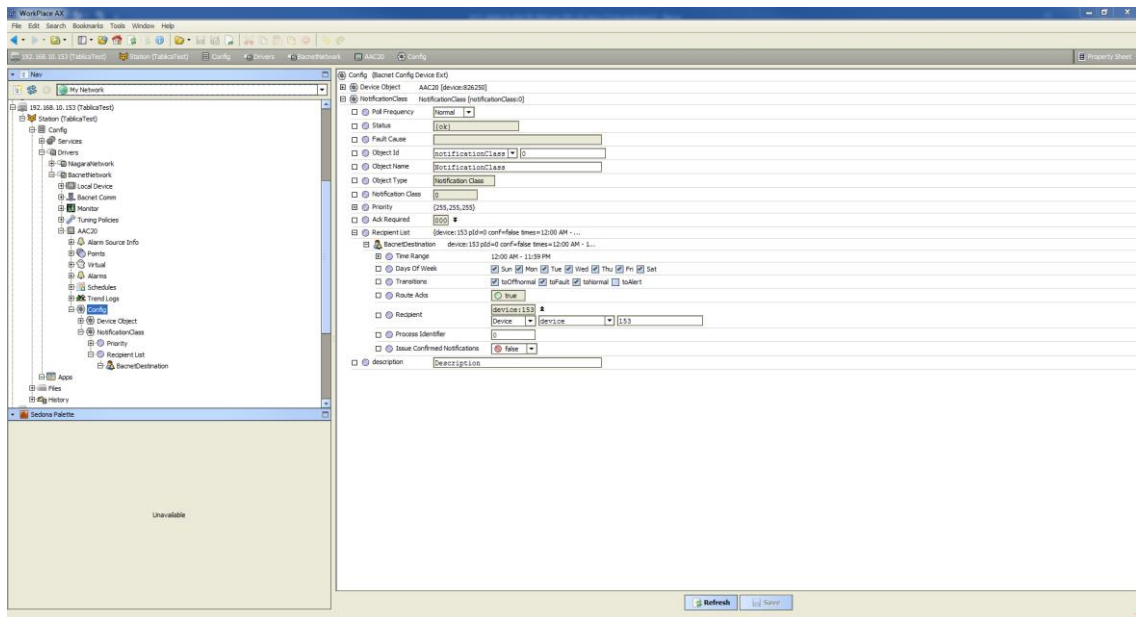


Figure 9 - BACnet Notification Class config object Property Sheet view

3.3. BACnet History objects

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

- Boolean History- share binary trends in BACnet network,
- Integer History- share integer trends in BACnet network,
- Numeric History- share numeric (float) trends in BACnet network.

To share trend’s log objects in BACnet network, first history trend log must be created in the application (for information see the AAC20plat manual).

Next corresponding type of trend log BACnet object component must be placed under BACnet Local Device network.

WARNING! The same object’s type should have unique “BACnet Name” and “Object ID” values in BACnet device.

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

3.4. BACnet Schedule objects

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

- Boolean Schedule - share Boolean schedule in BACnet network,
- Numeric schedule - share numeric (float) schedule in BACnet network.

To share schedule objects in BACnet network, first schedule must be created in the application (for information see AAC20plat manual).

Next corresponding type of BACnet schedule object component must be placed under BACnet Local Device network.

WARNING! In BACnet device, the same object's type should have unique "BACnet Name" and "Object ID" values.

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

3.4.1. Schedule special events

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

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

3.5. BACnet time synchronization

BACnet Time synchronization is a built-in function which allows to receive time message from master device and synchronize the controller RTC (Real Time Clock) with 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.

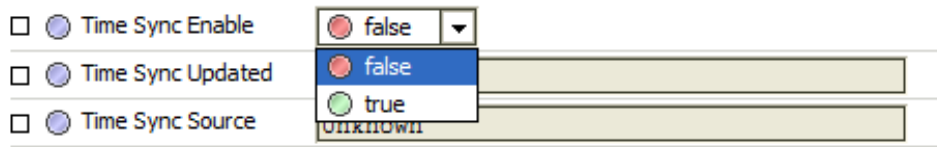


Figure 10 - BACnet Time Synchronization

3.5.1. Sending time messages from Niagara BACnet network

Niagara BACnet Network has a built-in function to send current time messages over BACnet network. List of receivers is defined in BACnet Local Device component. There are two lists for BACnet receivers:

- Time Synchronization Recipients – Recipients that will receive time including time zone shifting
- UTC Time Synchronization Recipients – Recipients that will receive UCT time (recommended)

Time Synchronization Interval is the next parameter which defines frequency of recipients time update.

To add iSMA-B-AAC20 controller to recipients list, please use right mouse button on Time Synchronization Recipients or UTC Time Synchronization Recipients slot and choose action addElement. Enter AAC20 BACnet device ID number in the popup window.

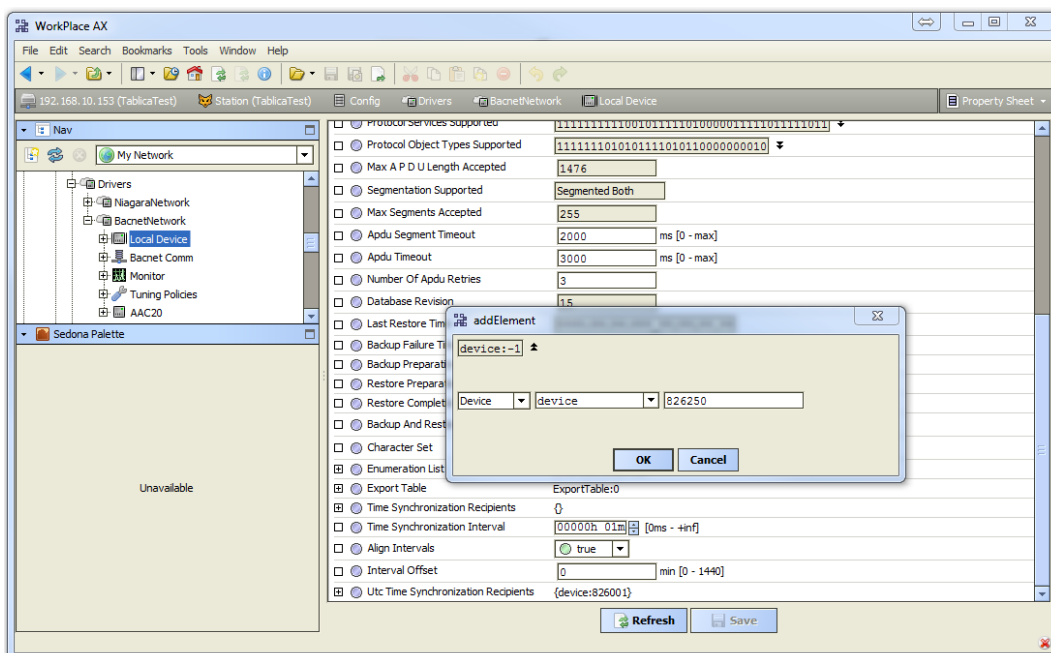


Figure 11 - Niagara time recipient adding window

3.6. BACnet Folder

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

Note: BACnet Folder is not visible over BACnet network.

4. BACnet Remote IP Network

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

Note: Before setting up BACnet Remote IP Network, please add Local Device component and enter Object Identifier number. To work properly iSMA-B-AAC20 controller should be also configured as BACnet device.

iSMA BACnet IP master in standard license is limited to 15 BACnet objects and it can be extended up to 500 objects.

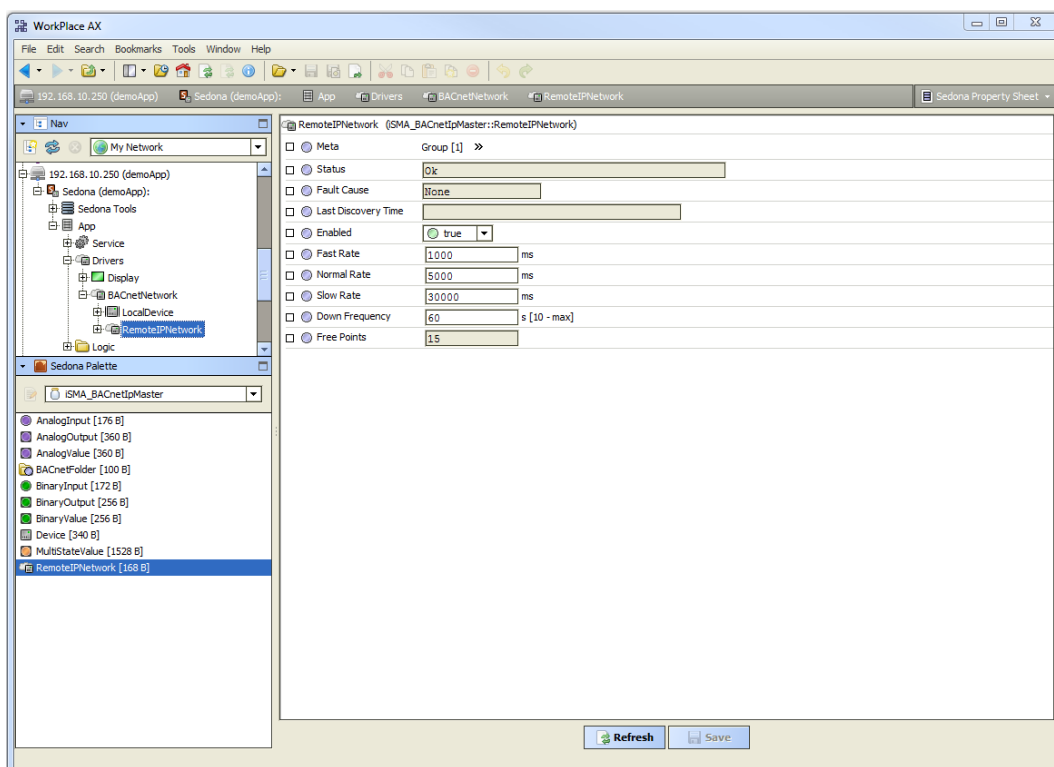


Figure 12 - BACnet Remote IP Network Property Sheet view

The component has the following slots:

- Status – Current status,
- Fault Cause – Fault cause description,
- Last Discovery Time – Last success discovery action time,
- Enabled – Enable/Disable 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 BACnet object in the BACnet Remote IP network.

4.1.BACnet IP Master Device

BACnet IP Master Device component is a component which is responsible for servicing physical device connected to iSMA-B-AAC20 controller by BACnet protocol. Each device is represented by a unique BACnet Device ID. The component has ping action available under the right mouse button, which sends test message to device to check device status (meaning “Monitor” ping requests). The ping requests are also generated at the network-level and 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 you want to read from, or write to device must be placed under the Device component.

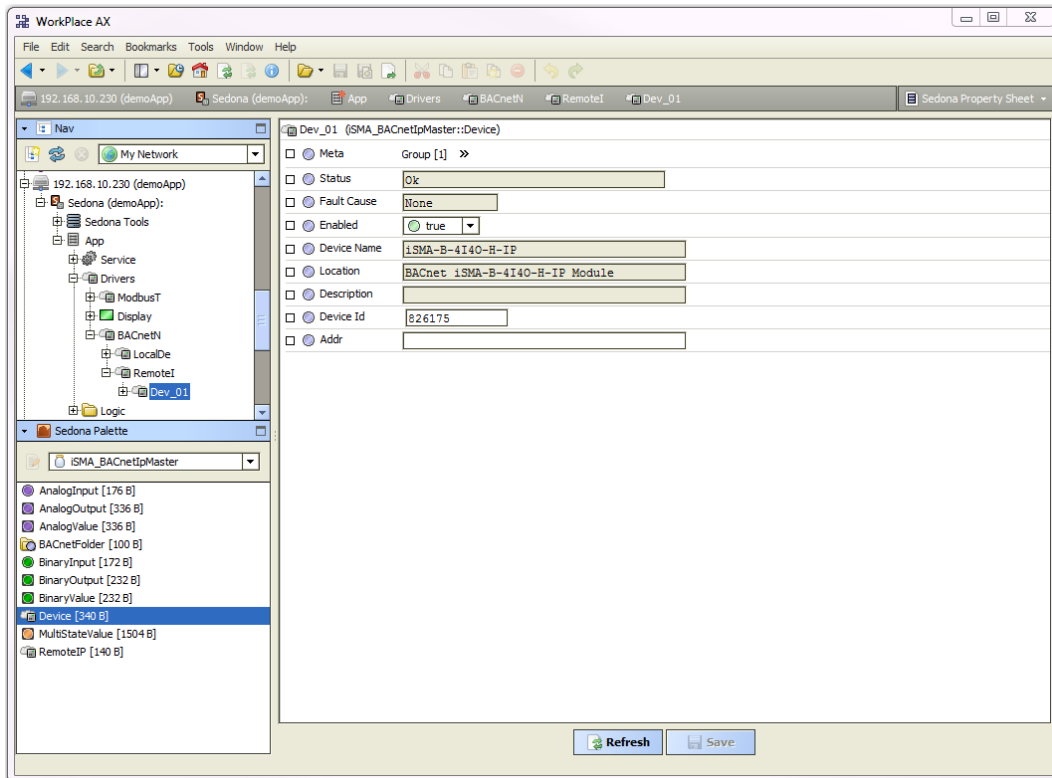


Figure 13 - BACnet IP Master Device Property Sheet view

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing device,
- Device Name - Read only, BACnet device name (read from device),
- Location - Read only, BACnet device location description (read from device),
- Description – Read only, additional description label (read from device),
- Device ID –BACnet device address (In Discover action this field is filled automatically),
- Add – Additional field for BACnet device IP address. The IP address should be enter for the devices installed out of local network range, behind router (for the devices installed in the local network, can be empty).

4.1.1. Device discover

BACnet IP Master supports device discovering. This action is available under right click on the Remote IP network component. The Discovering process is shown in Status slot. At the end of this process a Discover folder will be created and all found will be placed there.

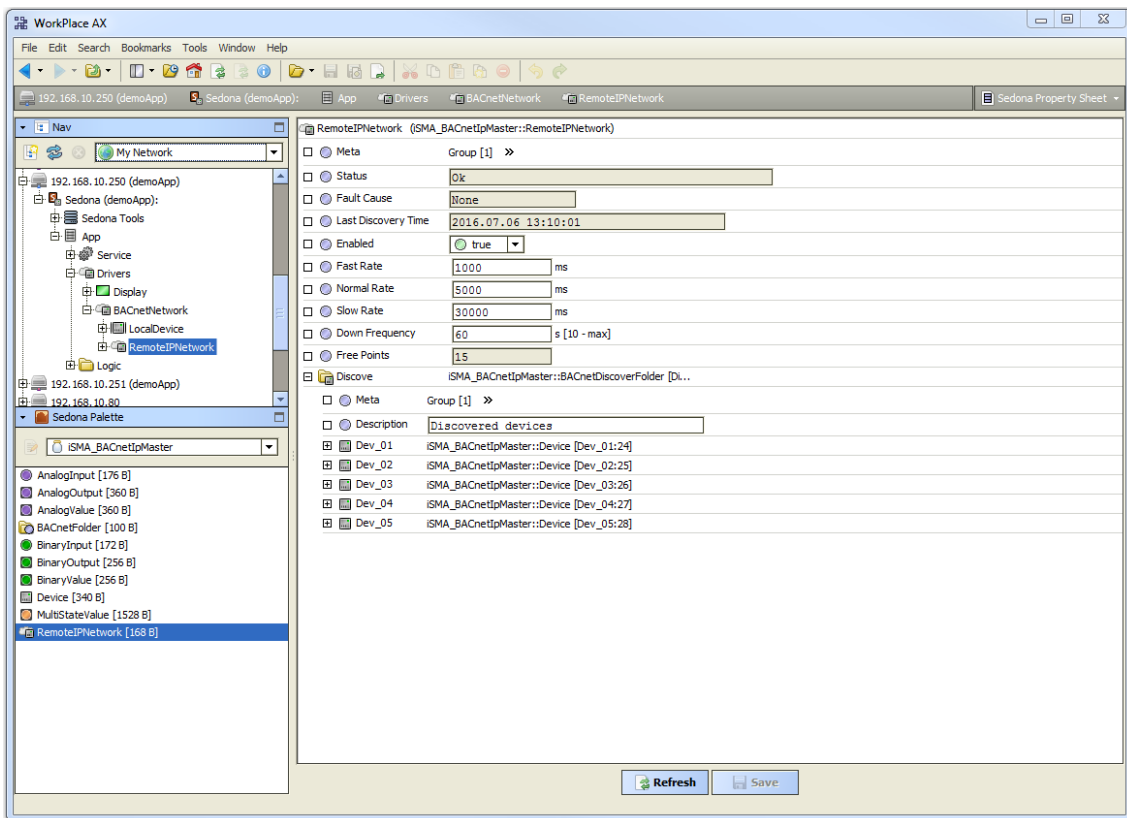


Figure 14 - Device Discover Property Sheet view

4.1.2. Adding BACnet IP Device manually

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

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

4.2. BACnet IP Master data objects

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

- Analog Input - to read the Numeric values,
- Analog Output – to read/write the Numeric values,

- Analog Value – to read/write the Numeric values,
- Binary Input – to read/write the Boolean values,
- Binary Output – to read/write the Boolean values,
- Binary Value – to read/write the Boolean values,
- MultiState Value– to read/write Integer and MultiState values with labels.

4.2.1. BACnet IP Analog Input

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

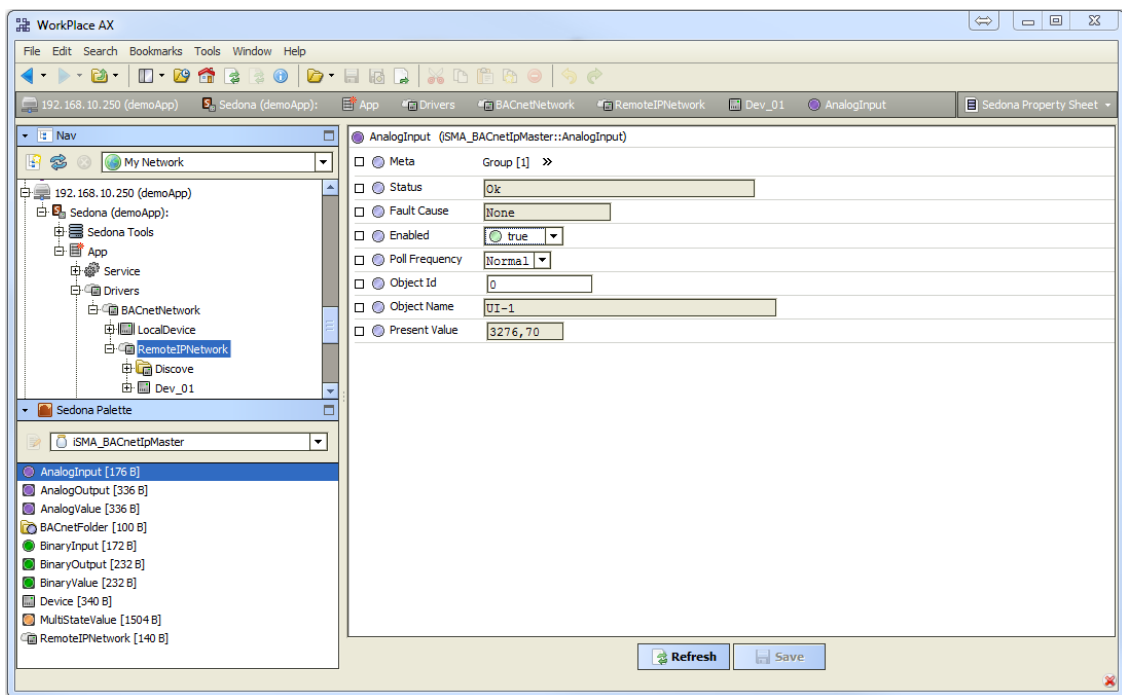


Figure 15 - BACnet IP Analog Input Property Sheet view

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

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,
- Object ID – BACnet data point object identification number,

- Object Name - Object name read from the remote device (read only),
- Present Value – BACnet data point object Present Value property (Output).

4.2.2. BACnet IP Analog Output

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

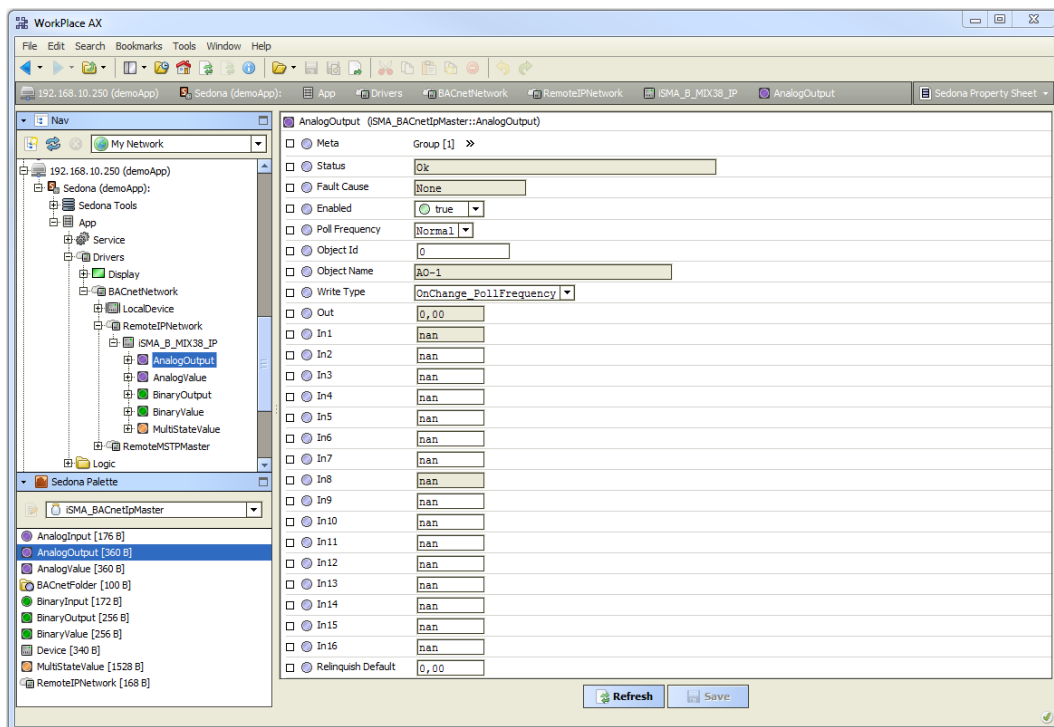


Figure 16 - BACnet IP Analog Output Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by Emergency Set),
- Emergency Auto – This action set null value on In1 slot (“switch off” Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action),
- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot,
- Read – This action forces object Present Value read.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,
- Object ID –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 –BACnet Analog Output object Out,
- In1 – (read only) The component input slot with the highest priority, can be set by Emergency Set action or by BACnet device,
- In8 – (read only) The component input slot with medium priority, can be set by Override action or by BACnet device,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

4.2.3. BACnet IP Analog Value

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

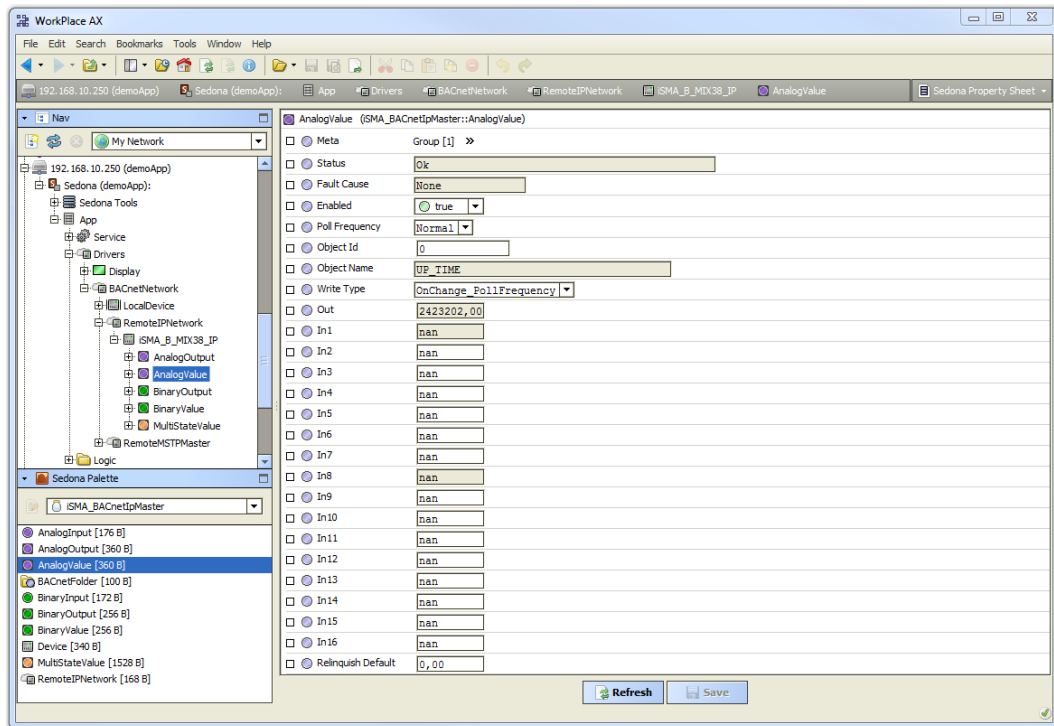


Figure 17 - BACnet IP Analog Value Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by Emergency Set action),
- Emergency Auto – This action set null value on In1 slot (“switch off” Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action),
- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot,
- Read – This action forces object Present Value read.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,
- Object ID – 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 Analog Value component Out,
- In1 – (read only) The component input slot with the highest priority, can be set by Emergency Set action or by BACnet device,
- In8 – (read only) The component input slot with medium priority, can be set by Override action or by BACnet device,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

4.2.4. BACnet IP Binary Input

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

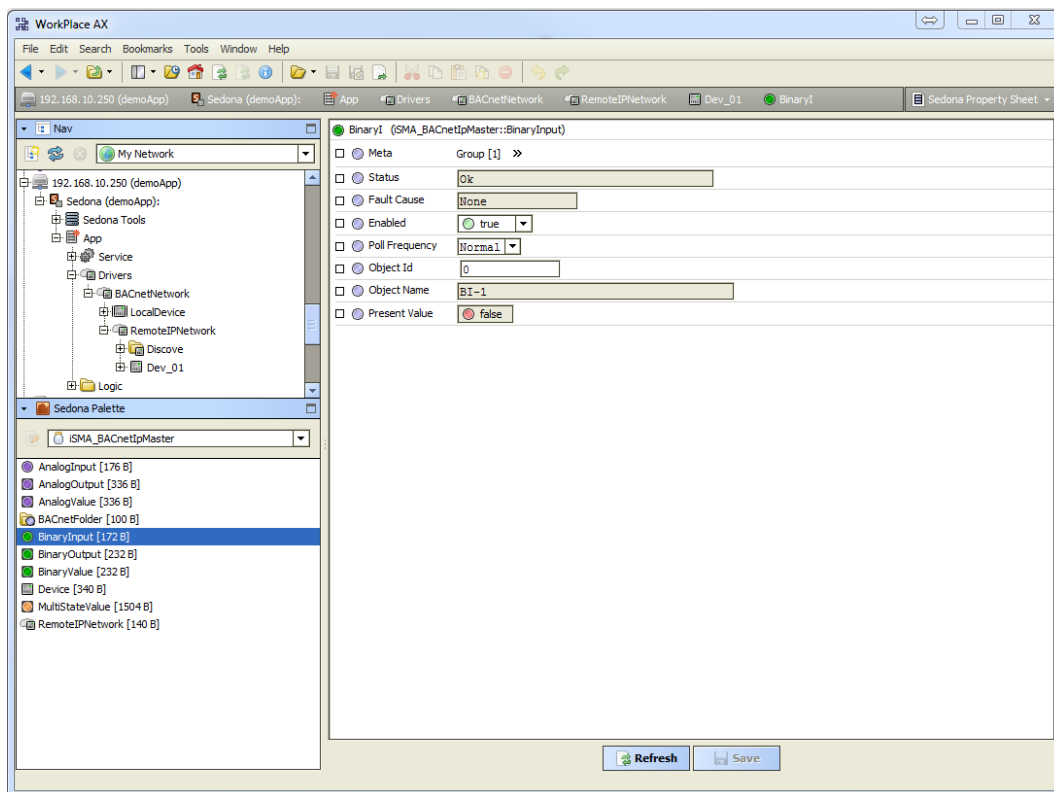


Figure 18 - BACnet IP Binary Input Property Sheet view

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

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,

- Object ID –BACnet object identification number,
- Object Name - Object name read from the remote IP device,
- Present Value –BACnet data point object Present Value property (Output).

4.2.5. BACnet IP Binary Output

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

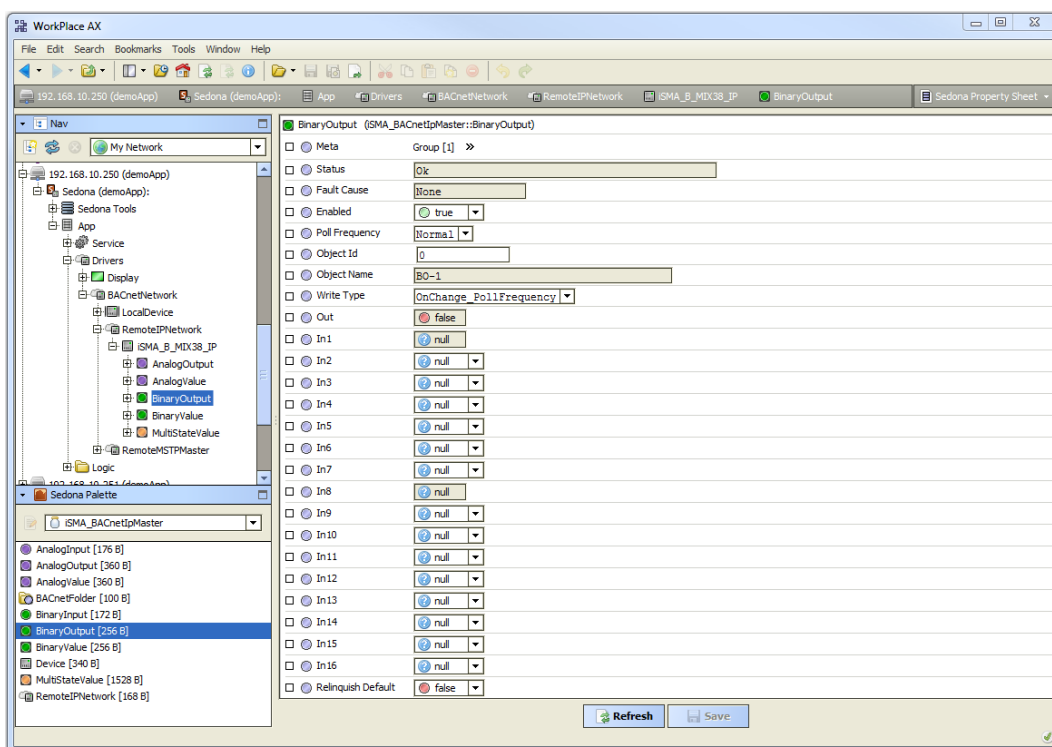


Figure 19 - BACnet IP Binary Output Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by the Emergency Set action),
- Emergency Auto – This action set null value on In1 slot (“switch off” Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action),
- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot,

- Read – This action forces object Present Value read.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,
- Object ID –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 Binary Output component Out,
- In1 – (read only) The component input slot with the highest priority, can be set by Emergency Set action or by BACnet device,
- In8 – (read only) The component input slot with medium priority, can be set by Override action or by BACnet device,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

4.2.6. BACnet IP Binary Value

Binary Value 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 network component) and write (sent) data with defined Write Type (On change or On Change and Poll Frequency). The component has 16 prioritized inputs slots and one output slot.

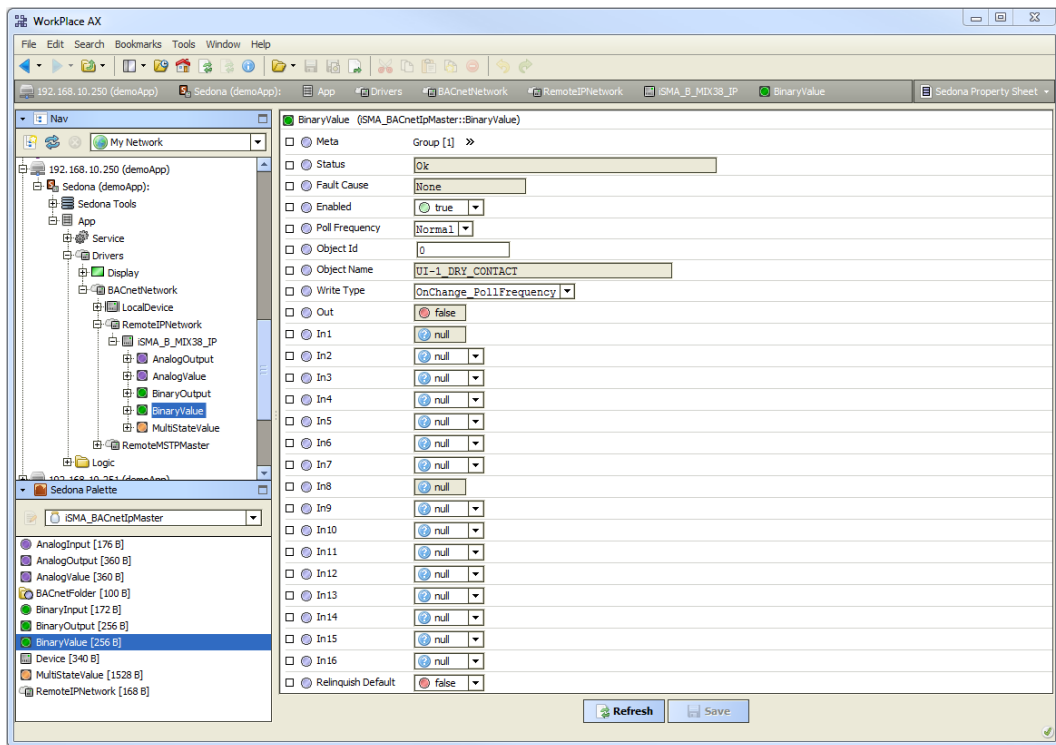


Figure 20 - BACnet IP Binary Value Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by Emergency Set action),
- Emergency Auto – This action set null value on In1 slot (“switch off” Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action or by BACnet device),
- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot,
- Read – This action forces object Present Value read.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,
- Object ID –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 – Binary Value component Out slot,
- In1 – (read only) The component input slot with the highest priority, can be set by Emergency Set action or by BACnet device,
- In8 – (read only) The component input slot with medium priority, can be set by Override action or by BACnet device,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

4.2.7. BACnet IP Multistate Value

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

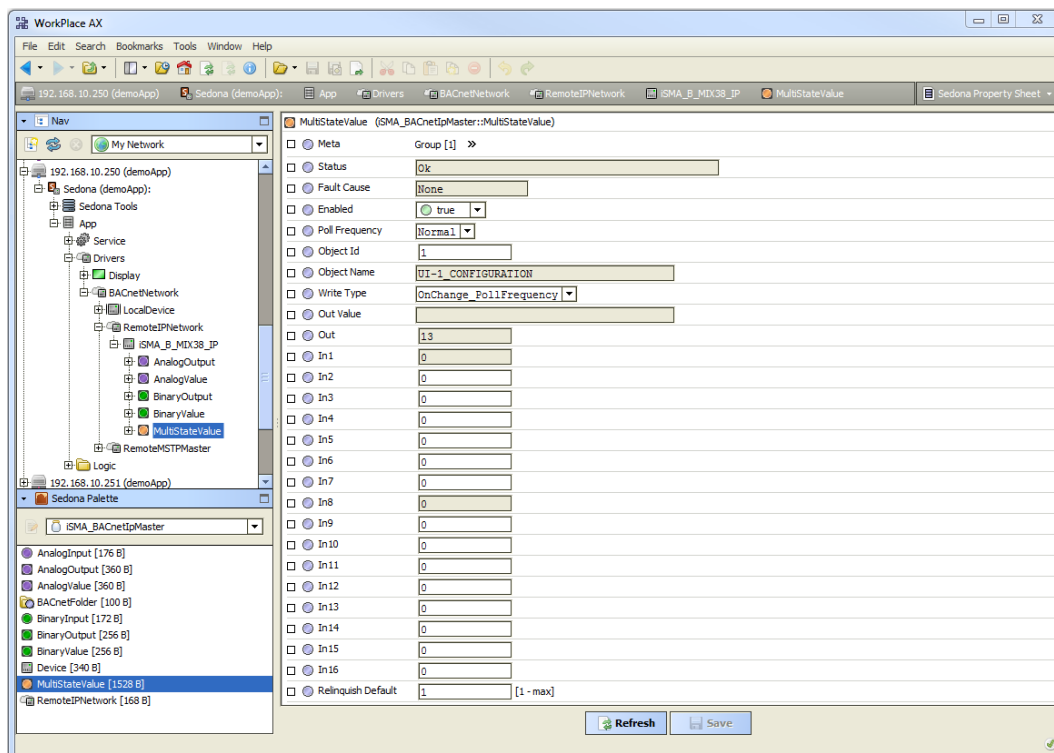


Figure 21 - BACnet IP Multistate Value Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by Emergency Set action),
- Emergency Auto – This action set null value on In1 slot ("switch off" Emergency Set action),

- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action),
- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot,
- Read – This action forces object Present Value read.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- BACnet Name - Object name read from remote object,
- Object ID –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 Multistate Value component Out,
- In1 – (read only) The component input slot with the highest priority, can be set by Emergency Set action or by BACnet device,
- In8 – (read only) The component input slot with medium priority, can be set by Override action or by BACnet device,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

5. BACnet MSTP Master Network

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

Note: Before setting up BACnet Remote MSTP Network, please add Local Device component and enter Object Identifier number. To work properly iSMA-B-AAC20 controller should be also configured as BACnet device.

BACnet Remote MSTP Network is limited up to 500 BACnet objects and it cannot be extended.

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

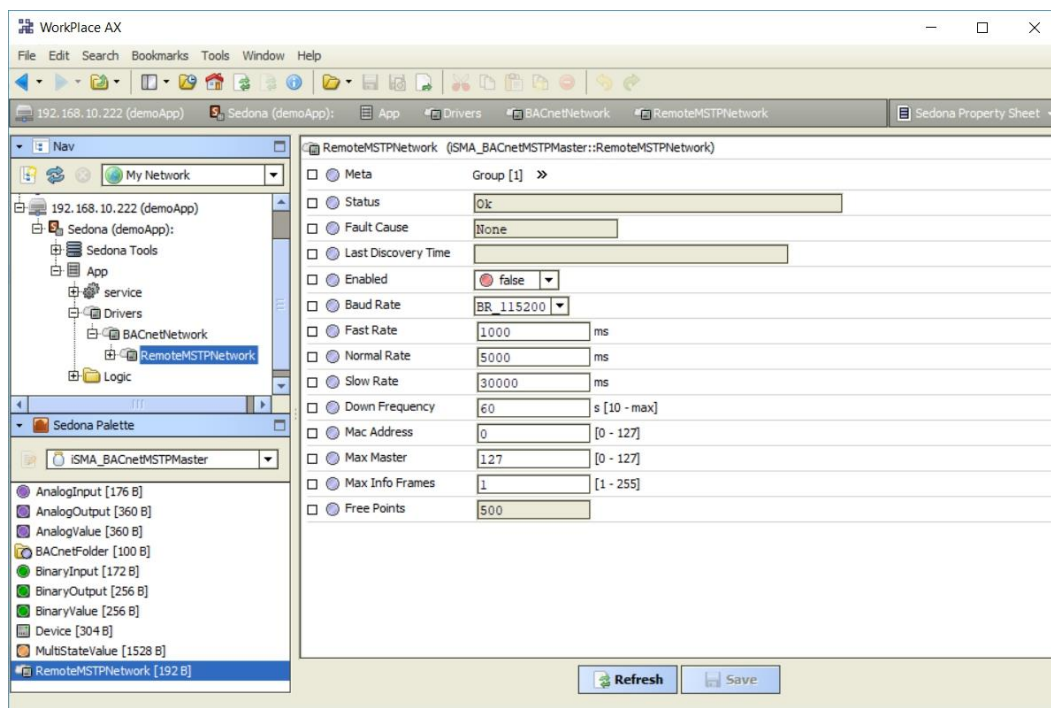


Figure 23 - BACnet MSTP Master Network Property Sheet view

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Last Discovery Time – Last success discovery action time,
- Enabled – Enable/Disable Remote MSTP Network,
- Baud Rate – Remote MSTP Network 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 MSTP Network,
- Max Master – Maximal master device address on MSTP Network,
- Max Info Frames – controls how many frames can be sent by the master before passing the token,
- Free points – Number of available physical points in the Remote MSTP Network (max. 500 points).

Each BACnet device on MS/TP network segment must have a unique MAC address. Typically 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 unique address could be set in MAC address slot (valid range is from 0 to 127).

In order to optimize network traffic there is a "Max master" and "Max Info Frames" parameters. Every master has the job of periodically polling for a new master. Each master knows who the next master on the network is, because that is who it will pass the token to. If user know that in his particular network there will be only five masters, he can restrict maximum master value. In that case the last master (with the address 5) on the network will not be trying to find master with address more than five but will give the token to the master with address "0". That restriction will help to save time and traffic on the network.

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

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

5.1. BACnet Remote MSTP Device

BACnet Remote MSTP Device is a component which is responsible for servicing physical device connected to iSMA-B-AAC20 controller by BACnet RS485 bus. Each device is represented by an unique BACnet Device ID. The component has ping action available under the right mouse button, which sends test message to device to check device status (meaning "Monitor" ping requests). Ping requests are also generated at the network-level and network's monitor periodically pings (queries) devices. While receiving any response from the device, including an exception response, this is considered proof of communication. All data points which you want to read from, or write to device must be placed under the Device component.

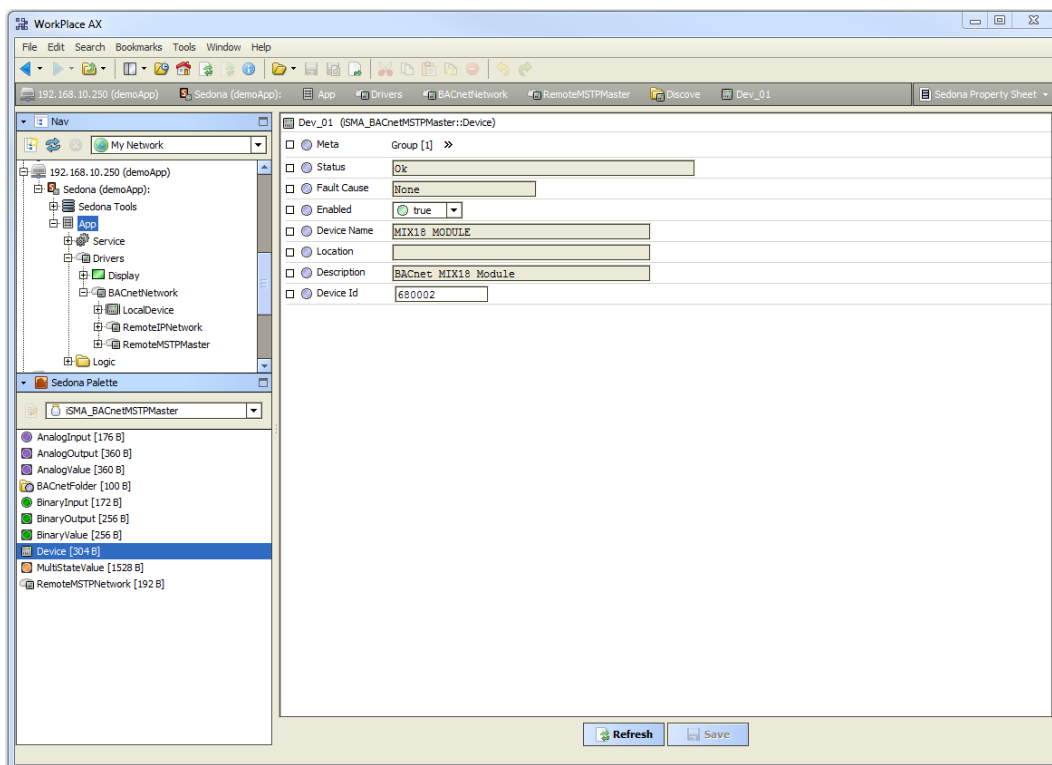


Figure 24 - BACnet Remote MSTP Device Property Sheet view

5.1.1. Device Discover

BACnet MSTP Master support device discovering. This action is available under right click on the Remote MSTP Network component. The Discovering process is shown in Status slot. At the end of this process a Discover folder will be created and all found will be placed there.

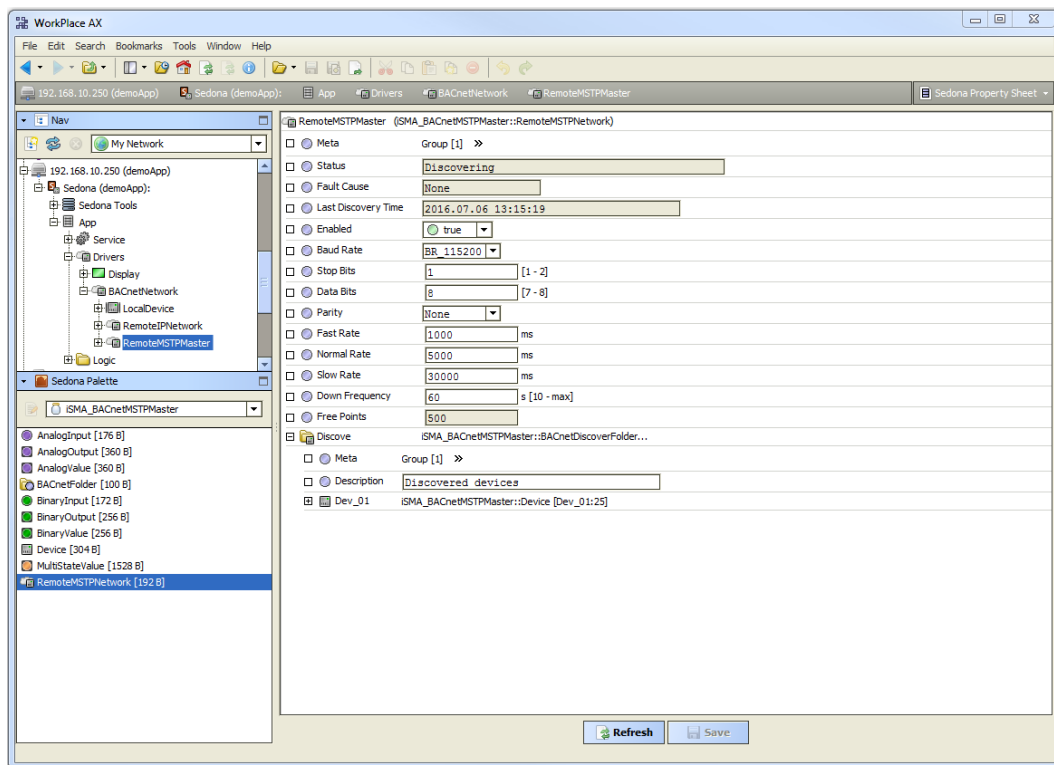


Figure 25 - Device Discover Property Sheet view

5.1.2. Adding BACnet MSTP device manually

BACnet Remote MSTP Network allows also to add the device manually (offline). To do this, add BACnet device component under the Remote MSTP Network, enter 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.

5.2. BACnet MSTP Device data points

iSMA-B-AAC20 controller BACnet MSTP network 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,
- MultiState Value– to read/write Integer and MultiState values with labels.

5.2.1. BACnet MSTP Analog Input

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

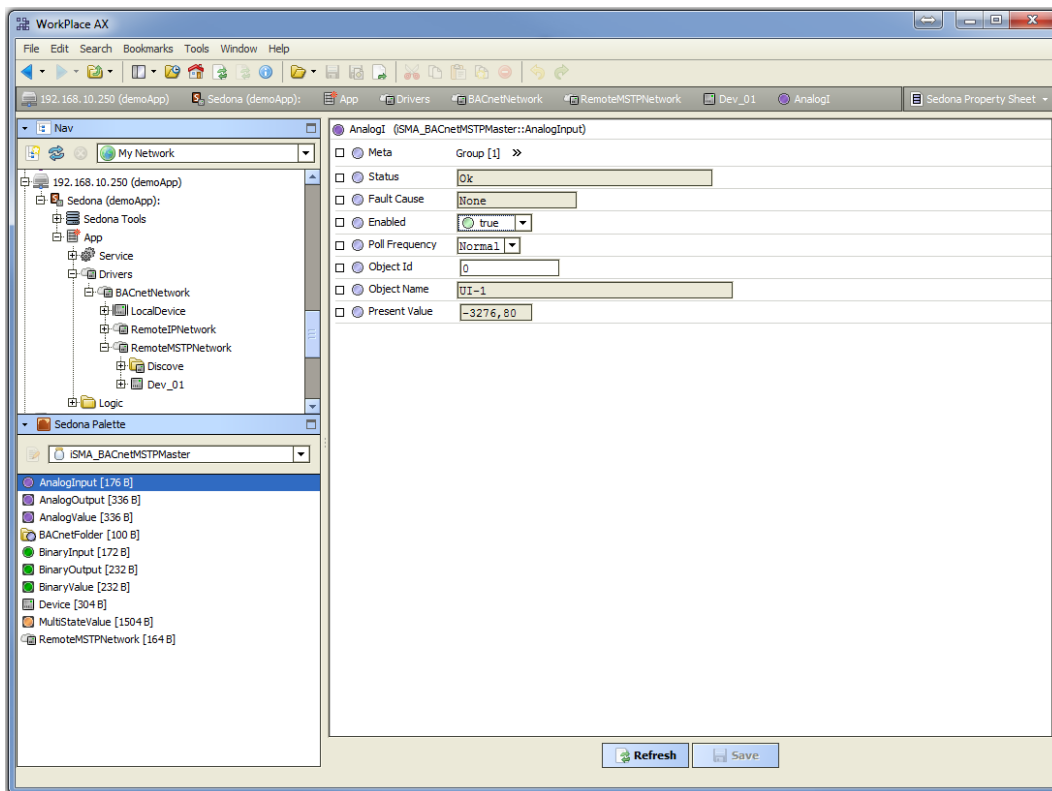


Figure 26 - BACnet MSTP Analog Input Property Sheet view

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

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,
- Object ID – BACnet MSTP object identification number,
- Object Name - Object name read from the remote device,
- Present Value – BACnet data point object Present Value property (Output).

5.2.2. BACnet MSTP Analog Output

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

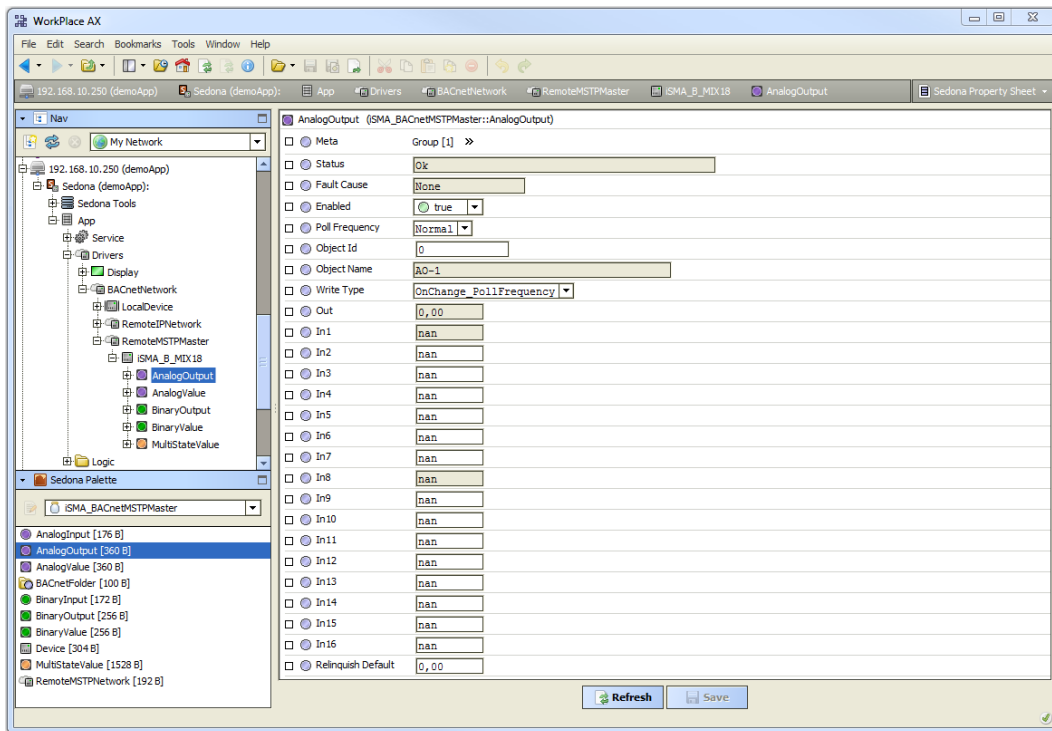


Figure 27 - BACnet MSTP Analog Output Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by Emergency Set),
- Emergency Auto – This action set null value on In1 slot (“switch off” Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action),
- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot,
- Read – This action forces object Present Value read.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,
- Object ID –BACnet MSTP object identification number,
- Object Name - Object name read from the remote device,
- Write Type – Sending value to device definition: On change or On Change and Poll Frequency,
- Out – Analog Output component Out,
- In1 – (read only) Component input slot with the highest priority, can be set by Emergency Set action or by BACnet device,
- In8 – (read only) Component input slot with medium priority, can be set by Override action or by BACnet device,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

5.2.3. BACnet MSTP Analog Value

Analog Value component is used to serve Analog Value BACnet MSTP object type from the devices. This component allows to read data with the defined poll frequency (defined in network component) and write (sent) data with defined Write Type (On change or On Change and Poll Frequency). The component has 16 prioritized inputs slots and one output slot.

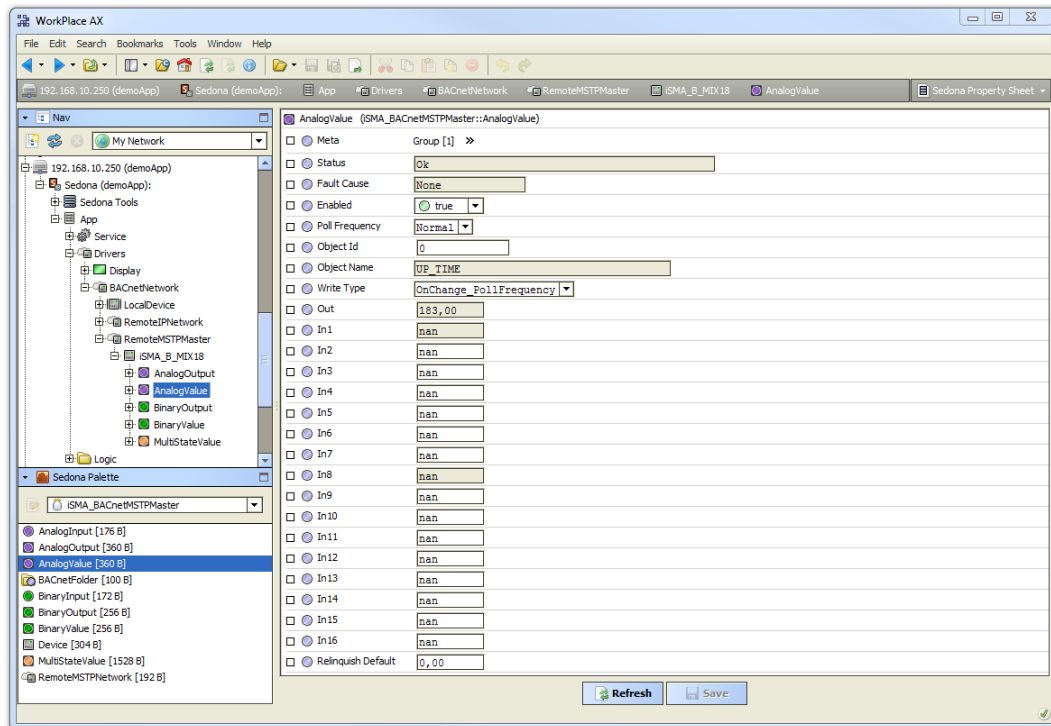


Figure 28 - BACnet MSTP Analog Value Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by Emergency Set action),
- Emergency Auto – This action set null value on In1 slot (“switch off” Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action),
- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot,
- Read – This action forces object Present Value read.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,
- Object ID –BACnet MSTP object identification number,
- Object Name - Object name read from the remote device,
- Write Type – Sending value to device definition: On change or On Change and Poll Frequency,

- Out – Analog Value component Out,
- In1 – (read only) Component input slot with the highest priority, can be set by Emergency Set action or by BACnet MSTP device,
- In8 – (read only) Component input slot with medium priority, can be set by Override action or by BACnet MSTP device,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

5.2.4. BACnet MSTP Binary Input

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

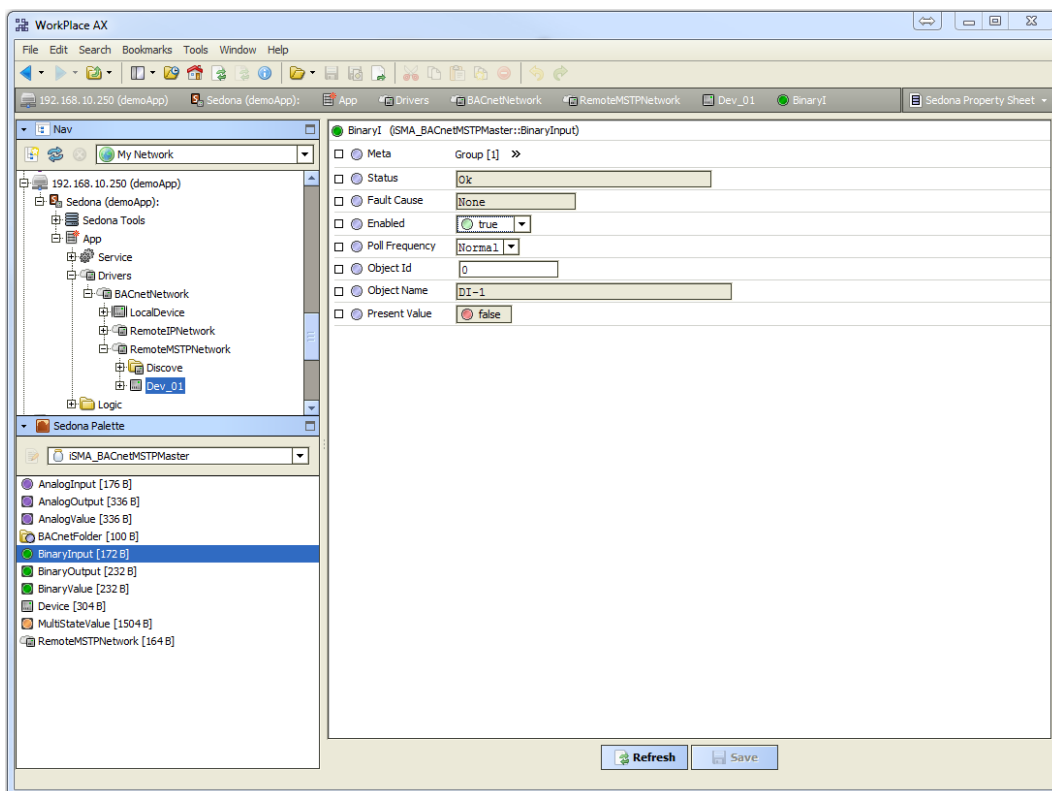


Figure 29 - BACnet MSTP Binary Input Property Sheet view

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

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,

- Enabled – Enable/Disable servicing device,
- Poll Frequency – Object read frequency group assign,
- Object ID – BACnet MSTP object identification number,
- Object Name - Object name read from the remote device,
- Present Value – BACnet data point object Present Value property (Output).

5.2.5. BACnet MSTP Binary Output

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

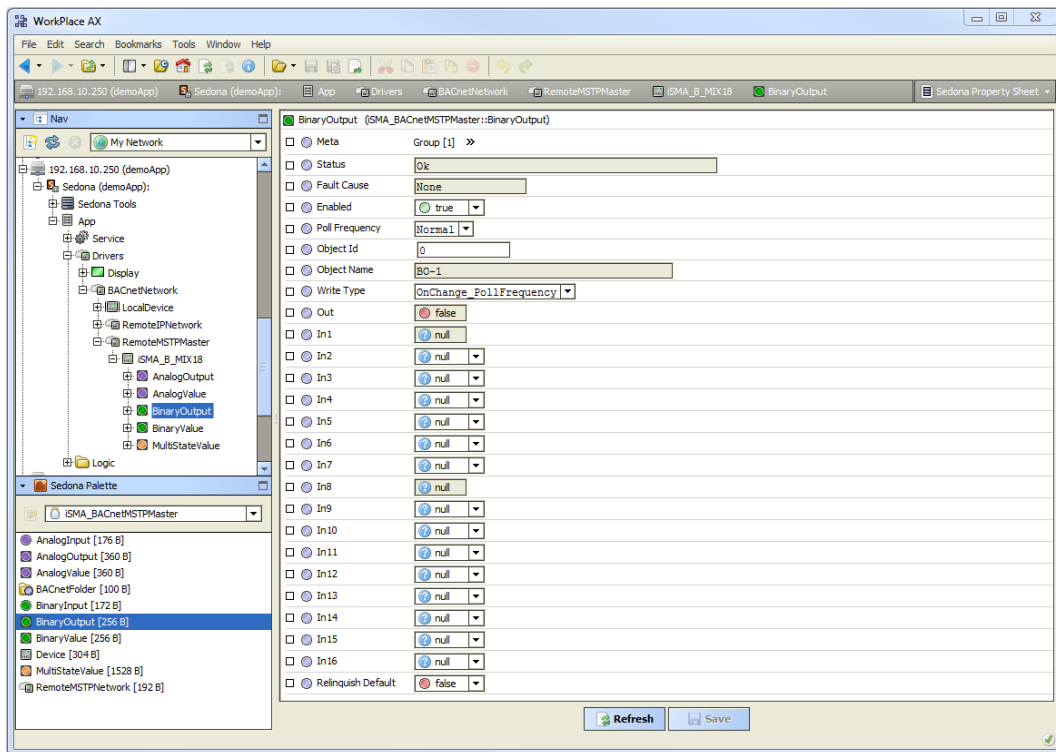


Figure 30 - BACnet MSTP Binary Output Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by Emergency Set action),
- Emergency Auto – This action set null value on In1 slot (“switch off” Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action),

- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot,
- Read – This action forces object Present Value read.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,
- Object ID –BACnet MSTP object identification number,
- Object Name - Object name read from the remote device,
- Write Type – Sending value to device definition: On change or On Change and Poll Frequency,
- Out – The Binary Output component Out,
- In1 – (read only) Component input slot with the highest priority, can be set by Emergency Set action or by BACnet MSTP device,
- In8 – (read only) Component input slot with medium priority, can be set by Override action or by BACnet MSTP device,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

5.2.6. BACnet MSTP Binary Value

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

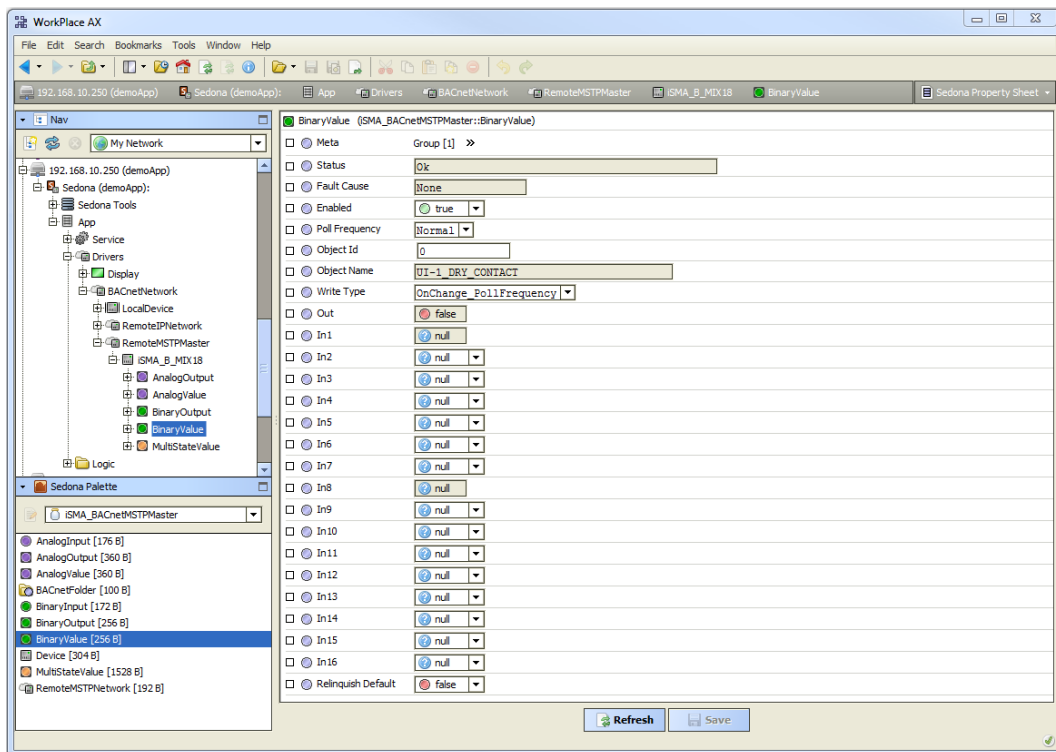


Figure 31 - BACnet MSTP Binary Value Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1 is read only and it can be set by Emergency Set action),
- Emergency Auto – This action set null value on In1 slot (“switch off” Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action),
- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot,
- Read – This action forces object Present Value read.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,
- Object ID –BACnet MSTP object identification number,
- Object Name - Object name read from the remote device,
- Write Type – Sending value to device definition: On change or On Change and Poll Frequency,

- Out – the Binary Value component Out,
- In1 – (read only) Component input slot with the highest priority, can be set by Emergency Set action or by BACnet MSTP device,
- In8 – (read only) Component input slot with medium priority, can be set by Override action or by BACnet MSTP device,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

5.2.7. BACnet MSTP Multistate Value

iSMA BACnet Multistate Value is component to serve the Multistate BACnet MSTP objects from the remote devices. This component uses only Integers values. This component can also read assigned text labels to numbers. This component allows to read data with the defined poll frequency (defined in network component) and write (sent) data with defined Write Type (On change or On Change and Poll Frequency). The component has 16 prioritized inputs slots and one output slot.

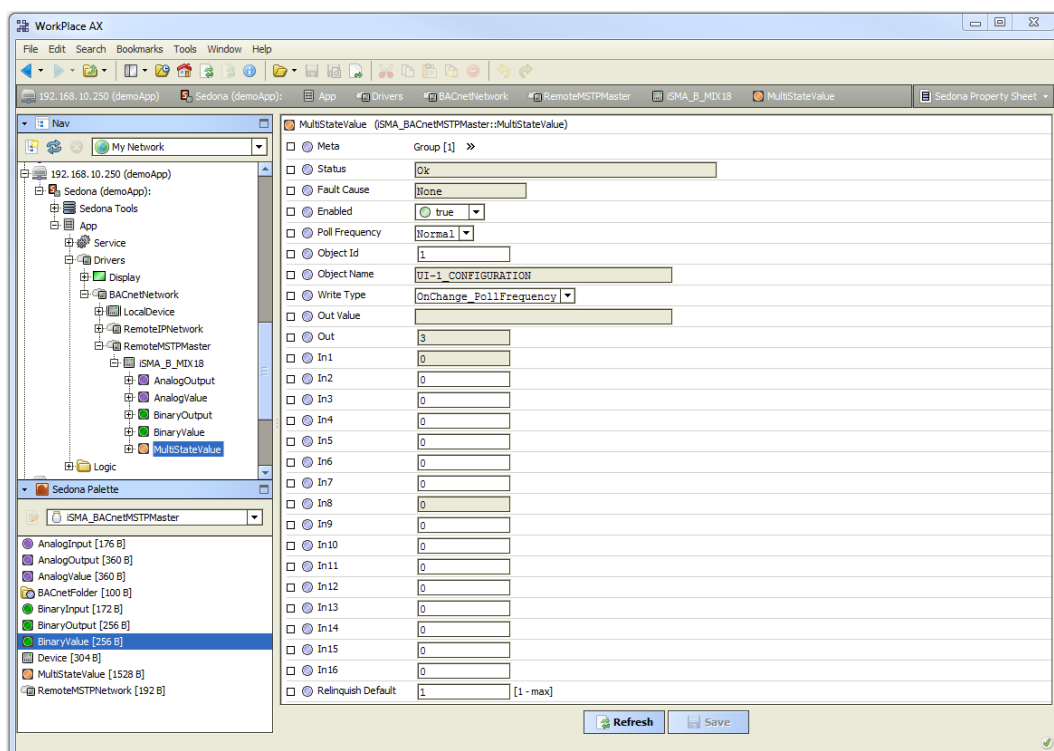


Figure 32 - BACnet MSTP Multistate Value Property Sheet view

The component has the following actions:

- Emergency Set – This action set value on In1 slot (the highest priority, please note slot In1

- is read only and it can be set by Emergency Set action),
- Emergency Auto – This action set null value on In1 slot (“switch off” Emergency Set action),
- Override – This action set value on In8 slot (medium priority, please note slot In8 is read only and it can be set by Override action),
- Auto – This action set null value on In8 slot (“switch off” Override action),
- Set – This action set value on In 16 slot,
- Read – This action forces object Present Value read.

The component has the following slots:

- Status – Component current status,
- Fault Cause – Fault cause description,
- Enabled – Enable/Disable servicing object,
- Poll Frequency – Object read frequency group assign,
- Object ID – BACnet data point object Identification number,
- BACnet Name - Object name read from the remote device,
- Write Type – Sending value to device definition: On change or On Change and Poll Frequency,
- Out – The Multistate Value component Out,
- In1 – (read only) Component input slot with the highest priority, can be set by Emergency Set action or by BACnet device,
- In8 – (read only) Component input slot with medium priority, can be set by Override action or by BACnet device,
- In2 – In16 – Writable components inputs (In 16 can be set by Set action),
- Relinquish Default – Object default value, the lowest priority.

5.3.BACnet Folder

BACnet Folder is a component which groups and organizes BACnet device's points components. BACnet folder has Description slot where we can additionally describe the components inside by label up to 32 characters.

6. BACnet terms

BACnet Building Automation and Control NETworking protocol (ANSI/ASHRAE Standard 135-2004) are open communication protocol standard 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 BACnet system or device, where it makes use of BACnet device for some particular purpose via a service request instance. BACnet server Operation mode for 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 BACnet/IP, its usage has become less common.

BACnet/IP Or B/IP. BACnet over Ethernet IP. Introduced in “Annex J” of BACnet standard, it has become the most popular BACnet link-layer protocol.

BACnet MSTP Or MS/TP. BACnet link-layer protocol used by lower-cost devices, using master slave/token passing over RS-485 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 the case of the single Device Object (type) per BACnet device, it must have a unique instance number across BACnet network on which it is installed.