

Niagara 4 Driver for Siemens S7

User Guide

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Change log

3.8

- Build for 3.8.111

4.2

- Build for 4.2.36.34
- Early release for testing

4.3

- Build for 4.3.58.4
- N4 Upgrade of S7 Driver - 4.3

4.4

- Build for 4.4.73
- Updated job logging
- Added S7 documentation module

4.8

- Build for 4.8.0.110

4.9

- Build for 4.9.0.164

4.10

- Build for 4.10.0.154

4.11

- Build for 4.11.1.16
- Added support for S7-1500 PLC
- Minor bugs fixed

Driver Overview

The S7 driver directly integrates Siemens S7 controllers into the Niagara system.

The S7 series PLCs are widespread devices, and our driver runs on dozens of European installations.

The Tridium Niagara driver allows connecting to Siemens S7 PLC via native S7 protocol over ethernet. The S7 PLC can be upgraded with Niagara graphics or integrated with various BMS protocols supported by Niagara.

The driver supports communication with Siemens PLC's S7-300, S7-400, S7-1200, and S7-1500 series over native S7 Ethernet protocol. The driver reads data from the DB part of memory. Supported data formats are Bit, Word, Short, Double Word, Double Int, Float, Date, String, and Printable String.

Key features:

- Connection to a PLC via Ethernet/IP
- Reading system info (only for S7-300/400 series)
- Reading the date and time from PLC (only for S7-300/400 series)
- Reading PLC status
- Reading block info – auto-discover DB (only for S7-300/400 series)
- Reading var – cyclical data reading
- Writing var

Supported devices:

- Siemens S7-300 PLC
- Siemens S7-400 PLC
- Siemens S7-1200 PLC
- Siemens S7-1500 PLC

Devices supported by the driver

- Siemens CPU S7-300 PLC (tested with CPU 313SC)
- Siemens CPU S7-400 PLC (not tested, but it is similar to S7-300 PLC)
- Siemens CPU S7-1200 PLC (tested with CPU 1212C)
- Siemens CPU S7-1500 PLC (not tested, but similar to S7-1200 PLC)

S7 Protocol partial compatibility list								
	CPU						CP	DRIVE
	300	400	WinAC	Snap7S	1200	1500	343/443/IE	SINAMICS
DB Read/Write	✓	✓	✓	✓	✓	✓ (3)	x	✓
EB Read/Write	✓	✓	✓	✓	✓	✓	x	✓
AB Read/Write	✓	✓	✓	✓	✓	✓	x	✓
MK Read/Write	✓	✓	✓	✓	✓	✓	x	x
TM Read/Write	✓	✓	✓	✓	x	x	x	x
CT Read/Write	✓	✓	✓	✓	x	x	x	x
Read SZL	✓	✓	✓	✓	✓	✓	✓	✓
Multi Read/Write	✓	✓	✓	✓	✓	✓	✓	✓
Directory	✓	✓	✓	✓	x	x	✓	(2)
Date and Time	✓	✓	✓	✓	x	x	x	✓
Control Run/Stop	✓	✓	✓	✓	x	x	(1)	✓
Security	✓	✓	✓	✓	x	x	x	x
Block Upload/Down/Delete	✓	✓	✓	x	x	x	✓	✓

- (1) After the “Stop” command, the connection is lost, Stop/Run CPU sequence is needed.
- (2) Although DB is present and accessible, the directory shows only SDBs.
- (3) See S7-1200/1500 notes.

The protocol implementation

- Connection to a PLC
- Reading system info (only for S7-300/400 series)
- Reading the date and time from PLC (only for S7-300/400 series)
- Reading PLC status
- Reading block info – auto-discover DB (only for S7-300/400 series)
- Reading var – cyclical data reading
- Writing var

Prerequisites for Integration

1. Correctly installed modules with the driver. Find more information in the chapter “Installation”.
2. Active driver’s license and certificate on the target platform. Find more information in the chapter “Licensing”.
3. Correct physical connection between systems. The PLC must be connected to the same LAN as JACE 8000 or PC with Tridium Supervisor 4.
4. Knowledge of types of points and their offset in DBs. In the case of S7-1200 PLC and S7-1500 PLC, knowledge of block numbers and their Mcc length.

Installation

Source files are available to download from the SAFECONTROL license web (<https://license.safecontrol.cz>). First, extract the **s7.zip** archive and copy all included *.jar files to your Niagara modules directory, typically:

C:\Niagara\Niagara-4.4.xx.xx\modules.

For correct behaviour, it is necessary to install *.jar files on both the client platform (Workbench PC) and the target platform (JACE8000 or Supervisor).

Note: Close the Niagara Workbench after inserting all the modules in the folder. Next time you start the Niagara Workbench, the driver will be loaded and immediately ready for use.

Licensing

There are various types of licences based on the number of used points. Only a demo license is time-limited.

You can ask for a license on the SAFECONTROL license web (<https://license.safecontrol.cz>) or by sending an e-mail to sales@safecontrol.cz. The purchased license and Safecontrol certificate file will be generated and prepared for download on the Niagara Central license web. You can also download the license online in Niagara Workbench in the License manager view, as shown in the picture below:

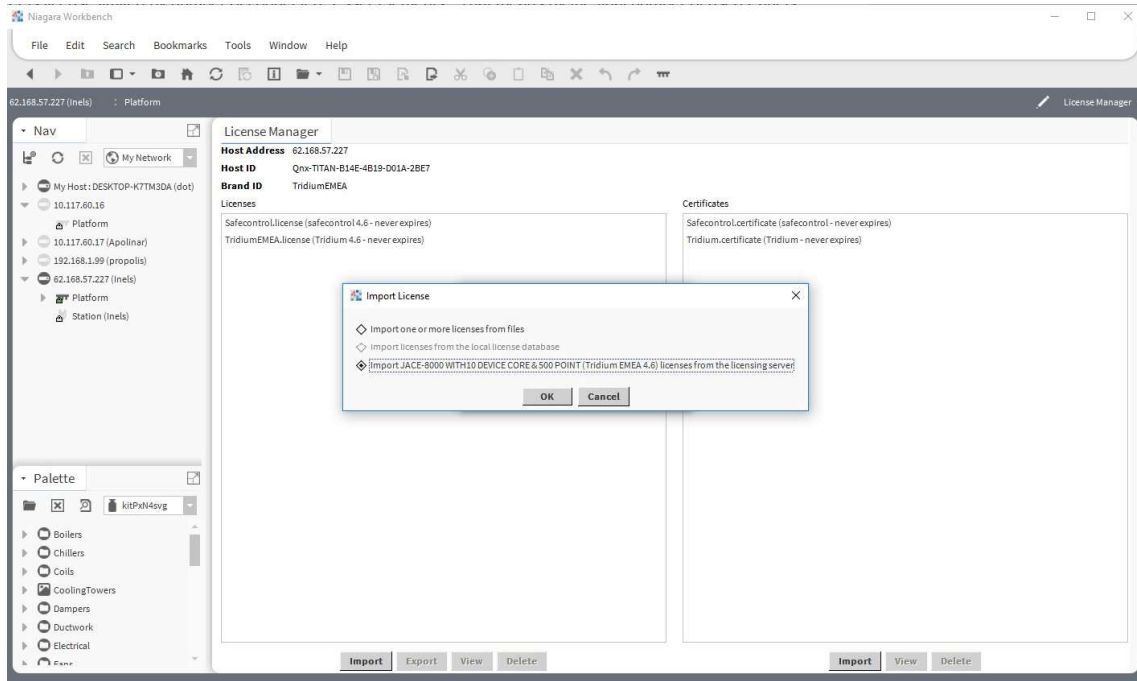


Figure 1: License import in the License manager

Order codes

- DR-SC-S7-250 – Driver for integration Siemens S7 PLC – 250 data points
- DR-SC-S7-UNL – Driver for integration Siemens S7 PLC – unlimited data points

Basic config guide

1. Connect the PLC to the same LAN as JACE 8000 or PC with Tridium Supervisor 4.
2. Add a new S7 Network to your Drivers node.
3. Add the chosen S7 Device to your S7 Network.
4. Correctly configure the newly added S7 Device.
5. Add blocks under DBs extension of S7 Device.
6. Add points under added blocks.

For more in-depth help, read the following chapters.

Setup guide

Overview

An S7 Network represents the network interface on Tridium Supervisor 4 or Tridium JACE 8000 used for communication with the S7 PLCs over S7 native protocol.

Connecting the S7 PLC

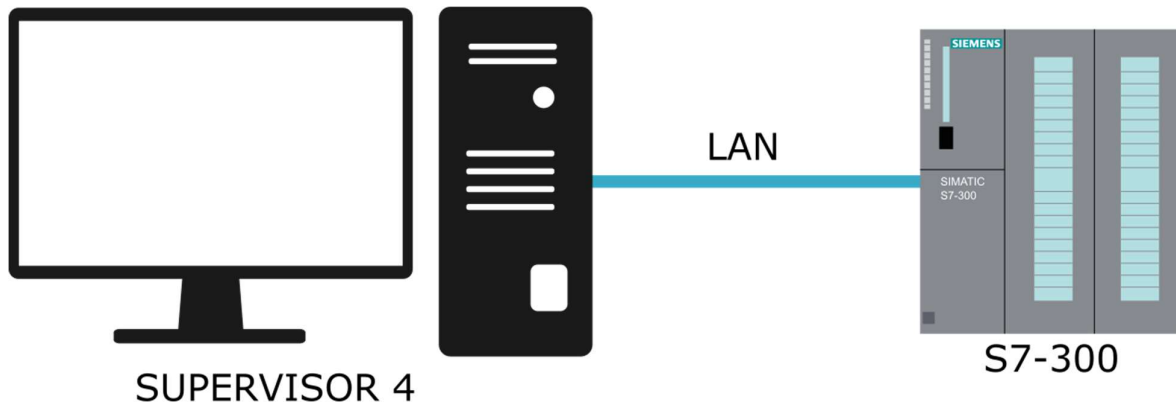


Figure 2: Diagram of connection to Supervisor 4

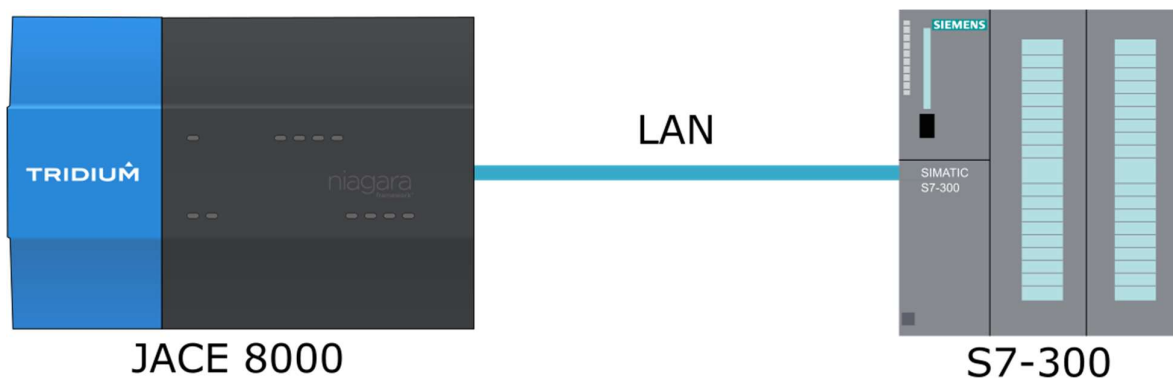


Figure 3: Diagram of connection to JACE 8000

Adding an S7 Network to a Station

To add an S7 Network, perform the following steps:

1. Connect chosen S7 to the same LAN as JACE 8000 or PC with Tridium Supervisor 4.
2. Open the station and expand the navigation tree.
3. Double-click on the Drivers node.
4. Use the “New” button in the Driver Manager window. Next, select S7 Network from the drop-down list and confirm it by clicking OK.
5. Enter a name for the network and click OK.

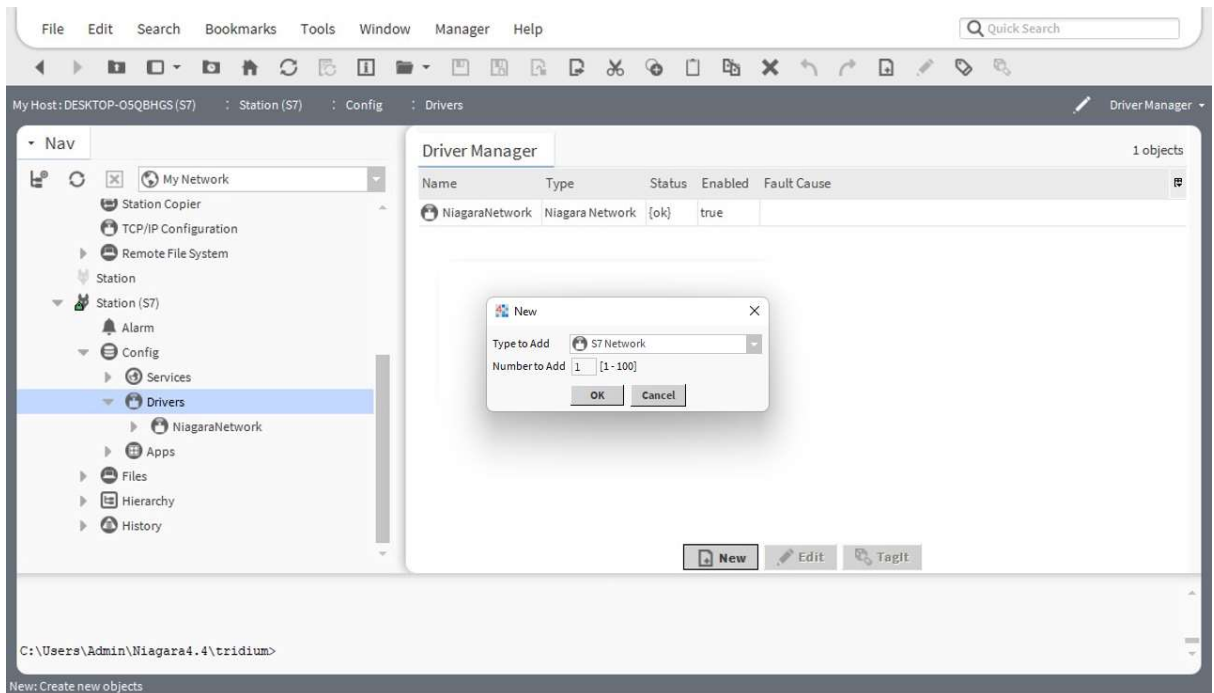


Figure 4: Adding a new network

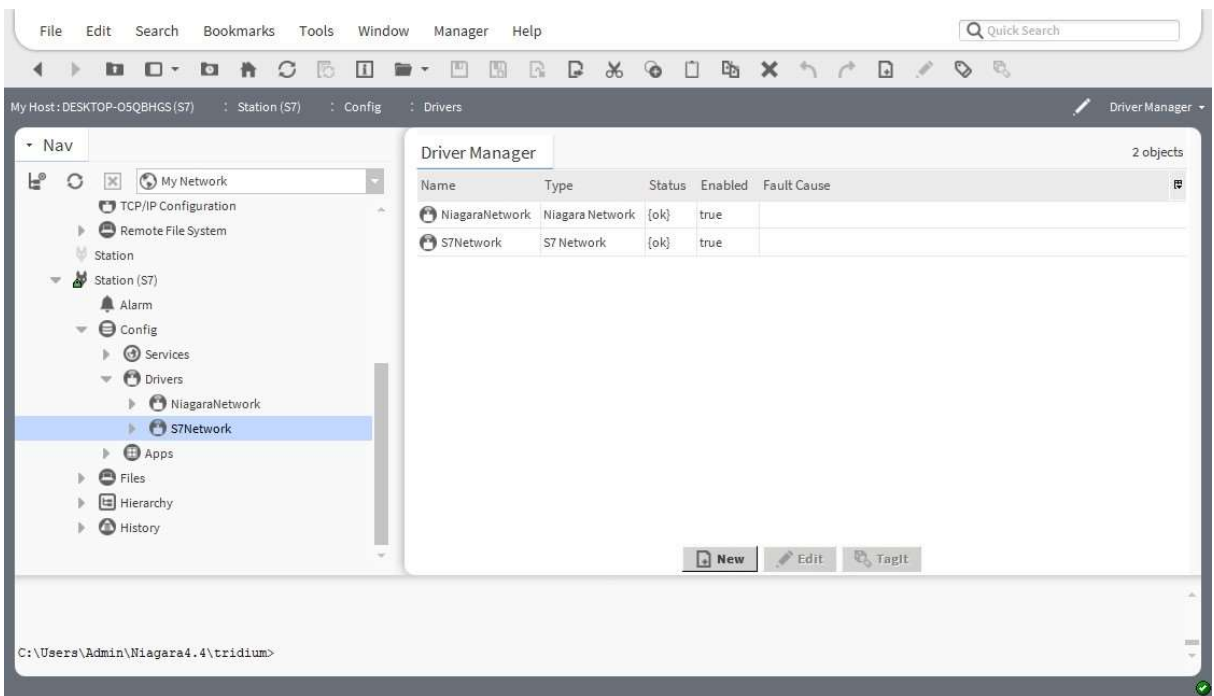


Figure 5: Successfully added S7 Network

Status {ok} indicates that the Niagara 4 platform has installed all required modules, licenses and certificates. Otherwise, see page 6 - chapter Installation, or page 7 - chapter Licensing.

Double-clicking the S7 network in Driver Manager will show S7 Device Manager with a blank table of devices.

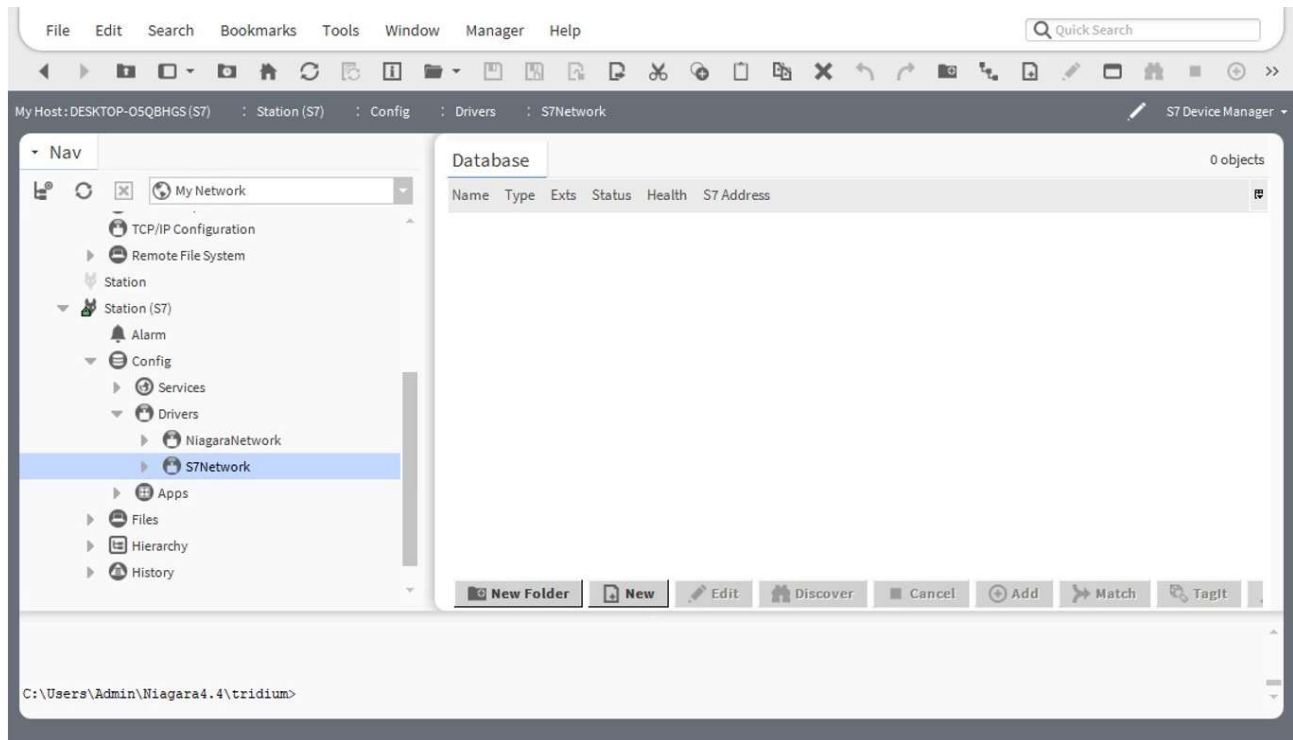


Figure 6: Empty S7 Network

Configuring an S7 Network

The S7 network property sheet contains conjoined settings for all descendants (S7 devices). The ping monitor and global poll scheduler settings are shared and applicable for all devices under the S7 network.

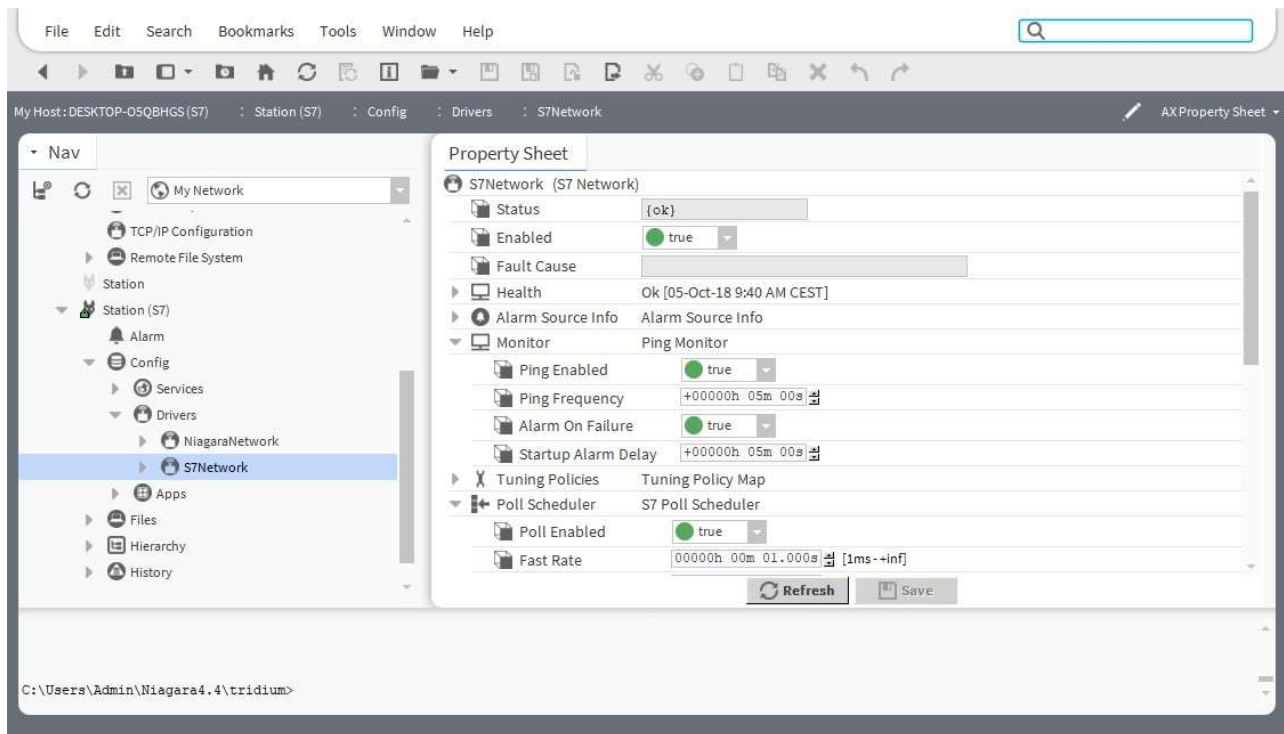


Figure 7: Property Sheet of the S7 Network - global communication parameters

S7 Device Manager

S7 Device Manager is the primary overview of the S7 Network components. You can open it by double-clicking on the S7 network in the navigation tree. The Manager shows a list of all devices in the S7 network.

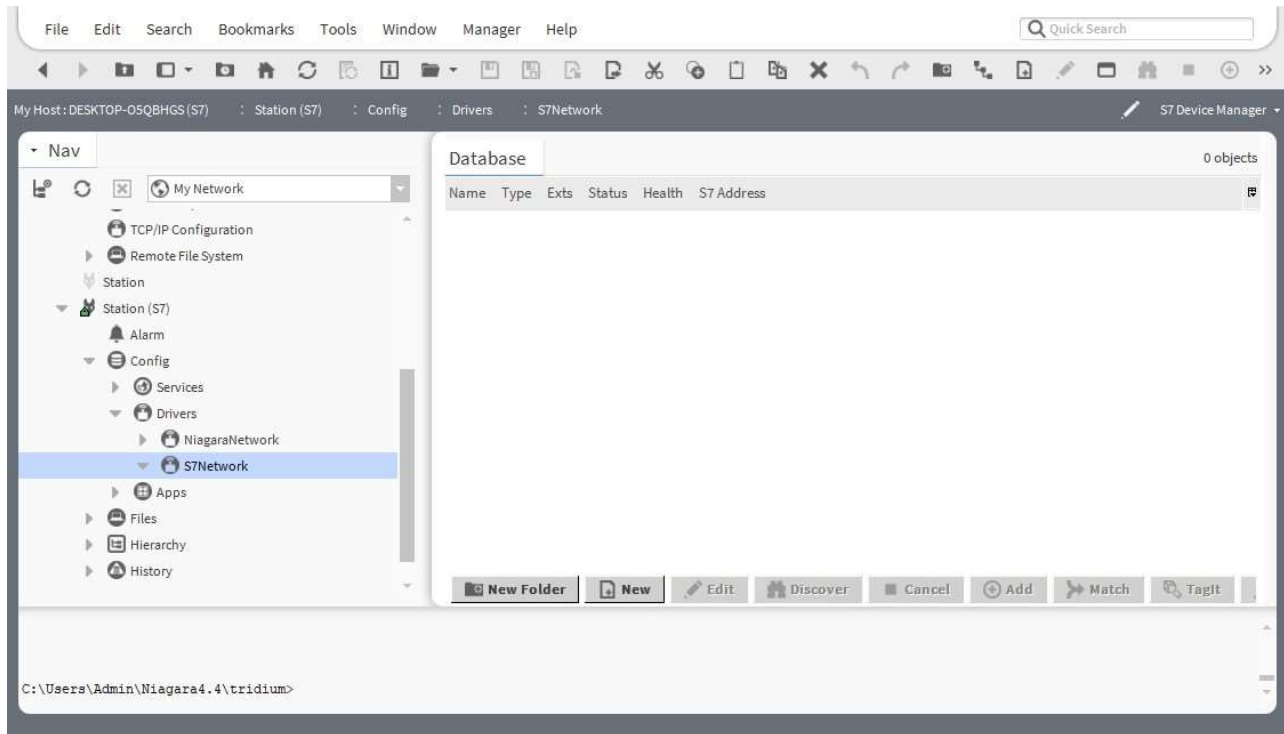


Figure 8: S7 Device Manager

S7 Device Manager provides a set of control buttons at the bottom of the window:

- **New Folder** – This will create a new folder meant for the custom organisation of devices.
- **New** – You can create a new S7 device with this button. Carefully fill in the pop-up window for a successful connection to PLC.
- **Edit** – You can edit the name and connection parameters of the selected device. Double-click on the device works as an Edit button.
- **Discover** – This button is disabled in the current release.
- **Add/Cancel** – These buttons are disabled in the current release.
- **Match** – This button is disabled in the current release.

Adding new S7 devices to the Station

To insert a new device in the S7 network, perform the following steps:

1. Open the S7 device manager.
2. Click the “New” button.
3. Select the PLC type (S7-300 PLC, S7-400 PLC, S7-1200 PLC or S7-1500 PLC) from the drop-down list and click OK. In the case of S7 PLC type 1200 or 1500, the device has to be in 300/400 compatibility mode.
4. Set the parameters of the device in the following window. The most important setting is the IP address of the device. The device can only be added with the correct IP address!

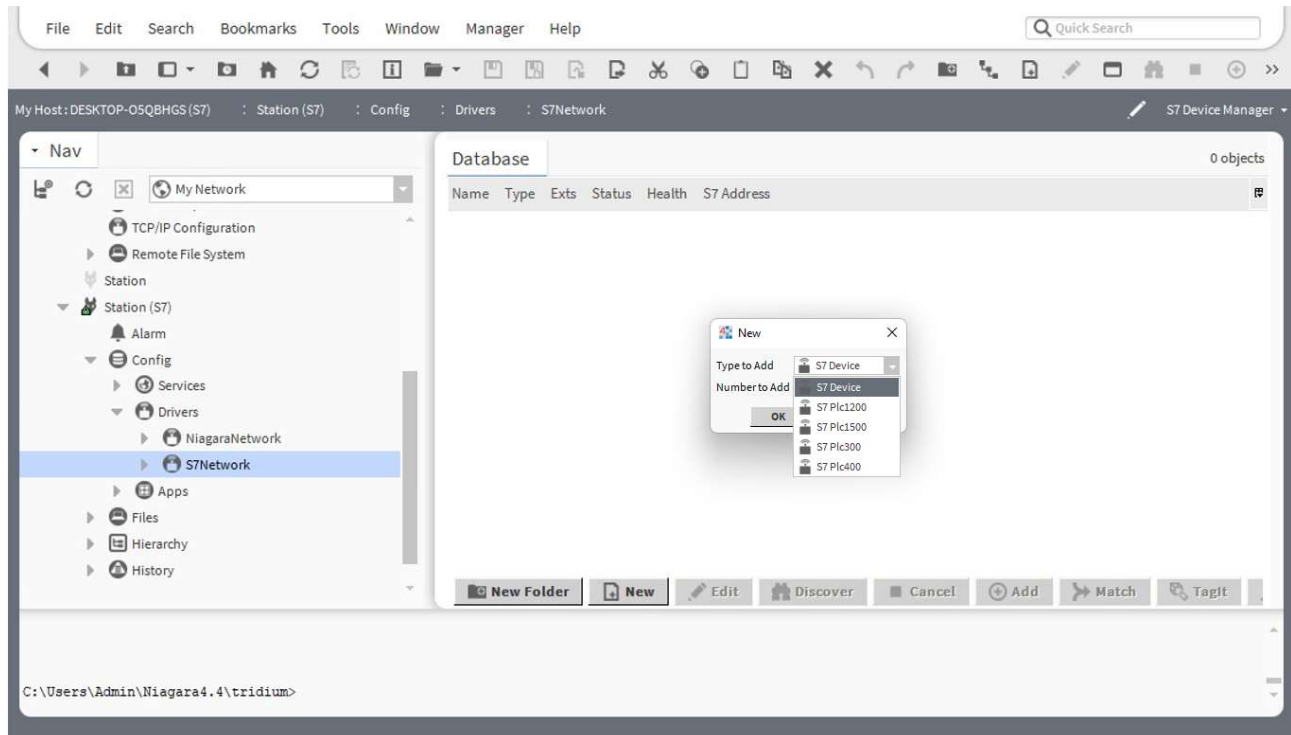


Figure 9: Adding a S7 device to the S7 Network

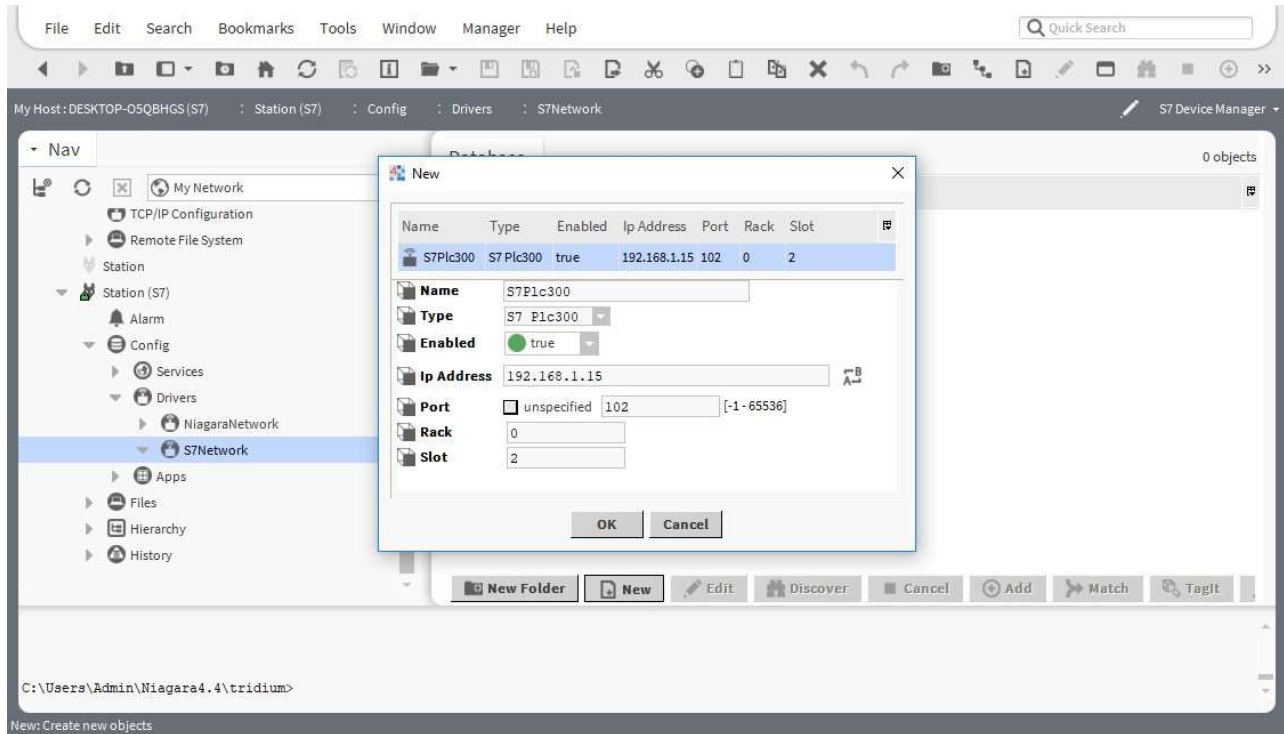


Figure 10: New S7 Device configuration menu

For the S7 PLC 1200 or 1500, it is necessary to change the Slot value to „1“. The most important setting is the IP address of the device. The device can only be added with the correct IP address!

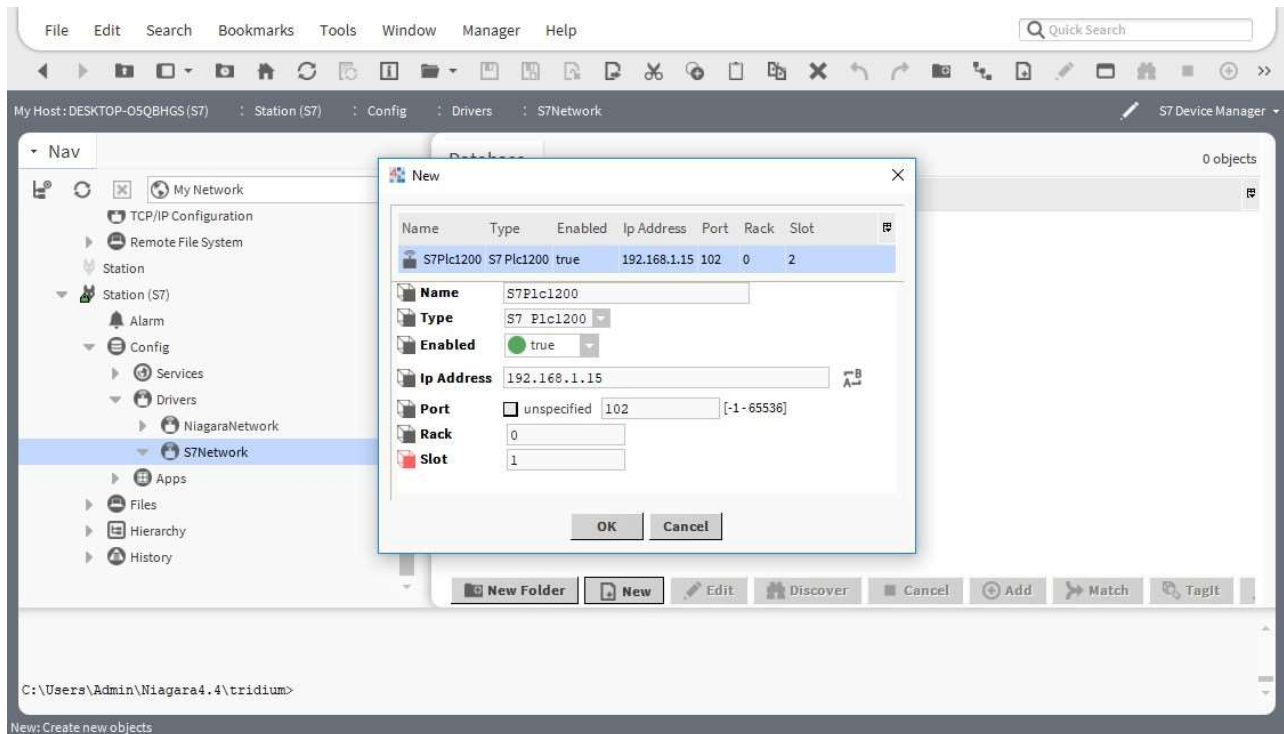


Figure 11: New S7 (S7 PLC 1200 or 1500) Device configuration menu

Sometimes, it is necessary to initiate communication by pinging the device after adding it. Right-click on the device in the device manager, choose Actions and use the Ping command. The health parameter should read {ok}.

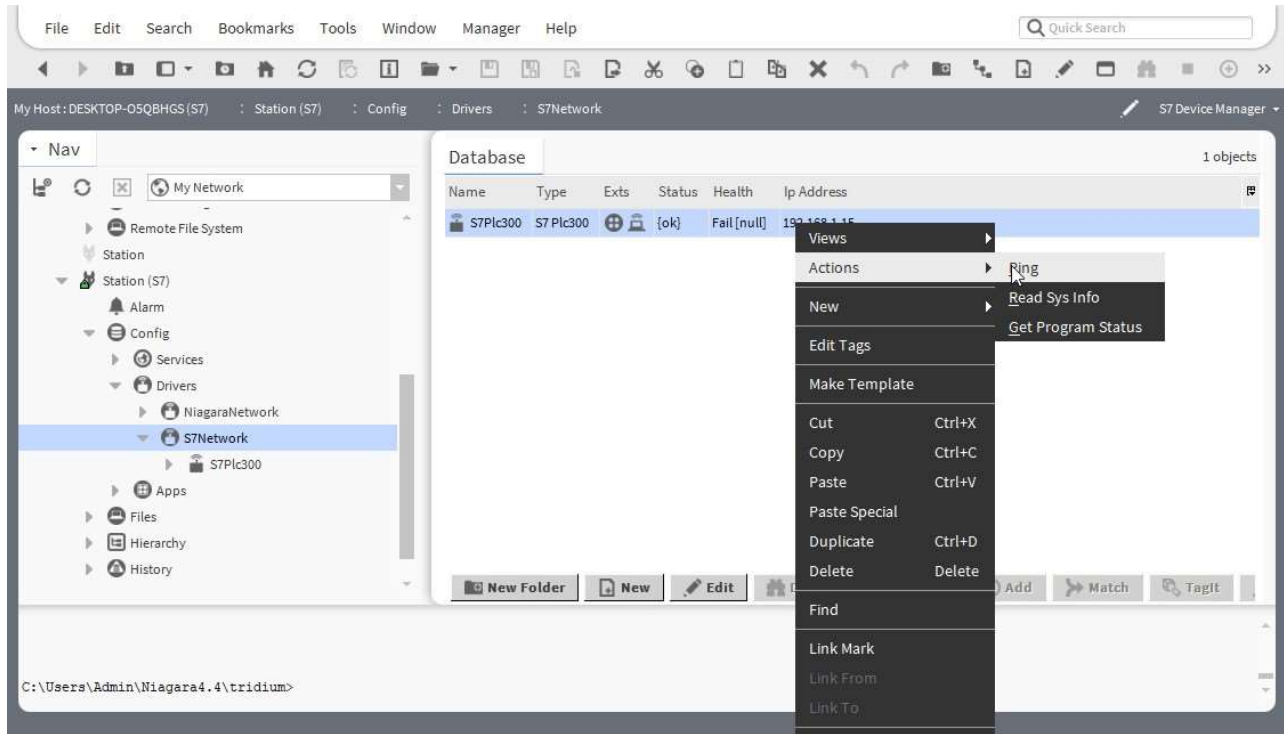


Figure 12: Ping Action on S7 Device

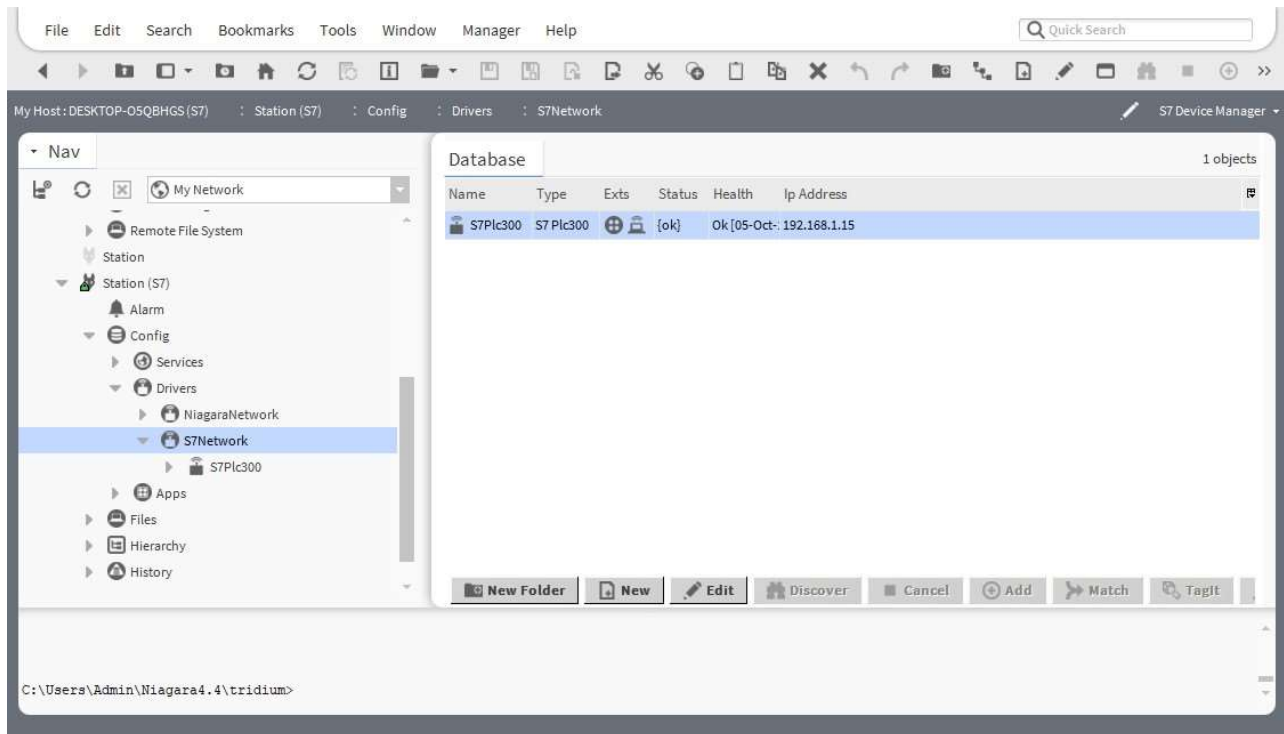


Figure 13: The {ok} status of the device

S7 Device

S7 Device in the Workbench represents the physical PLC. Double-click the device in the device tree to open the S7 device property sheet. You can set selected parameters here (the most important is Poll frequency) and read information about the PLC and its communication.

From the context menu are accessible Actions for Pinging the device, Reading system info and Getting program status. System time and complete system information are not accessible for all types of S7 PLC.

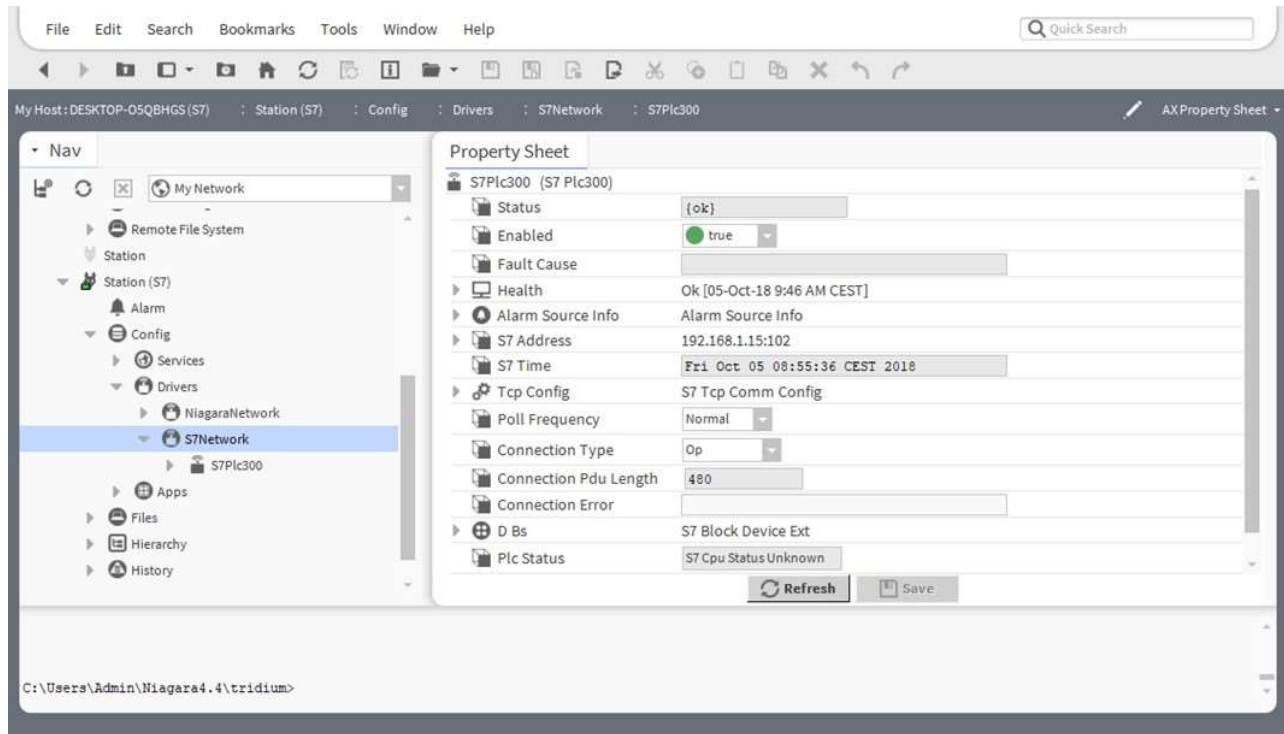


Figure 14: Device property sheet

S7 Block Manager

Data Block is a part of PLC memory in which program variables are stored. There are multiple DB types, but SAFECONTROL S7 Driver can read out and write only in a **Global Data Block**. Each DB has its address (Number), length (Mcc length is the number of accessible bytes in the DB) and further parameters.

S7 Block Manager is accessible by double-clicking on the “DBs” property under the S7 Device in the navigation tree. There are two different managers, one for S7-300 PLC, S7-400 PLC and one for S7-1200 PLC, S7-1500 PLC.

The S7-300 PLC and S7-400 PLC support automatic DB discovery. For auto-discovery, follow the instructions below:

1. Open S7 Block Manager.
2. Click the “Discover” button.
3. Check the result in the top window of S7 Block Manager.

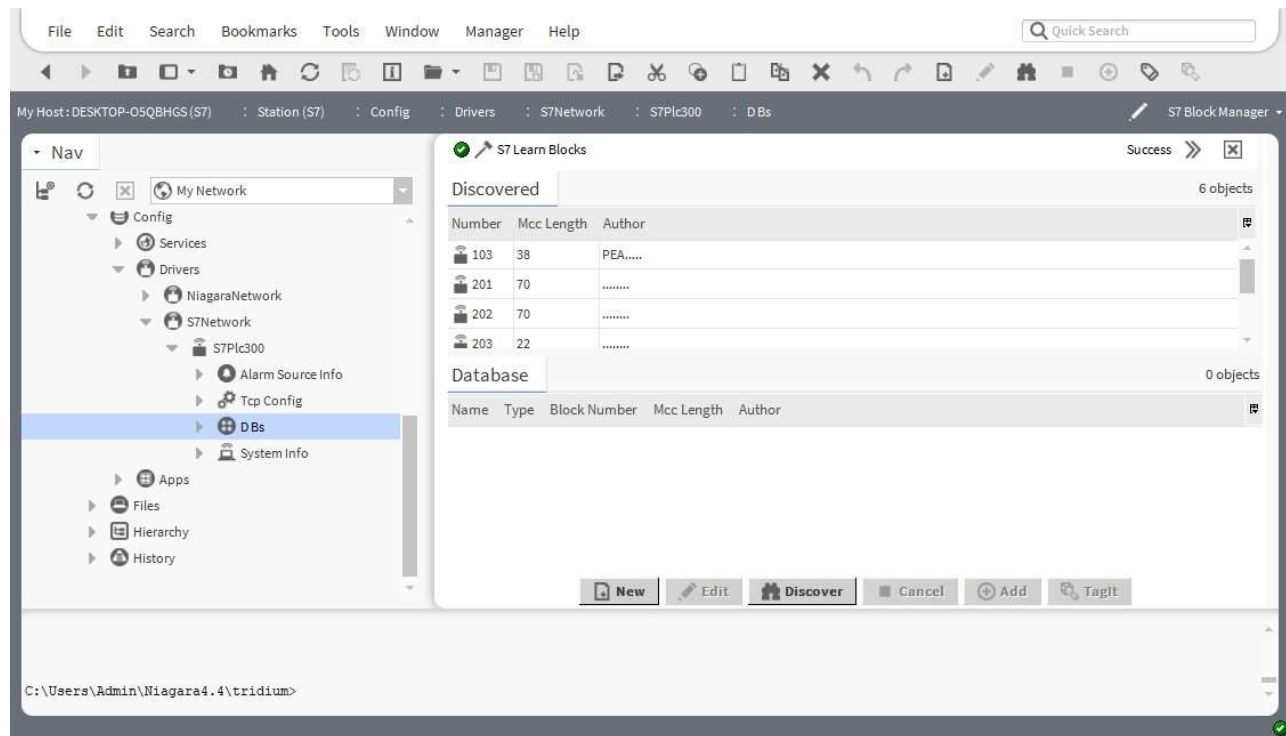


Figure 15: Block manager with the successful discovery

4. Choose the required DB and drag it to the bottom window.
5. Confirm your choice by clicking OK.

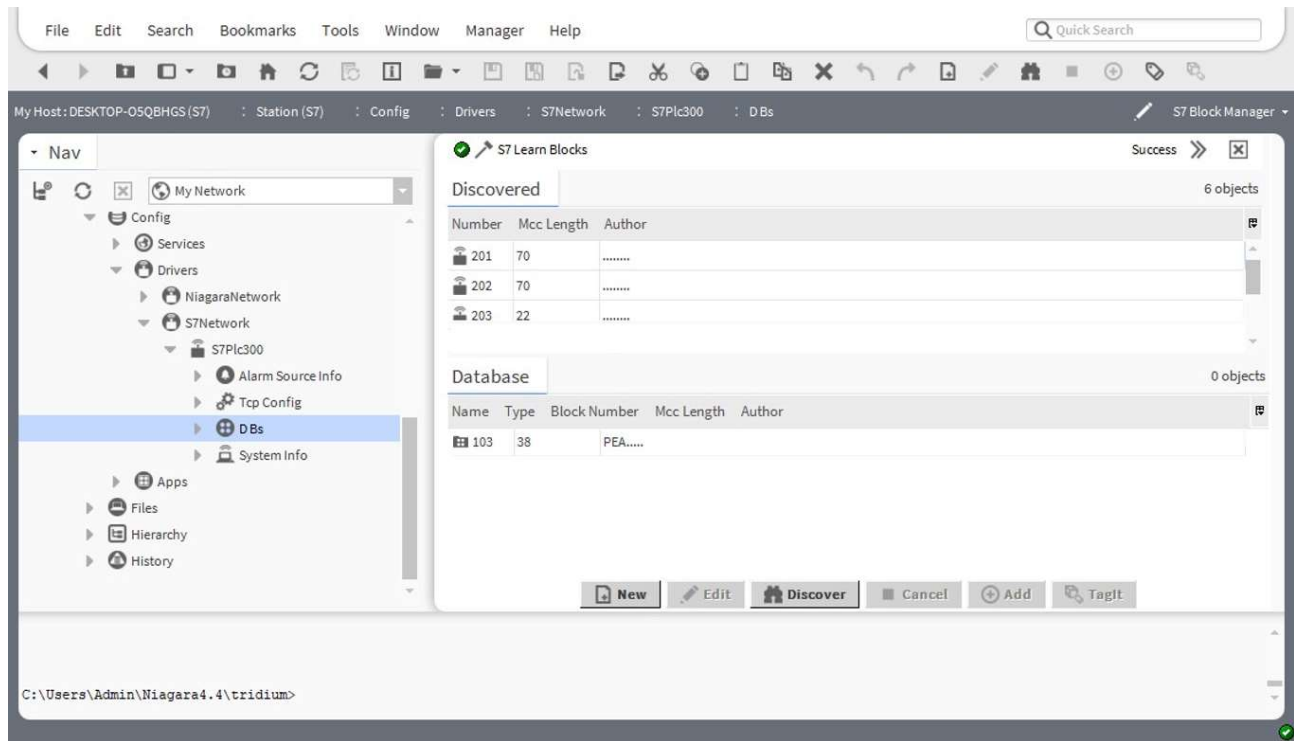


Figure 16: Successfully added DB

Manual adding of DB

This function is available for offline configuration of S7-1500 PLC, S7-1200 PLC, S7-300 PLC, and S7-400 PLC.

For the manual DB addition, perform the following steps:

1. Open S7 Block Manager.
2. Click the “New” button.
3. In the first window, fill in the number of DBs you want to add.
4. In the second window, fill in the correct **block number** and **Mcc length**.

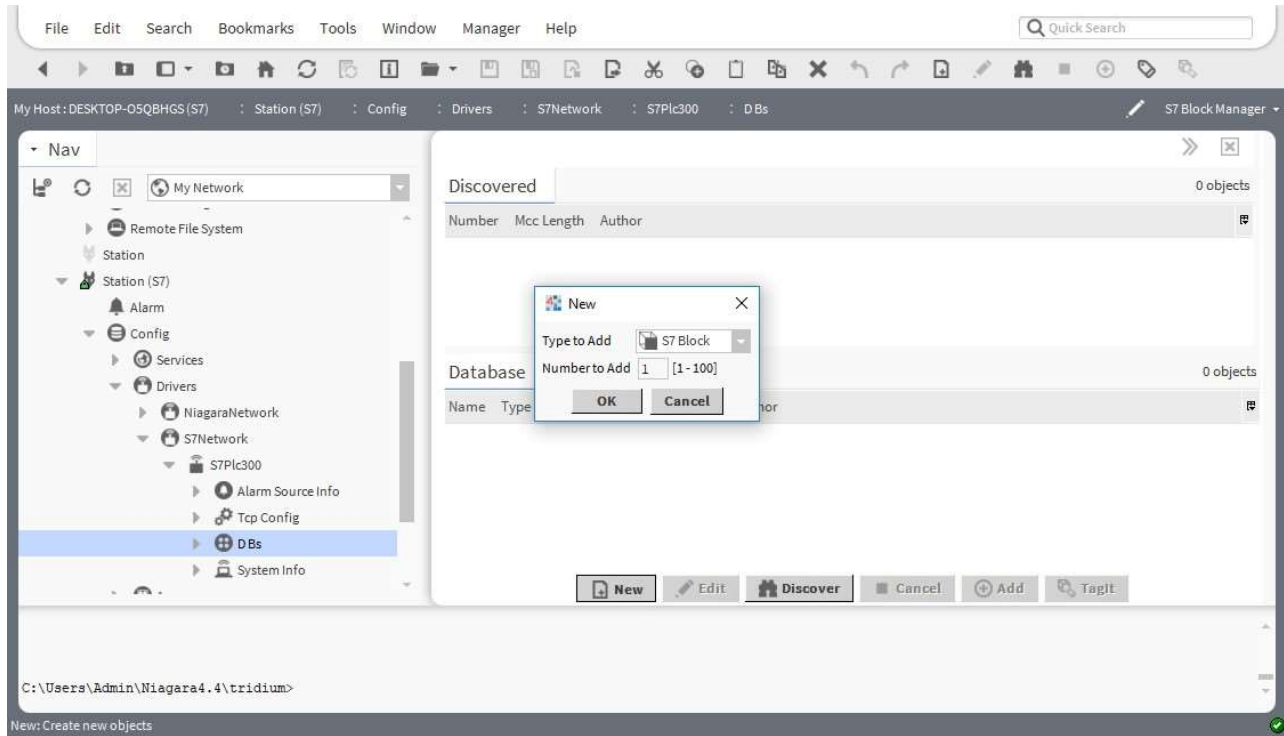


Figure 17: New DB dialogue menu

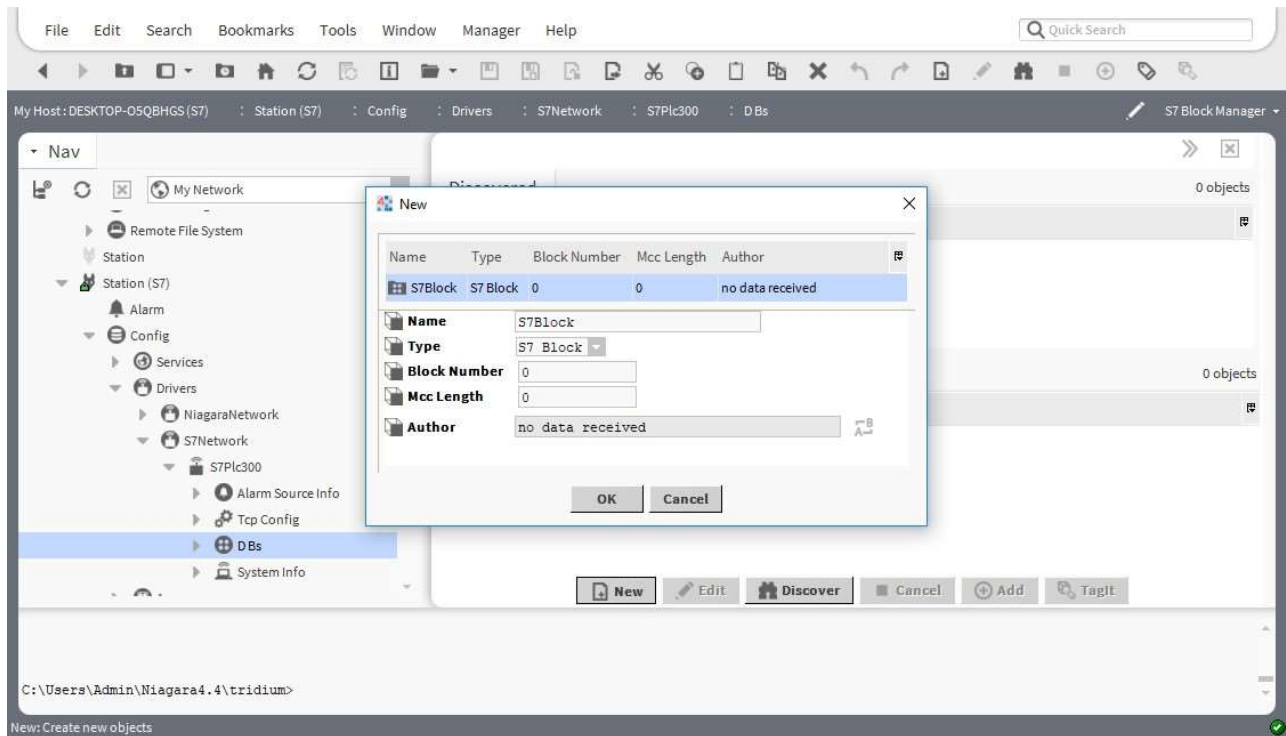


Figure 18: New DB configuration

S7 DBs

All data in a DB are read in one poll cycle. You can see the raw data and set the Poll rate settings under the attribute Data. Each DB has its Poll rate settings – you can select a slow rate for DB with lower priority and a fast rate for most important data or data which require a short response time. The Poll rate details are defined in the S7 network property sheet.

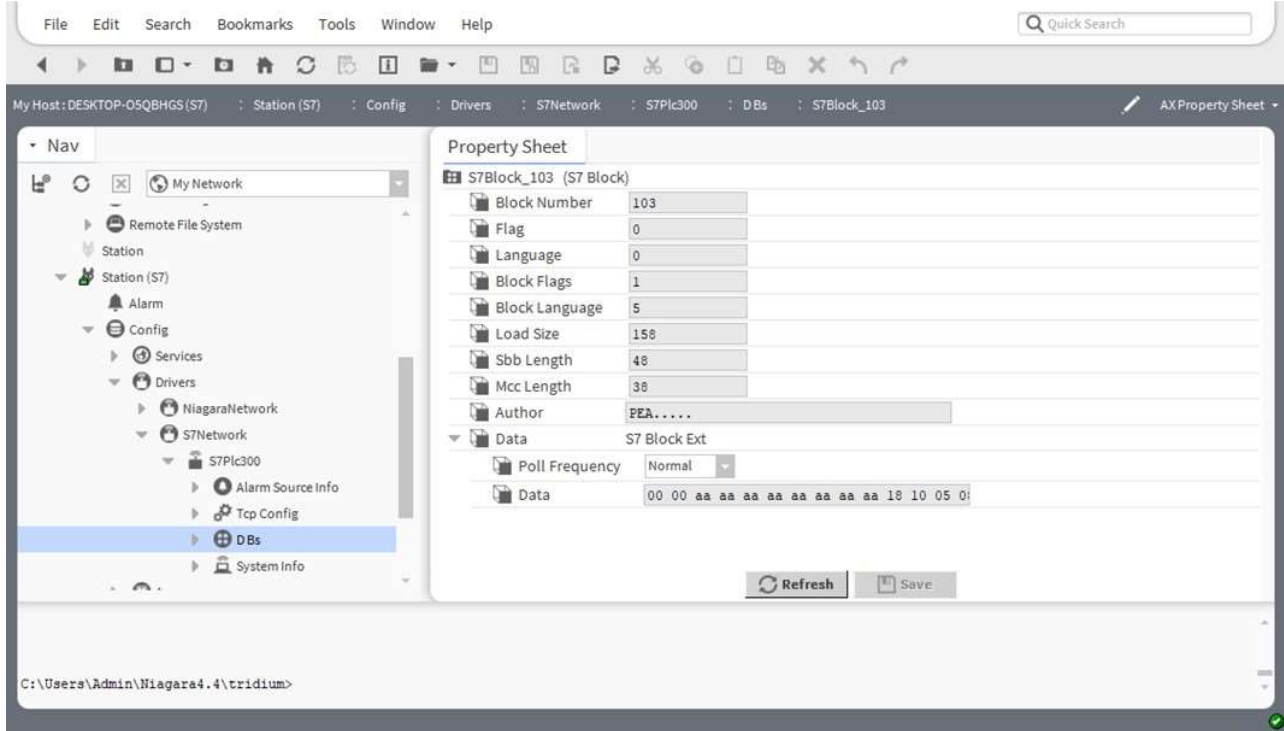


Figure 19: DB property sheet

S7 Points

S7 Control points must be manually added from S7 Point Manager under the DB.

Adding a new S7 Point

1. Open S7 Point Manager by double-clicking the selected DB.
2. Click the “New” button.
3. Choose the required data type and the number of points in the first appearing window.
4. Set starting offset for the point in the selected DB. **Offset is counted in bytes.**
5. For the bit point/writable, it is necessary to set the required bit offset (the position in the byte) in the attribute proxy Ext.

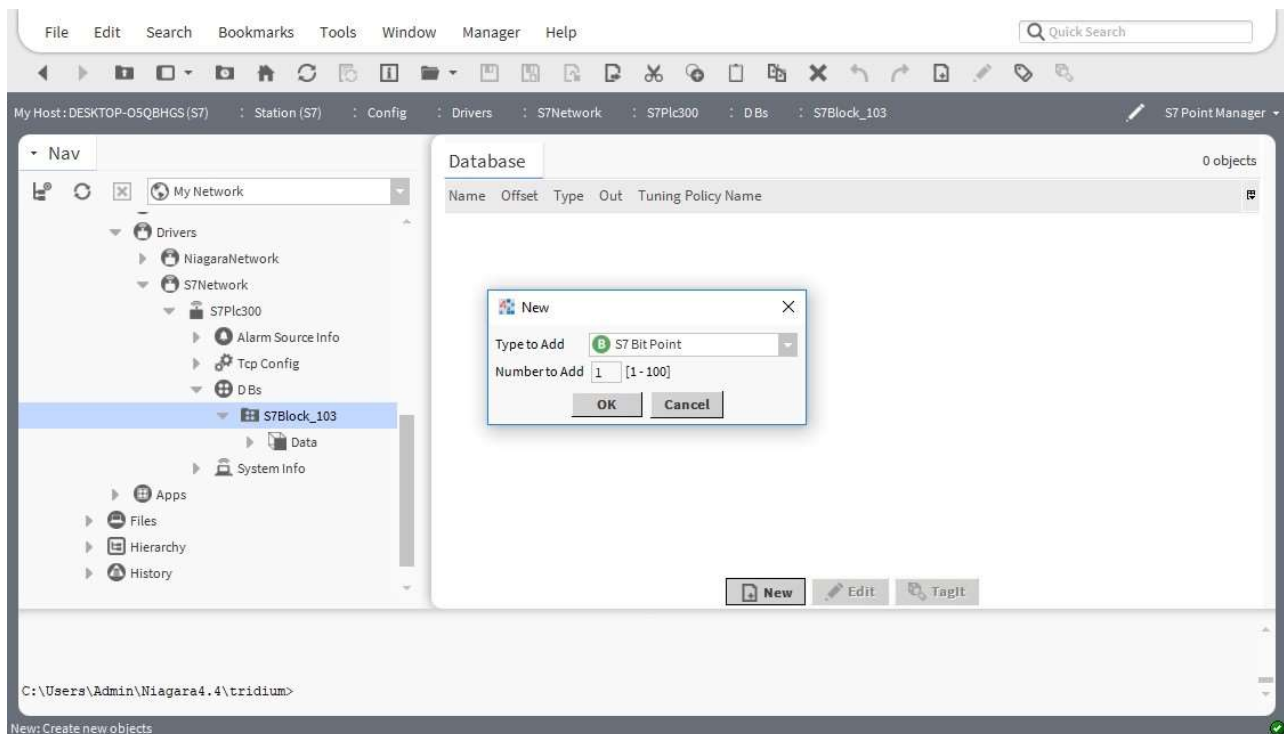


Figure 20: Adding a new S7 point

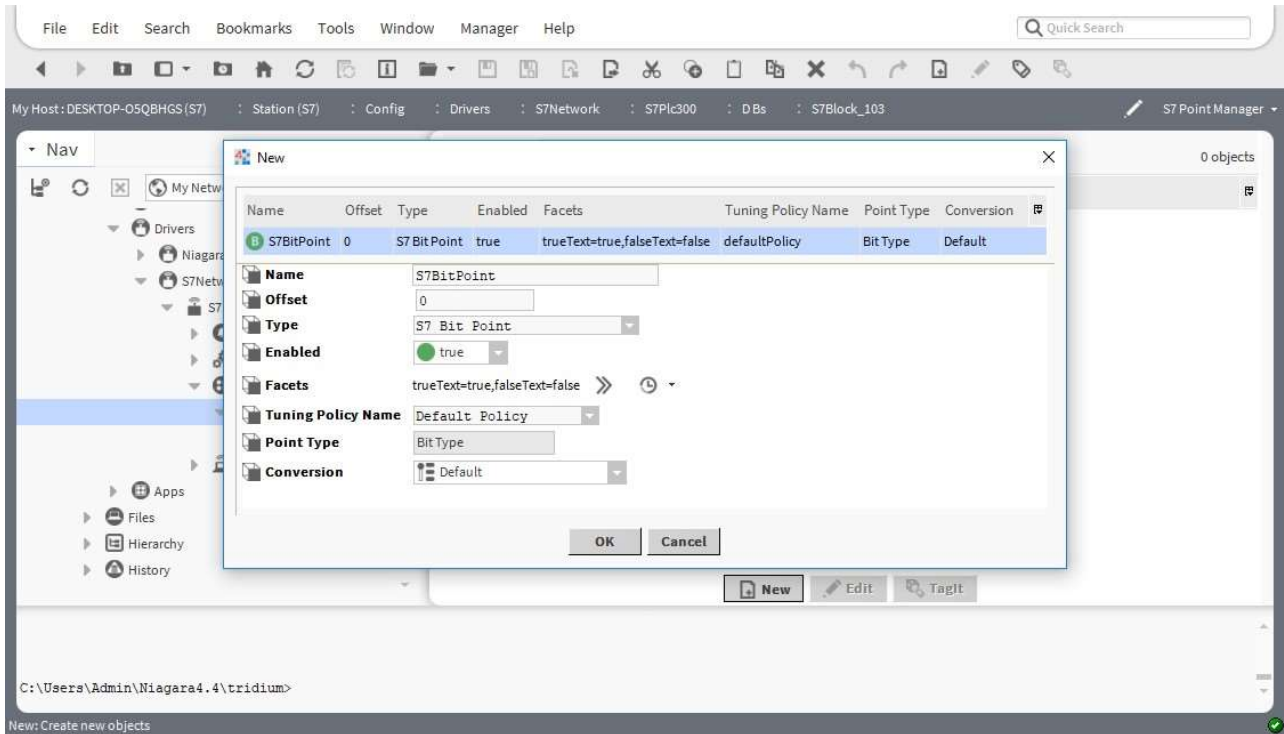


Figure 21: Set start offset in the DB

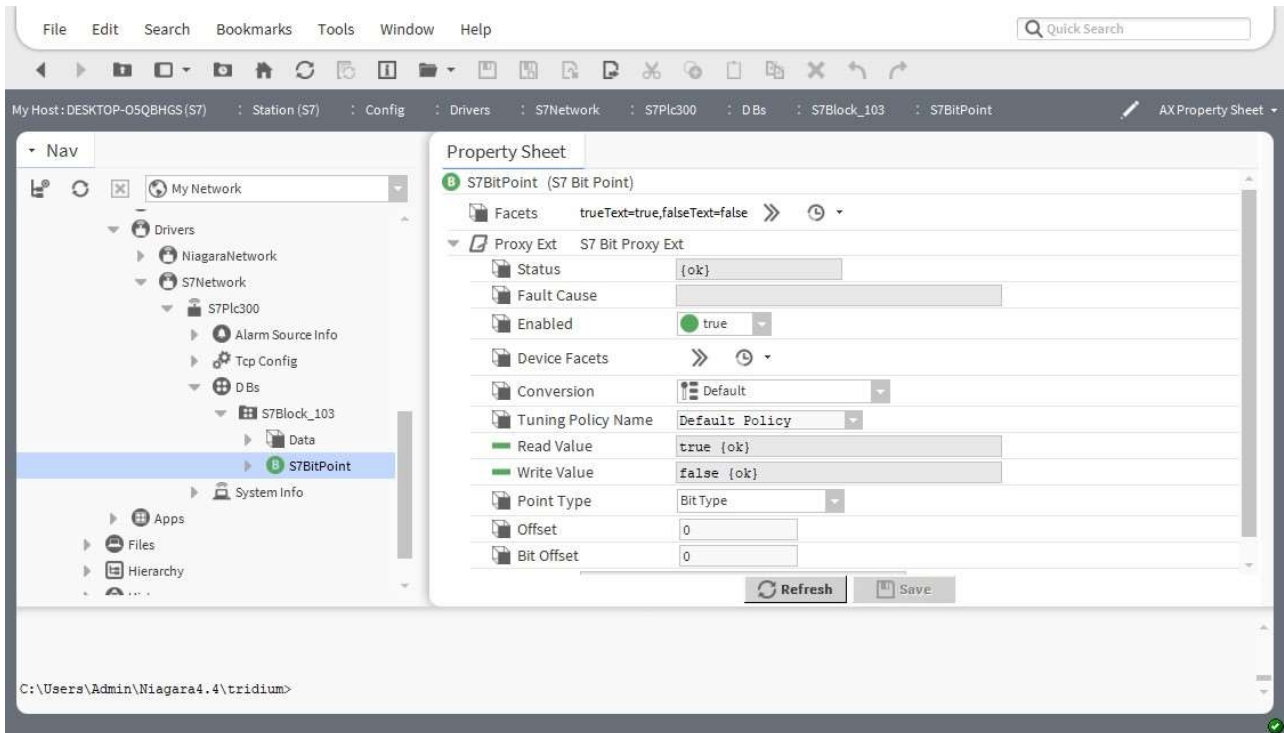


Figure 22: Set bit offset in the byte

Siemens data representation in Niagara:

S7 Data Type	Niagara Control Point
Bit	Boolean Point / Boolean Writable
Short	Numeric Point / Numeric Writable
Word	
Double Word	
Float	
Date	String Point / String Writable
String	
Printable String	

FAQ

Q: The driver doesn't establish communication with S7-1200 PLC.

A: Check the IP address and set the slot number to "1".

Q: How to set bit offset for the bit point / writable?

A: Open the proxy Ext under the bit point property sheet and set the required offset in the attribute Bit offset.

Q: Can I add the DB manually without connected PLC?

A: All the points can be added manually before on-site installation.

Q: The data in DB are empty, or the point under DB is in a fault state.

A: Check the Block Number and Mcc length in the program in S7 PLC. Check the attribute Point Type under point Proxy Ext.