

Design-Guideline

Commissioning the FieldConnex® PROFINET Power Hub



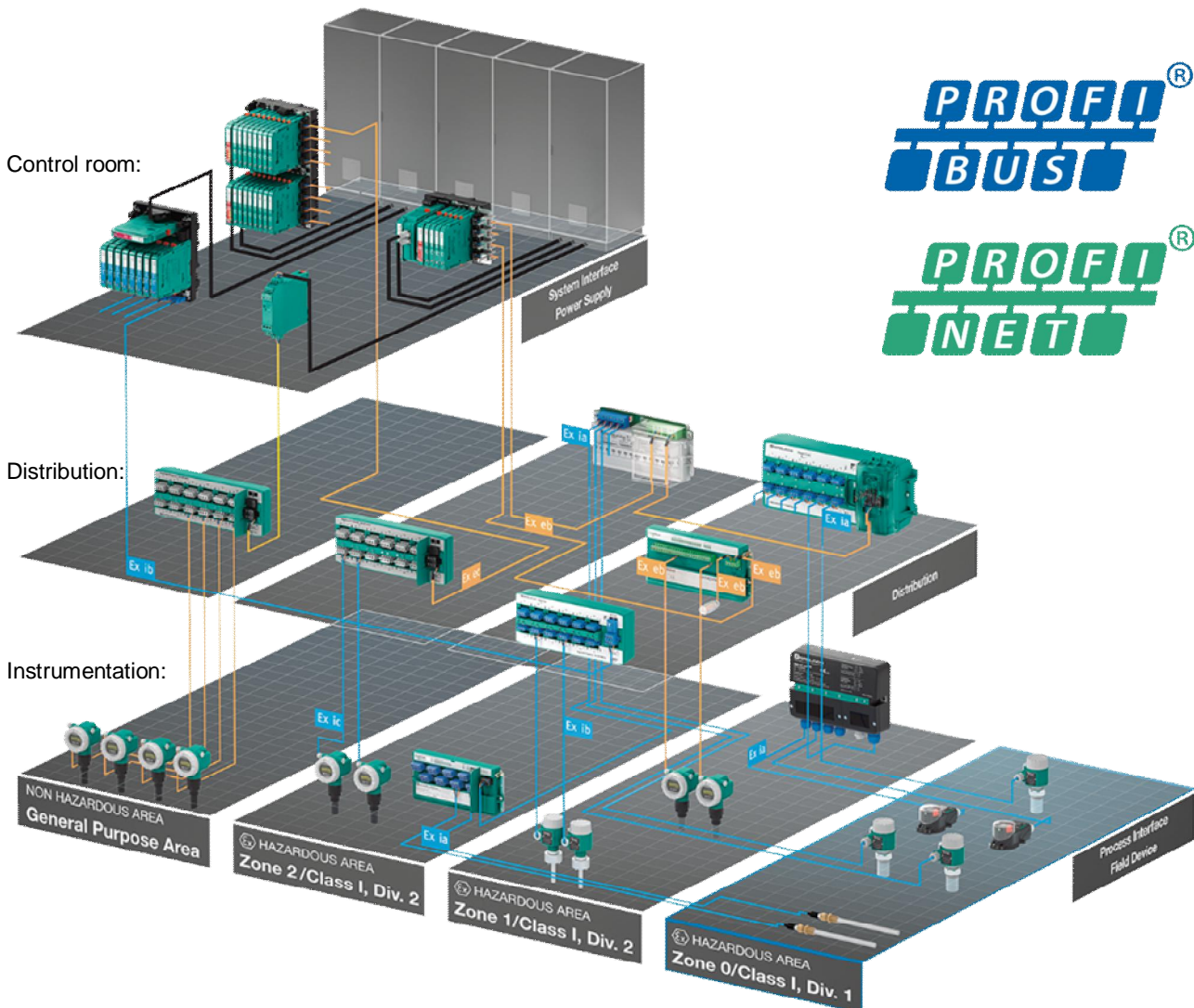
Quality Information from a Quality Supplier

This publication utilizes Pepperl+Fuchs' expertise and knowledge to provide a clear insight into technological and application issues you may face with a fieldbus installation. It corresponds to our way of working and thinking: combining state-of-the-art technologies with years of research and innovation to simplify planning, installation and commissioning, operation, and plant upkeep.

Our promise is to simplify your work processes with fieldbus: You can stay focused on your day-to-day business with a reliable FieldConnex® fieldbus infrastructure. It ensures the connection between DCS and instruments, fully digital with explosion protection for any hazardous area. We are driven to provide innovation with proven reliability for process automation practitioners:

- § FieldConnex is robust, reliable, and the first choice of many well-known end users worldwide.
- § Advanced physical layer diagnostics reach down to spurs, accessories, and instruments; interpret data, and provide detailed fault analysis. Water ingress and worn-out surge protectors are identified without manual inspection.
- § The High-Power Trunk concept allows long cable runs and high device counts and is now an industry standard.

If the content of this paper sparks comments or questions, we invite you to contact your Pepperl+Fuchs office or representative to get in touch with the experts. We are glad to share our expertise with you for your business success.



Abstract

Nowadays, fieldbus infrastructure plays a significant role in the process automation. It is reliable and cost-effective. The topology requirement of the industrial field components, signal transfer rate, and system eligibility in hazardous areas make it a result of the latest industry evolution.

PROFIBUS PA enables the connection of long cables for field device. It guarantees the credibility of signal data transfer between the DCS and the field devices in both hazardous areas and non-hazardous areas. An industrial Ethernet namely the PROFINET has been introduced in order for the field devices to communicate at high baud rate.

Pepperl+Fuchs is well-known for its technology in process automation. It offers the FieldConnex PROFINET IO Power Hub which is approved for installation in Zone 2 or Division 2 hazardous areas. There are tools for DCS integration which enable the easy configuration and troubleshooting of the gateway as well as the field devices.

This paper presents the essential information to commission PROFIBUS PA networks via the FieldConnex PROFINET IO Power Hub with the Siemens PCS 7. The commissioning with other Siemens DCS is generally similar.

Adequate attention has been dedicated for the details of system commissioning procedure as well as its verification via the corresponding software. The illustrations that are used in the documents are subjected to deviations depending on the software versions and the examples which are used. This commissioning guide can assist your implementation of the innovation to use PROFINET in your Plant Asset Management. Pepperl+Fuchs does not hold any obligations to any detail discrepancy of this commissioning guide. We wish you all the best for your project with PROFINET.

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Abbreviations

Abbreviation	Definition
CPU	Central processing unit
DCP	Dynamic Configuration Protocol
DCS	Distributed control system
DHCP	Dynamic Host Configuration Protocol
DP	Decentralized Peripherals
DTM	Device type manager
FDT	Field Device Tool
GSD	Generic Station Description
GSDML	General Station Description Mark-up Language
IO	Input/output
IP	Internet Protocol
MAC	Media Access Control
PA	Process automation
PCS	Process control system
PN IO	PROFINET IO interface
PROFIBUS	Process Field Bus
PROFINET	Process Field Net
r/w	Read / write
Seg	Segment

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1 Introduction

FieldConnex is a Pepperl+Fuchs brand name and comprises a comprehensive fieldbus infrastructure that connects the control system to field devices. It is designed for the fieldbus protocols FOUNDATION Fieldbus H1 and PROFIBUS PA.

PROFIBUS PA is a robust fieldbus with a baud rate of 31.25 kilobits per second designed to operate in harsh environments with long cable lengths. It is typically operated as a subnetwork to PROFIBUS DP which supports baud rate up to 12 Megabits per second (see: Figure 1: PROFIBUS PA as a subnetwork to PROFIBUS DP).

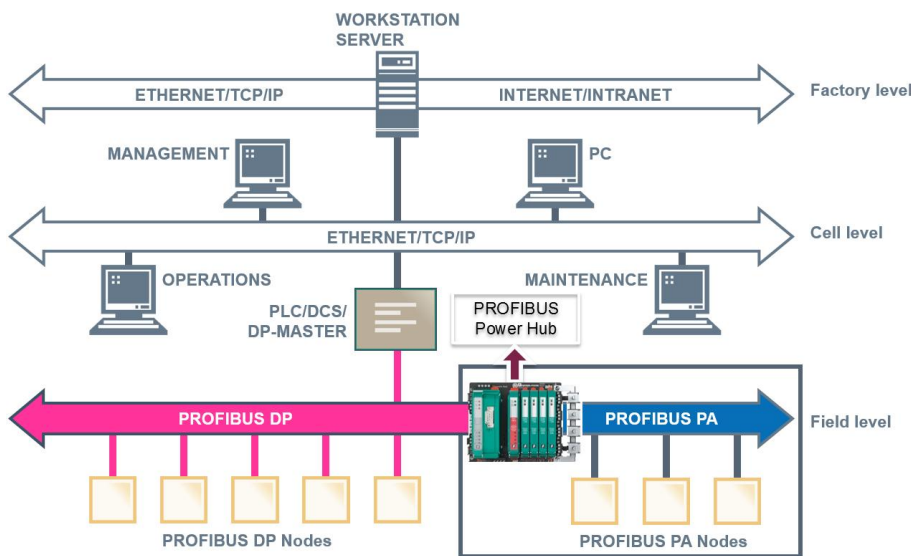


Figure 1: PROFIBUS PA as a subnetwork to PROFIBUS DP

PROFIBUS PA can now communicate over PROFINET, an Industrial Ethernet with a baud rate of 100 Megabits per second. FieldConnex PROFINET IO Power Hub will be integrated for the application of PROFIBUS PA devices via the PN IO to the controller. The gateway which is part of the PROFINET Power Hub operates with power supply modules that are connected to the same or a separate motherboard (see: Figure 2: PROFIBUS PA as a subnetwork to PROFINET).

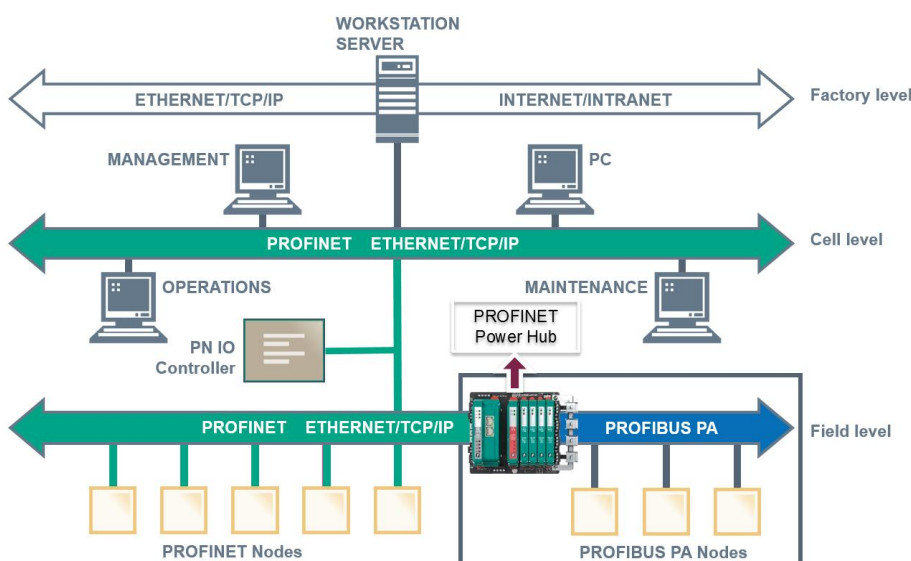


Figure 2: PROFIBUS PA as a subnetwork to PROFINET

The PN IO system consists of the IO Controller, the IO Supervisor, and IO Devices. Each component has its function to allow the data transfer (see: Figure 3: The functions of the PROFINET IO components).

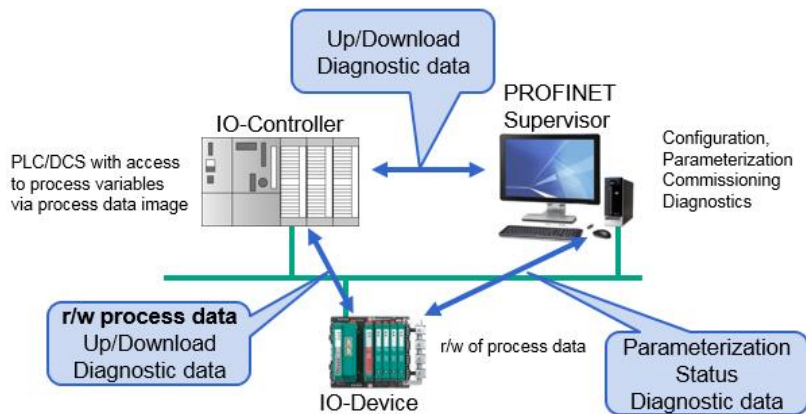


Figure 3: The functions of the PROFINET IO components

The components that are involved in the communication via PROFINET IO are similar to those via PROFIBUS DP. Therefore, a comparison can be made for the users who are already familiar to PROFIBUS DP (see: Table 1: PROFINET IO components).

Table 1: PROFINET IO components	
PROFINET IO component	Comparable PROFIBUS DP component
IO Controller	PROFIBUS DP Master class 1
IO Supervisor	PROFIBUS DP Master class 2 (configuration tool)
IO Device	PROFIBUS DP slave

The data exchange between the IO Controllers and the IO Devices follows the provider-consumer model which is based on a Real-Time communication (see: Figure 4: Provider-consumer model).

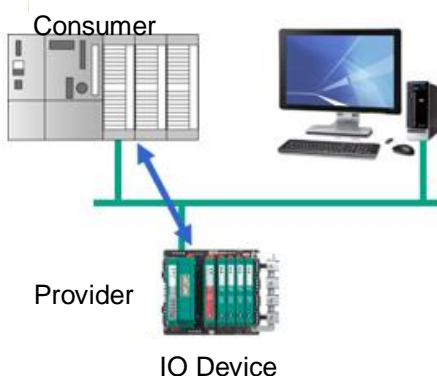


Figure 4: Provider-consumer model

The gateway driver libraries for different PN IO Controllers are developed, tested, and approved by the controller vendor development teams. Apart from that, the gateway DTM and a web server enable access to the gateway status and diagnosis via the IO Supervisor. The vendors' DTM enables parameterization, diagnosis, and status information of the PROFIBUS PA devices.

The PROFINET gateway is an IO Device which supports DCP and DHCP. DCP is a special PROFINET protocol to set and combine IP address and Name. When DHCP is activated, the IO Supervisor will configure the valid IP address to an IO Device by resetting it back to the factory setting.

2 Components

This chapter introduces the mentioned fundamental terms in this commissioning guide.

2.1 Hardware and Interface

DCS	In the fieldbus context, DCS uses fieldbuses to connect transducers and actuators. A control loop manager as well as a process monitoring system are parts of a DCS. Whenever necessary, operating personnel may intervene manually, e.g. if faults.
MAC address	Each Ethernet interface has been given a fixed, globally unique address by its manufacturer referred as the MAC address. This is stored on the network card and is used for identification in the local network.
PROFIBUS DP	Master-slave bus protocol according to RS485 hardware architecture which offers fast and deterministic data exchange. Standard also covers redundancy. Nodes are connected to the bus in parallel
PROFIBUS PA	Operation as a subnetwork to PROFIBUS DP or PROFINET. The Segment Coupler connects the two networks for data transfer and supplies power to the PROFIBUS PA segment
PROFINET	Provider-consumer bus protocol according to Ethernet hardware architecture which is qualified for deterministic and faster data exchange compared to PROFIBUS DP.
PROFINET IO	The interface for fast data exchange between IO Controllers and IO Devices which are the Ethernet-based field devices.
PROFINET Power Hub	Modular, motherboard-based power supply system for four PROFIBUS PA segments. It consists of one or two motherboards with plug-in modules for power supply to the segment, connection to PROFINET and advanced diagnostics for the physical layer.

2.2 Software and Files

DTM	The DTM is a graphical software module to parameterize a field device. A DTM is manufacturer-specific. It is integrated in the framework application
FDT	The FDT concept created a standard to integrate devices in various user interfaces (framework applications such as PACTware™). It specifies the data exchange between the device-specific driver and the framework application.
GSD file	The GSD file is a specific configuration file of PROFIBUS DP/PA device. It allows the configuration of input and output data during cyclic communication.
GSDML file	GSD files written in XML based language contains the required parameters of the PROFIBUS PA devices.

3 Overview

For a smooth commissioning of the PROFINET Power Hub, there are a series of essential steps to consider (see: Figure 5: Essential steps for the commissioning of PROFINET Power Hub).

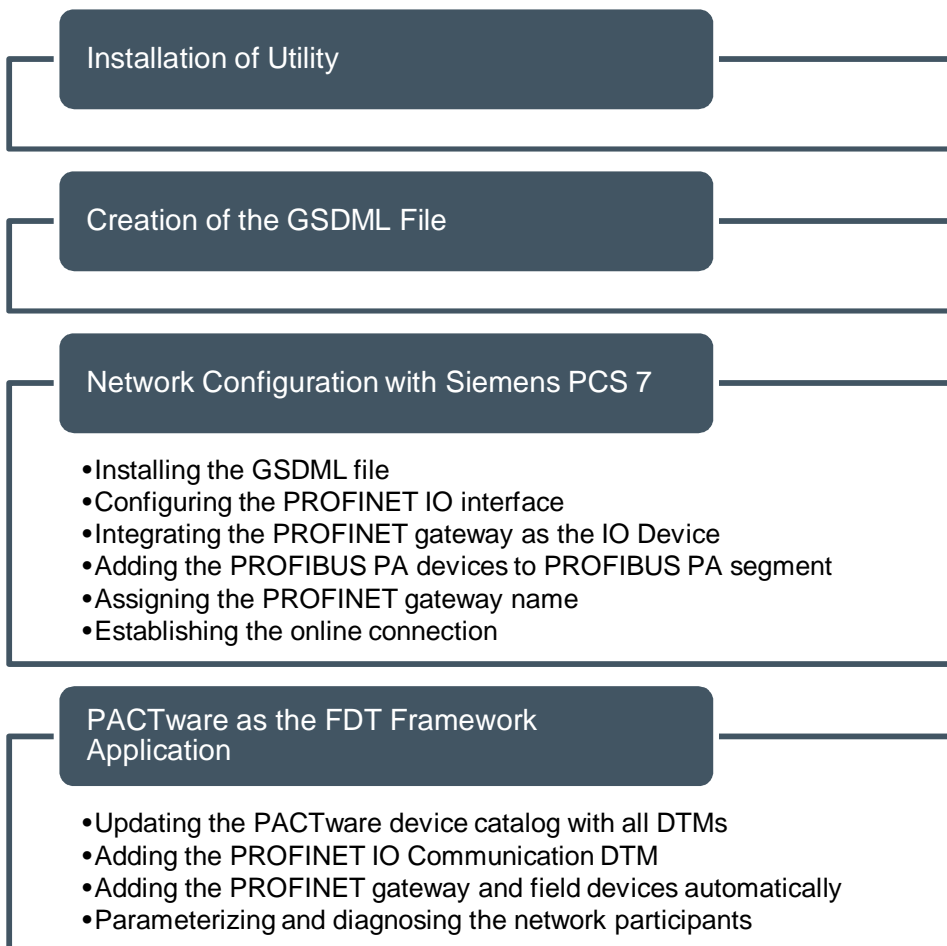


Figure 5: Essential steps for the commissioning of PROFINET Power Hub

4 Installation of Utilities

Installations of software and applications to a workstation are mandatory to allow the functions of the IO Supervisor in PROFINET communication.

All Pepperl+Fuchs software and applications can be downloaded at www.pepperl-fuchs.com. Navigation for the search of respective software or application at the website are provided below (see: Table 2: Navigation for installation of utility).

Software / application	Search path in the website	Action after download
DTM collection (DTM FieldConnex is the mandatory DTM collection because it contains DTM for PROFINET IO Communication and DTM for the gateway module of the FieldConnex PROFINET Power Hub)	<ol style="list-style-type: none"> 1) Go to Products > Explosion Protection > Software 2) Select Software > DTM Collection 3) Download the corresponding DTM collections for all the field devices <p><u>Example 1: for an Ultrasonic Level Sensor LUC-M**</u></p> <ol style="list-style-type: none"> a. Choose Level Control DTM b. Download the corresponding ZIP file from the list of DTMs <p><u>Example 2: for Multi-Input/Output Device R8D0-MIO-Ex12.PA*</u></p> <ol style="list-style-type: none"> a. Choose DTM FieldConnex b. Download the corresponding ZIP file from the list of software tools 	<ol style="list-style-type: none"> 1) Extract each folder 2) Install the DTMs
GSD files (for each PROFIBUS PA device)	<p>For <u>Example 1</u></p> <ol style="list-style-type: none"> 1) Search for LUC-M** 2) Download the corresponding ZIP file from the list of drivers <p>For <u>Example 2</u></p> <ol style="list-style-type: none"> 1) Search for R8D0-MIO-Ex12.PA* 2) Download the corresponding ZIP file from the list of drivers 	Extract each folder
PACTware 4.1	<ol style="list-style-type: none"> 1) Search for PACTware 2) Choose PACTware 4.1 3) Download the corresponding ZIP file from the list of software tools 	<ol style="list-style-type: none"> 1) Extract the folder 2) Install the software
PROFINET GSD Generator	<ol style="list-style-type: none"> 1) Search for PROFINET Power Hub 2) Download the corresponding ZIP file from the list of software tools 	<ol style="list-style-type: none"> 1) Extract the folder 2) Install the software

DTMs and GSDs of third-party field devices have to be downloaded based on the respective vendor's source.

Additionally, the DCS vendor has corresponding software which needs to be installed for configurations to allow cyclic communication between IO Controller and IO Devices. The installation source is dependent on the choice of DCS. Field devices which do not have a DTM can still be parameterized and diagnosed in this software, for example, the old sensor interface FD0-BI-Ex12.PA from Pepperl+Fuchs which possesses only a GSD file. Besides, the software as the IO Supervisor could be capable to allow assignment of IP address to IO Devices via:

- § IO Controller automatically,
- § the operating personnel manually, and
- § the DHCP automatically.

If that is not the case, download the Pepperl+Fuchs Discovery and Configuration Tool (see: chapter 8.3) for these purposes (see: Table 3: Navigation for installation of Pepperl+Fuchs Discovery and Configuration Tool).

Software / application	Search path in the website	Action after download
Pepperl+Fuchs Discovery and Configuration Tool	<ol style="list-style-type: none"> 1) Search for PROFINET Power Hub 2) Download the corresponding ZIP file from the list of software tools 	<ol style="list-style-type: none"> 1) Extract the folder 2) Install the software

5 Creation of the GSDML File

A field device presents its functionality to a PROFINET IO controller via a GSDML file which contains all relevant data for engineering and data exchange. Generation of the GSDML file can be done using the PROFINET GSD Generator.

- 1) Open the **PROFINET GSD Generator**
- 2) Click the icon **Select folder** (see: Figure 6: Search for GSD file folder).

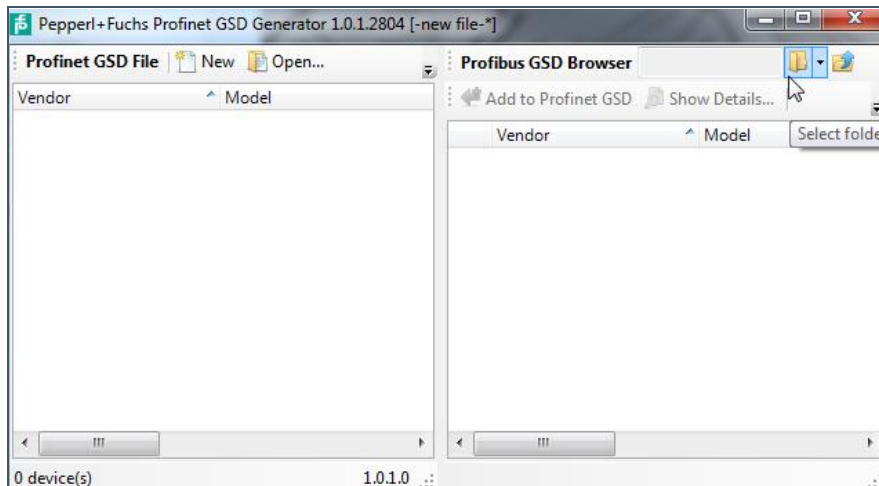


Figure 6: Search for GSD file folder

The examples which are used in the procedure are the downloaded GSD files for Ultrasonic Level Sensor LUC-M** (example 1) and Multi-Input/Output Device R8D0-MIO-Ex12.PA* (example 2).

- 3) Select the GSD file **folder** for the example 1 and click **OK** (see: Figure 7: Select GSD file folder).

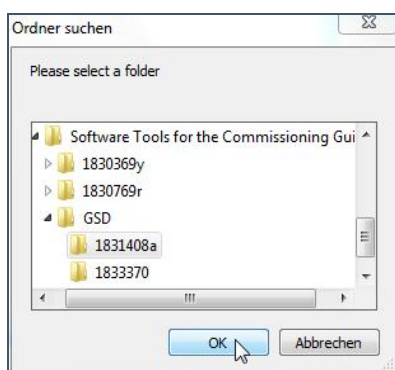


Figure 7: Select GSD file folder

The GSD will be added to PROFIBUS GSD Browser (see: Figure 8: Update of PROFIBUS GSD).

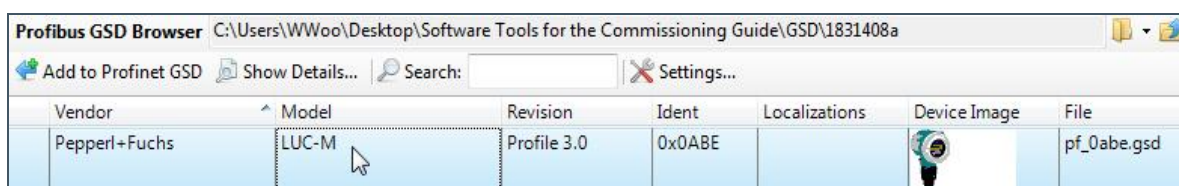


Figure 8: Update of PROFIBUS GSD

- 4) Click **Add to Profinet GSD** (see: Figure 9: Adding the PROFIBUS GSD to PROFINET GSD).



Figure 9: Adding the PROFIBUS GSD to PROFINET GSD

It shall appear under PROFINET GSD file list now (see: Figure 10: Update of PROFINET GSD list).

Profinet GSD File		
Vendor	Model	Ident
Pepperl+Fuchs	LUC-M (Profile 3.0)	0x0ABE

Figure 10: Update of PROFINET GSD list

Repeat steps 2 to 4 for additional GSD files. In this example, only one more GSD file for Multi-Input/Output Device R8D0-MIO-Ex12.PA* (example 2) is added. All the added GSD files shall appear after one another under PROFINET GSD file list (see: Figure 11: Complete list of PROFINET GSD to be converted to GSDML file).

Profinet GSD File		
Vendor	Model	Ident
Pepperl+Fuchs	LUC-M (Profile 3.0)	0x0ABE
PEPPERL+FUCHS	*D0-MIO-Ex12.PA* (Phy MBP) (1.0 MBP)	0x0F8B

Figure 11: Complete list of PROFINET GSD to be converted to GSDML file

- 5) **Save the GSDML file at a required location** (see: Figure 12: Create and save the GSDML file).

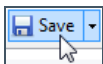


Figure 12: Create and save the GSDML file

The GSDML file is then saved at the required location (see: Figure 13: A GSDML file).

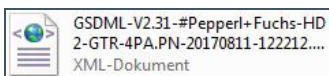


Figure 13: A GSDML file

6 Network Configuration with Siemens PCS 7

The real network participants have to be modeled and addressed with the DCS configuration software to allow the cyclic communication. It is just a part of the IO Supervisor which is responsible for the network configuration.

As an example, the configuration is done with the Siemens SIMATIC S7-300 as the PCS inside SIMATIC Manager software. The network configuration with other Siemens DCS/PCS using a different software is analogous.

6.1 Installing the GSDML file

- 1) Open the **SIMATIC Manager**.
- 2) Select **File > New...** to create a project (see: Figure 14: Creating a project in SIMATIC Manager).

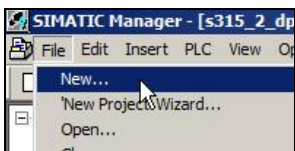


Figure 14: Creating a project in SIMATIC Manager

- 3) **Name the new project and click OK** (see: Figure 15: Naming the project).

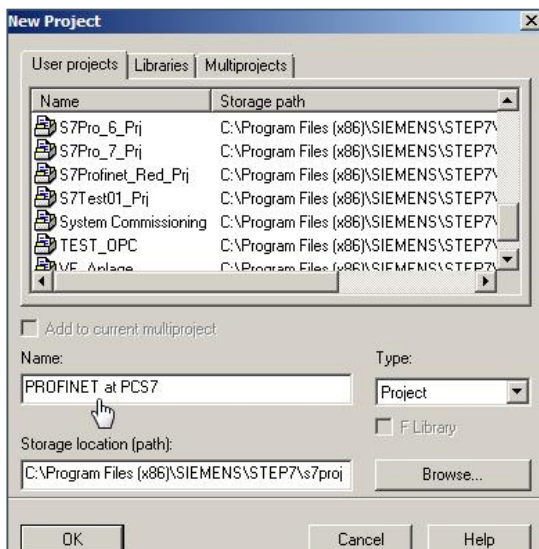


Figure 15: Naming the project

- 4) **Right-click the project and select Insert New Object > SIMATIC 300 Station** (see: Figure 16: Choose the PCS model corresponding to the system hardware).



Figure 16: Choose the PCS model corresponding to the system hardware

- 5) To start HW Config, right-click the PCS **SIMATIC 300(1)**, then select **Open Object** (see: Figure 17: Open Hardware configuration).

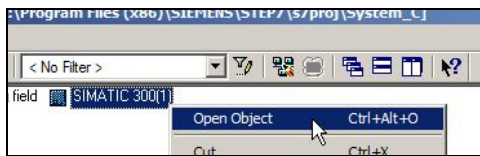


Figure 17: Open Hardware configuration

- 6) Select **Options > Install GSD File...** (see: Figure 18: Search for the GSDML file).

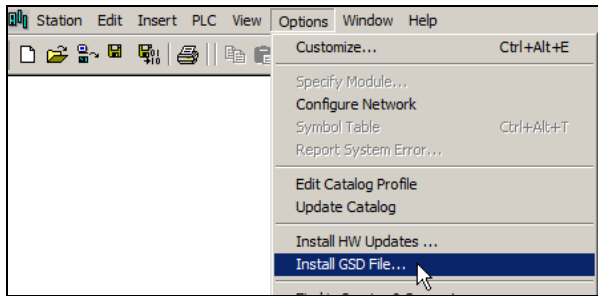


Figure 18: Search for the GSDML file

- 7) Search of the GSDML file with **Browse...**, then select **Install** (see: Figure 19: Installing the GSDML file).

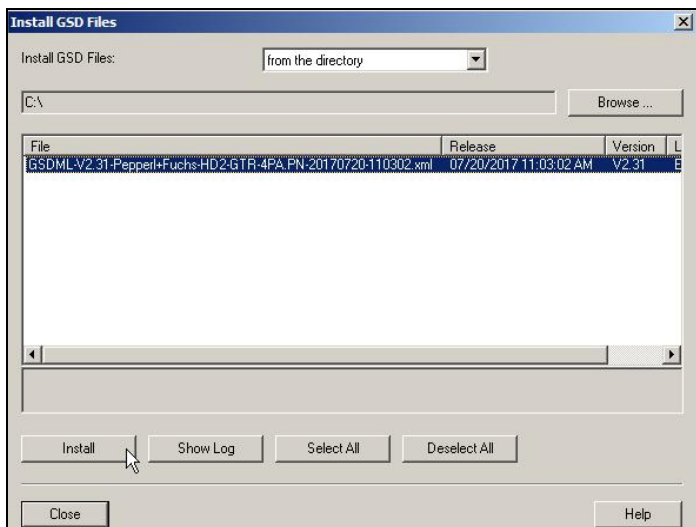


Figure 19: Installing the GSDML file

- 8) Once the installation is successful, click **OK** to the message (see: Figure 20: Message after successful installation), then **Close** the window as shown in step 7 above.

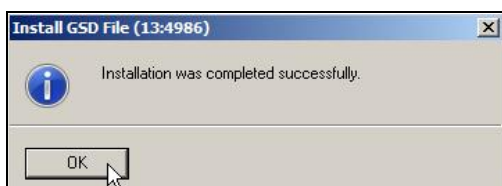


Figure 20: Message after successful installation

6.2 Configuring the PROFINET IO interface

- 1) At the right side of the window, select **SIMATIC 300 > RACK-300 > Rail** to add rail (see: Figure 21: Add rail).

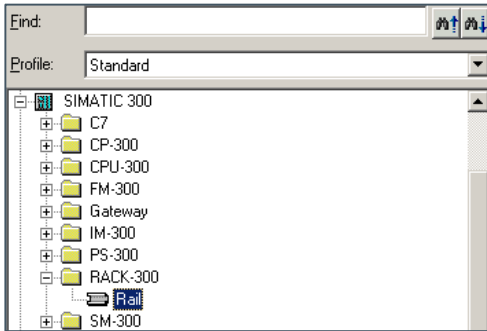


Figure 21: Add rail

- 2) To add the corresponding power supply, select **SIMATIC 300 > PS-300 > PS 307 5A** (see: Figure 22: Adding the corresponding power supply).

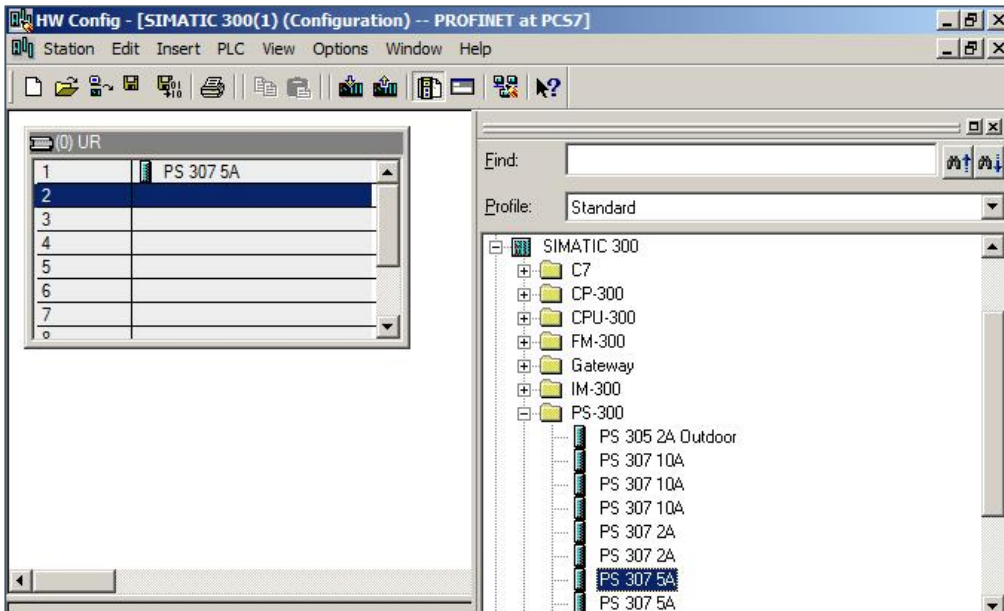


Figure 22: Adding the corresponding power supply

- 3) Select **SIMATIC 300 > CPU-300 > CPU 315-2 PN/DP > 6ES7 315-2EH13-0AB0 > V2.6** to add the corresponding CPU unit (see: Figure 23: Adding the corresponding CPU unit).

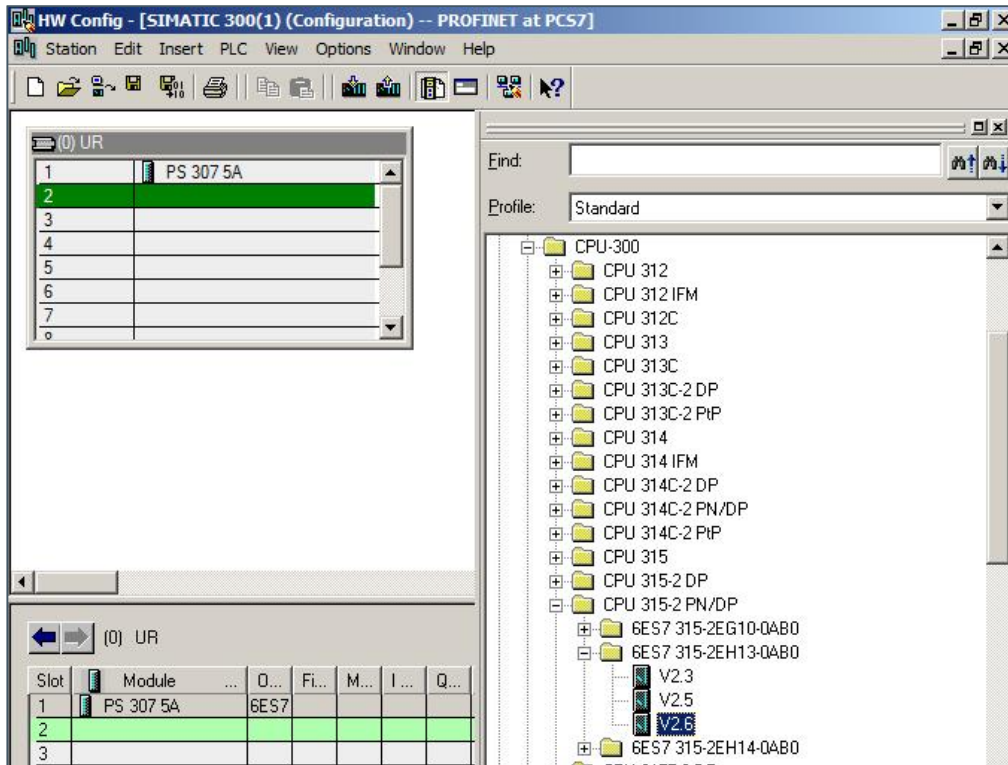


Figure 23: Adding the corresponding CPU unit

- 4) Key in the set **IP address** for the PROFINET IO Ethernet interface, then click **New** (see: Figure 24: Setting up PN IO IP address).

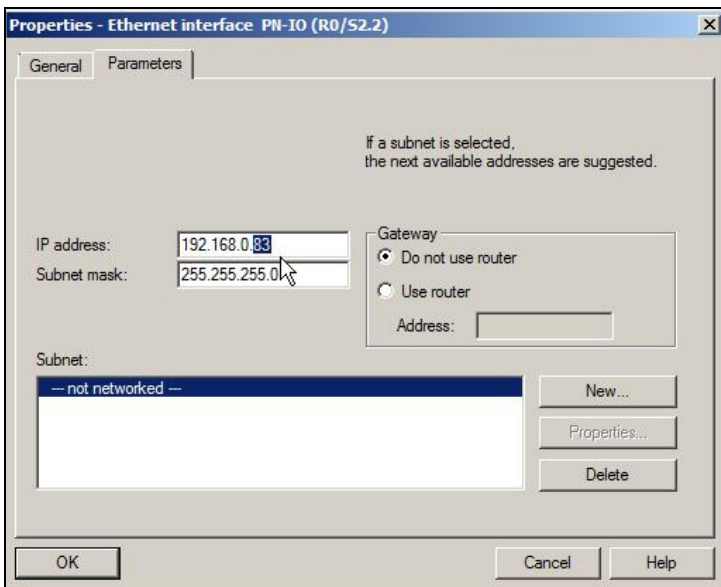


Figure 24: Setting up PN IO IP address

- 5) **Name** the new subnet and click **OK** (see: Figure 25: Creating and naming the new subnet).

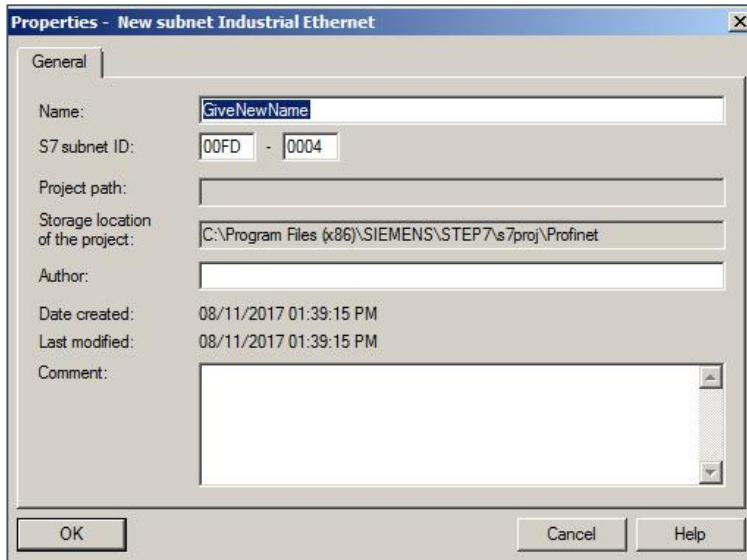


Figure 25: Creating and naming the new subnet

The images can be aligned as required (see: Figure 26: Connection between DCS and PROFINET IO system).

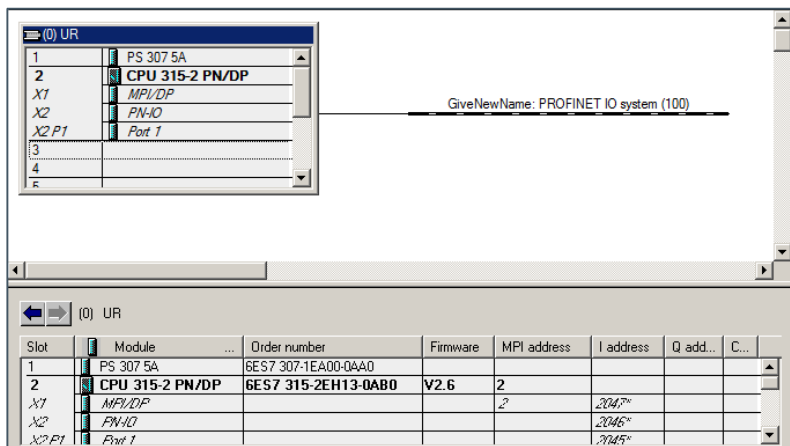


Figure 26: Connection between DCS and PROFINET IO system

6.3 Integrating the PROFINET gateway as the IO Device

- 1) Drag and drop the corresponding gateway to the PROFINET IO system. At the right side of the window, click **PROFINET IO > Additional Field Devices > Gateway > HD2-GTR-4PA.PN** (see: Figure 27: Drag and drop gateway to PROFINET IO system).

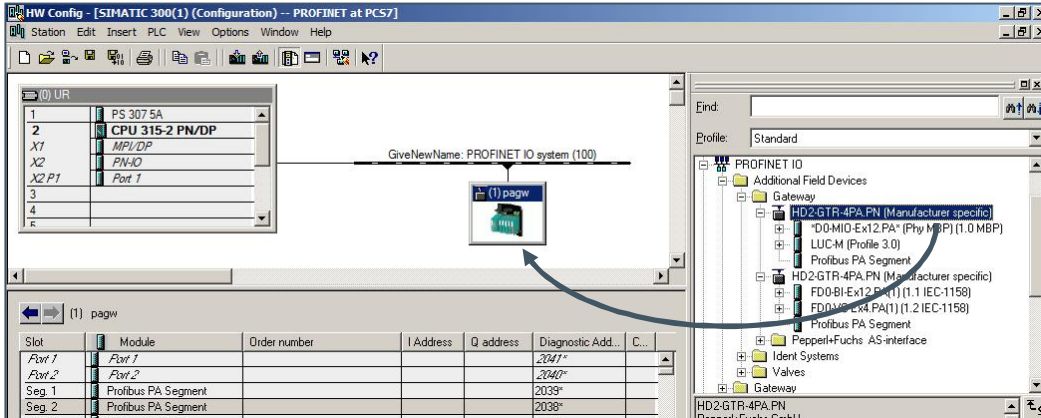


Figure 27: Drag and drop gateway to PROFINET IO system

Note that there are two identical PROFINET gateways shown in the list. However, currently there is no DCS available yet which will support a redundant FieldConnex PROFINET Power Hub, gateway module HD2-GTR-4PA.PN. The choice of the only gateway depends on the slot where the gateway is being inserted to the motherboard.

- 2) Double-click the icon of the inserted gateway and key in the **Device name** for the PROFINET gateway, then click **OK** (see: Figure 28: Keying in the PROFINET gateway device name).

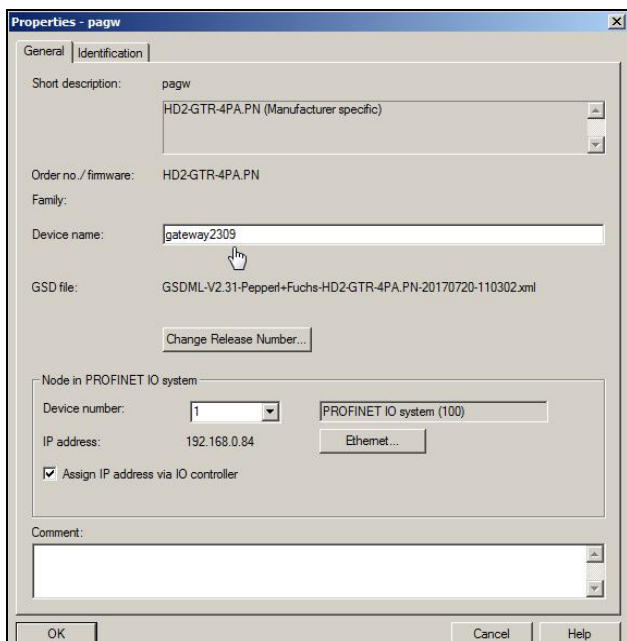


Figure 28: Keying in the PROFINET gateway device name

Note that there are naming conventions for the PROFINET IO Device. SIMATIC Manager does not verify these and allows invalid device names which will not work (see: 8.1). The default option with **Assign IP address via IO controller** is left unchanged. Nevertheless, the IP address can also be set manually or picked up automatically via DHCP (see: 8.2).

6.4 Adding the PROFIBUS PA devices to PROFIBUS PA segment

- 1) Optionally, delete the unused PROFIBUS PA segments to prevent any error coming from unused segment (see: Figure 29: Deleting unused PROFIBUS PA segments).

Slot	Module	Order number	I Ad...	Q...	D...	Comment
DAP	gateway2309	HD2-GTR-4PA.PN			2043	
Interface	Interface				2042	
Port 1	Port 1				2041	
Port 2	Port 2				2040	
Seg. 1	Profibus PA Segment				2039*	
Seg. 2	Profibus PA Segment				2038*	
Seg. 3	Profibus PA Segment				2037*	
Seg. 4	Profibus PA Segment				2036*	

Figure 29: Deleting unused PROFIBUS PA segments

Each PROFIBUS PA segment can accommodate a number of PROFIBUS PA devices with the options of device address range from 03 to 49. Each PROFIBUS PA device need to be added to the slot in the particular segment corresponding to its device address.

- 2) For the example 1 that is used so far, select the **Seg.1 05** (segment 1 slot 05) at the left bottom table. To add the Ultrasonic Level Sensor to **Seg.1 05**, click **PROFINET IO > Additional Field Devices > Gateway > HD2-GTR-4PA.PN > LUC-M (Profile 3.0)** at the right side of the window (see: Figure 30: Adding the Ultrasonic Level Sensor to PROFINET gateway).

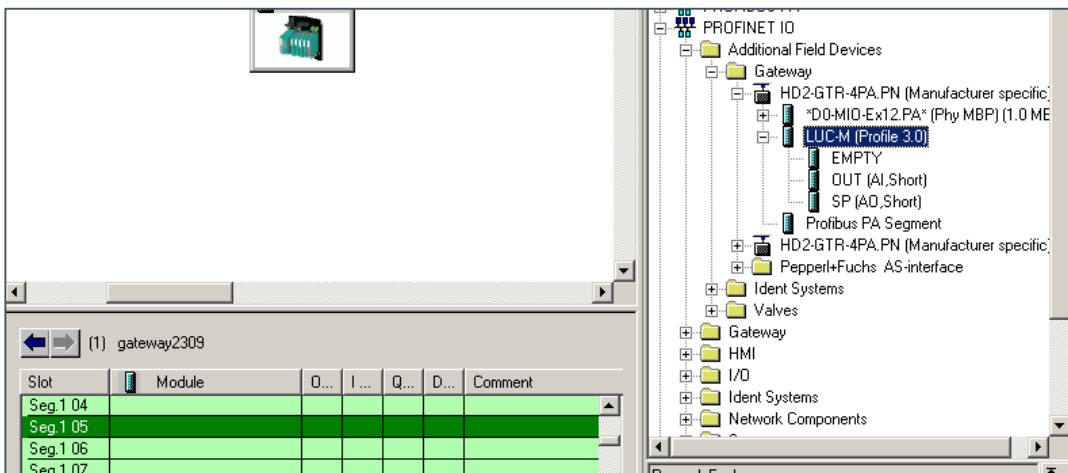


Figure 30: Adding the Ultrasonic Level Sensor to PROFINET gateway

The available IO modules of the PROFIBUS PA device will be added automatically into the subslots under the inserted device. For the example 1, under slot Seg.1 05 (see: Figure 31: Automatically added subslots under Seg. 1 05).

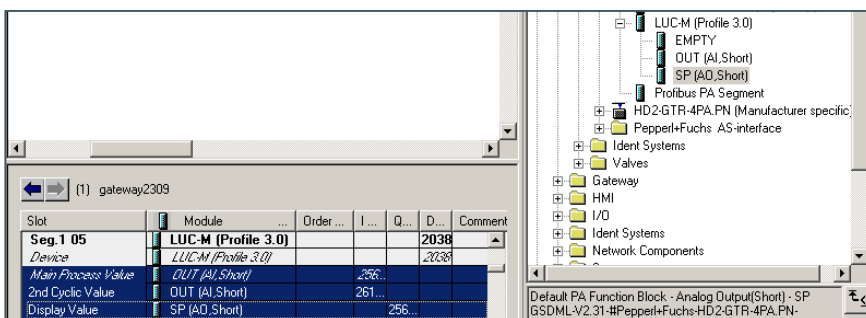


Figure 31: Automatically added subslots under Seg. 1 05

- 3) Step 2 is repeated for additional PROFIBUS PA devices. For the example 2 that is used so far, select the **Seg.1 06** at the left bottom table. To add the Multi-Input/Output Device to **Seg.1 06**, click **PROFINET IO > Additional Field Devices > Gateway > HD2-GTR-4PA.PN > *D0-MIO-Ex12.PA*(Phy MBP)(1.0 MBP)** at the right side of the window (see: Figure 32: Adding the Multi-Input/Output Device to PROFINET gateway).

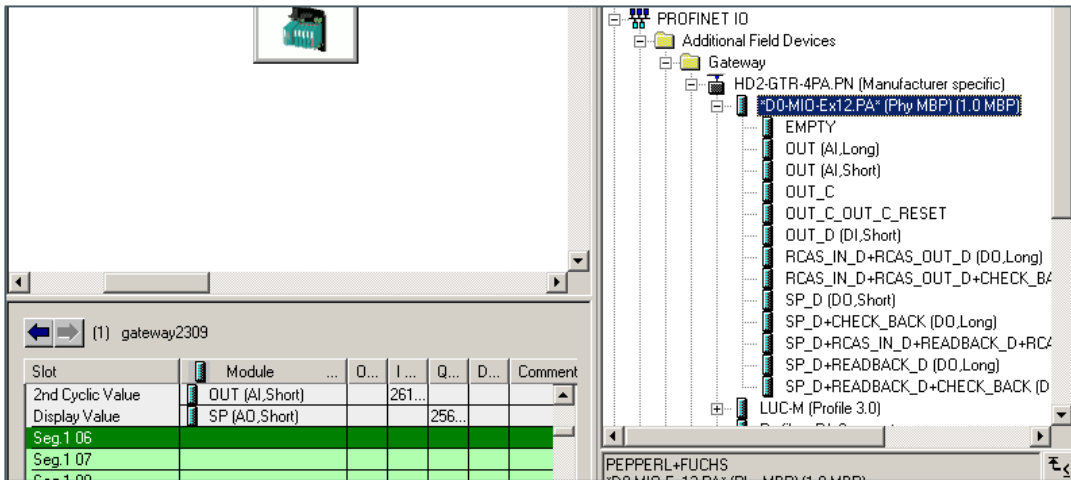


Figure 32: Adding the Multi-Input/Output Device to PROFINET gateway

The available IO modules of the PROFIBUS PA device will be added automatically into the subslots under the inserted device. For the example 2, under slot Seg.1 06 (see: Figure 33: Automatically added subslots under Seg. 1 06). For certain PROFIBUS PA devices such as this Multi-Input/Output Device, the IO modules added in the subslots might not be required. These might also be in the wrong sequence or need to be replaced with another IO modules. The operating personnel can manipulate this by deleting the automatically added IO modules, by rearranging them or by replacing them with other options from the list.

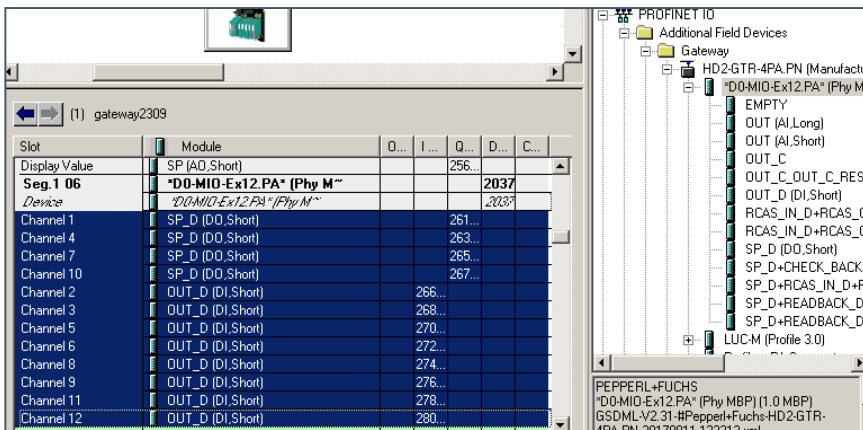


Figure 33: Automatically added subslots under Seg. 1 06

6.5 Assigning the PROFINET gateway name

- 1) Click **PLC > Ethernet > Assign Device Name...** (see: Figure 34: Search for window to assign device name).

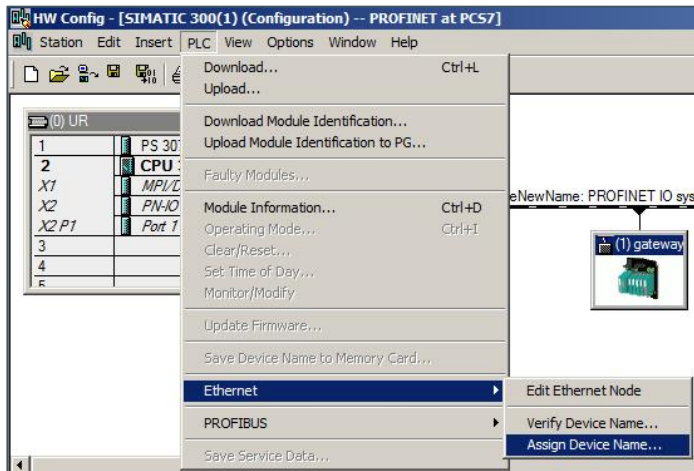


Figure 34: Search for window to assign device name

- 2) Make sure that the **Device name** is the same as set previously (see: Figure 28: Keying in the PROFINET gateway device name), then click **Assign name** (see: Figure 35: Assign device name).

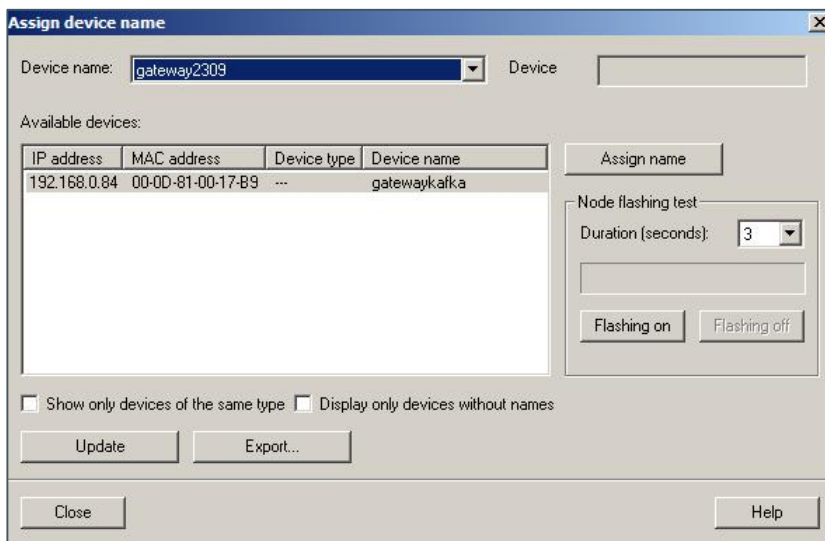


Figure 35: Assign device name

The device name shall be updated now to the assigned name (see: Figure 36: Updated device name of the gateway).

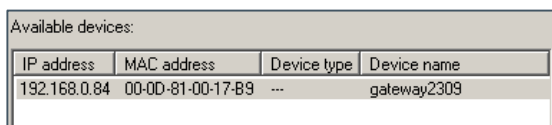


Figure 36: Updated device name of the gateway

- 3) Click **Close** to close the window.

6.6 Establishing the online connection

- 1) Click **PLC > Download...** (see: Figure 37: Searching for the target CPU unit).

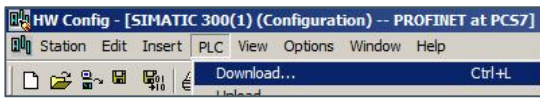


Figure 37: Searching for the target CPU unit

- 2) Select the CPU unit and click **OK** (see: Figure 38: Select the target CPU unit).

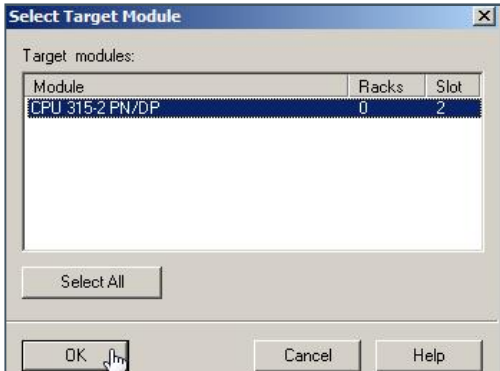


Figure 38: Select the target CPU unit

- 3) Key in the **PN IO IP address** (see: Figure 24: Setting up PN IO IP address) and click **OK** (see: Figure 39: Enter connection to target station).

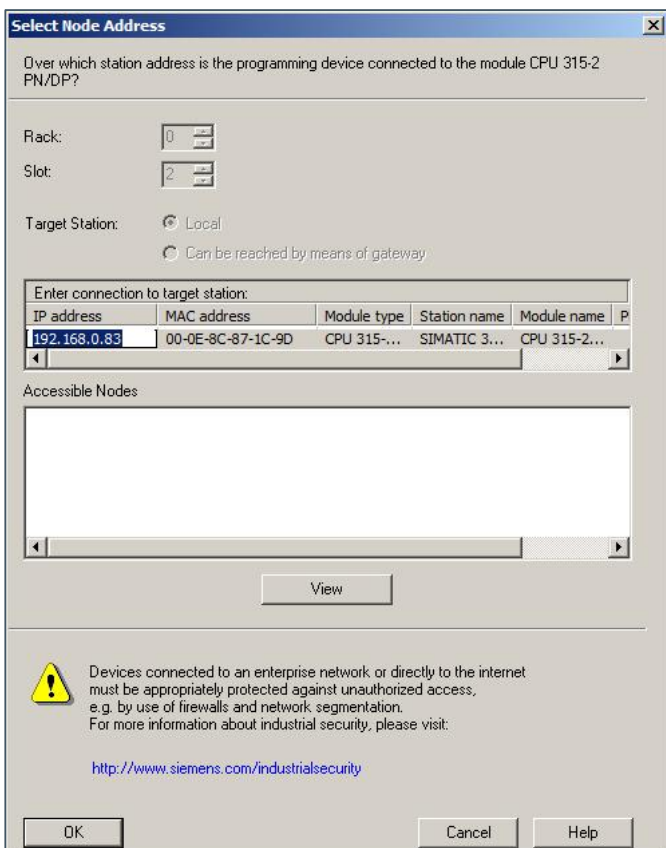


Figure 39: Enter connection to target station

- 4) Click **Yes** to start the module completely (see: Figure 40: Activate the CPU unit).

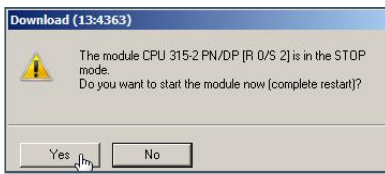


Figure 40: Activate the CPU unit

The PROFINET gateway HD2-GTR-4PA.PN as the IO Device and all the PROFIBUS PA devices with the correct configuration shall go online now. These can be diagnosed with the IP address of the IO Device. Make sure that the CPU is connected with the Ethernet cable to allow the physical PROFINET IO communication.

- 5) Key in the **IO Device IP address** into the web browser (see: Figure 41: Troubleshooting the PROFINET gateway with the connected PROFIBUS PA devices).

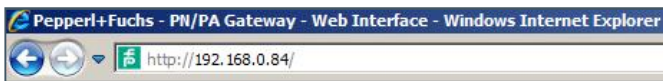


Figure 41: Troubleshooting the PROFINET gateway with the connected PROFIBUS PA devices

- 6) The PROFINET name will be shown as **Tag**. Select **Device > Diagnosis** to diagnose the connection with the PN IO (see: Figure 42: Diagnosis of PROFINET).

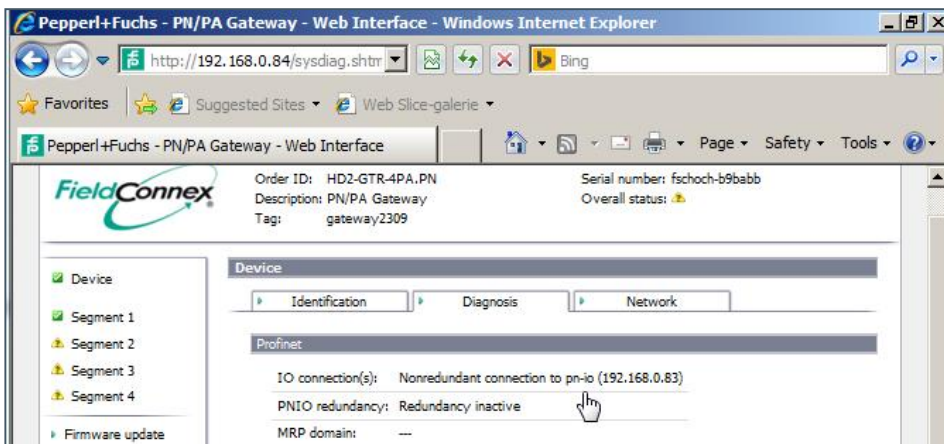


Figure 42: Diagnosis of PROFINET

- 7) At the left side, select the corresponding segment, such as **Segment 1** to view **Diagnosis and Field devices** for the segment status (see: Figure 43: Overall segment status for Segment 1).

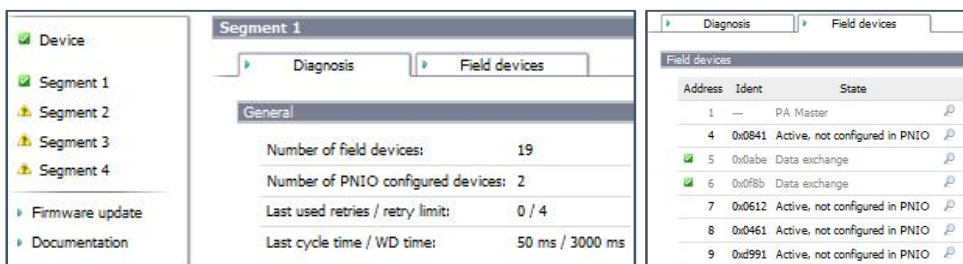


Figure 43: Overall segment status for Segment 1

7 PACTware as the FDT Framework Application

The DTM is the central access point for parameterization and diagnosis of a field device. It is implemented in the FDT frame and offers an overview of the actual network by displaying the DTMs for all devices and their functions.

7.1 Updating the PACTware device catalog with all DTMs

- 1) Open the **PACTware 4.1**.
- 2) Click **View > Device Catalog** to open device catalog (see: Figure 44: Open device catalog).

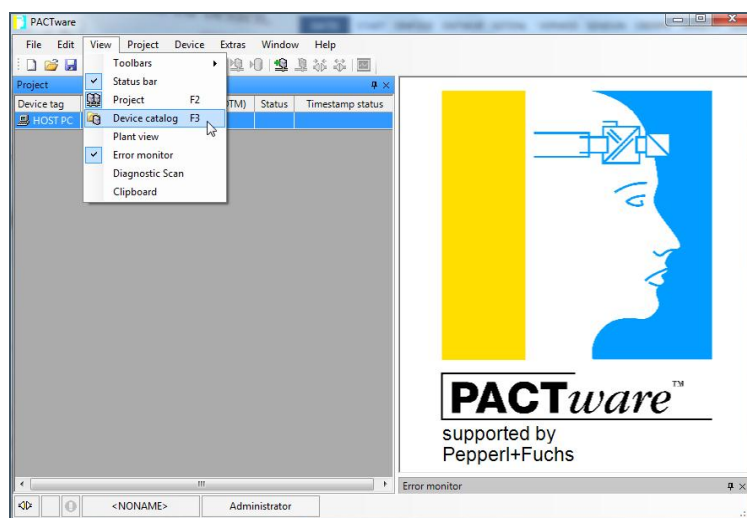


Figure 44: Open device catalog

- 3) To create new PACTware device catalog, click **Update device catalog**, then click **YES** to a popped out dialog box (see: Figure 45: Update device catalog).

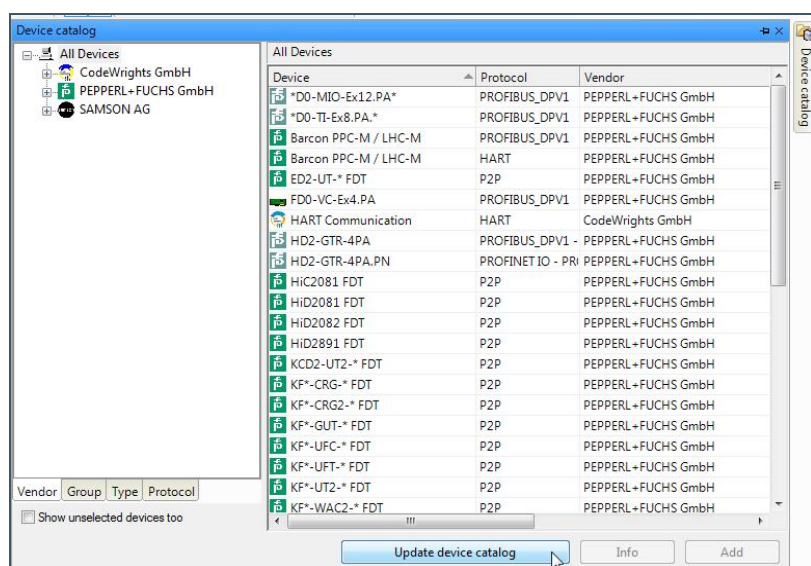


Figure 45: Update device catalog

All installed DTMs should be viewable in this list, else the DTM might have not been installed properly. Reinstall the DTM and perform the device catalog update again.

7.2 Adding the PROFINET IO communication DTM

- 1) Click **File > New** to create a project (see: Figure 46: Creating a project in PACTware).



Figure 46: Creating a project in PACTware

- 2) Right-click **Host PC**, then select **Add device** (see Figure 47: Adding device).

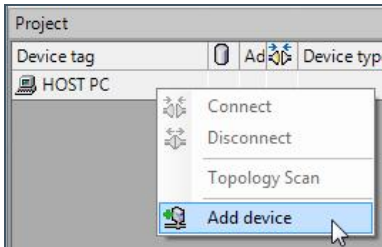


Figure 47: Adding device

- 3) Choose the **PNIO Comm DTM** and click **OK** (see: Figure 48: Choosing the PROFINET driver).

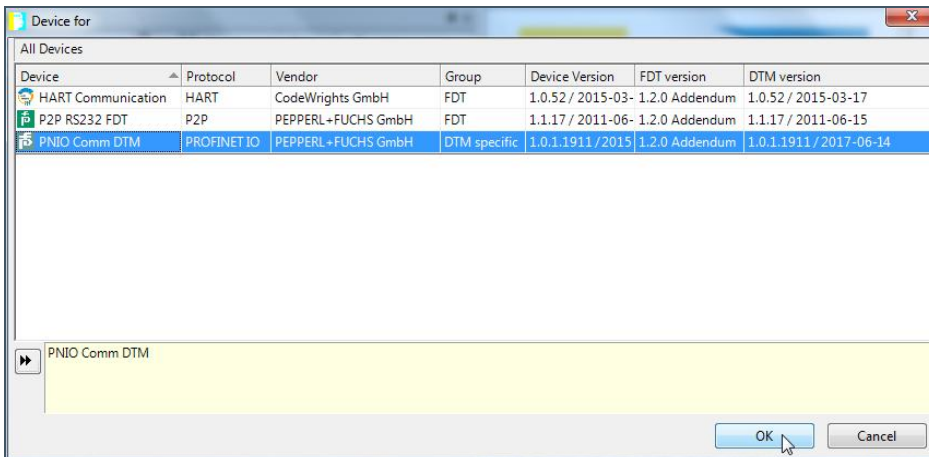


Figure 48: Choosing the PROFINET driver

7.3 Adding the PROFINET gateway and field devices automatically

- 1) Right-click **PNIO CommDTM**, then select **Additional functions** > **Topology Scan** (see: Figure 49: Search for Topology Scan of gateway module).

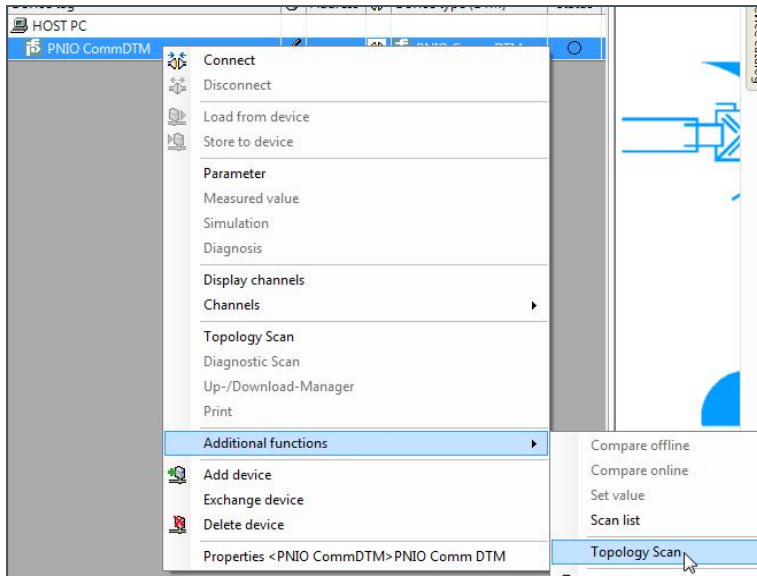


Figure 49: Search for Topology Scan of gateway module

- 2) Click the **Start** button (see: Figure 50: Start searching for gateway module).

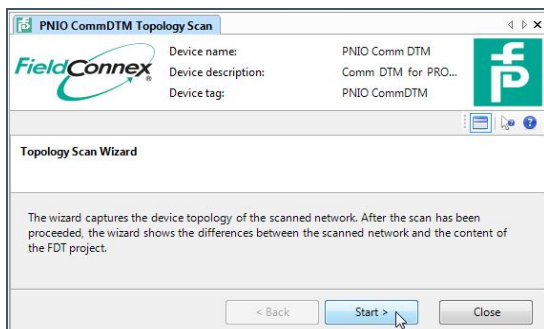


Figure 50: Start searching for gateway module

- 3) Click **Next** to confirm the found gateway module (see: Figure 51: Confirm the found gateway module).

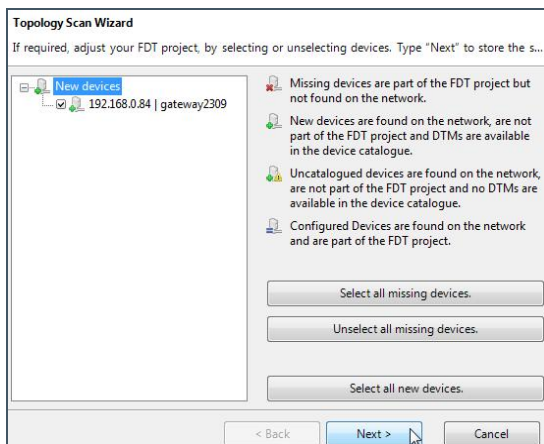


Figure 51: Confirm the found gateway module

- 4) **Close the Topology Scan Wizard** (see: Figure 52: Closing the Topology Scan Wizard).

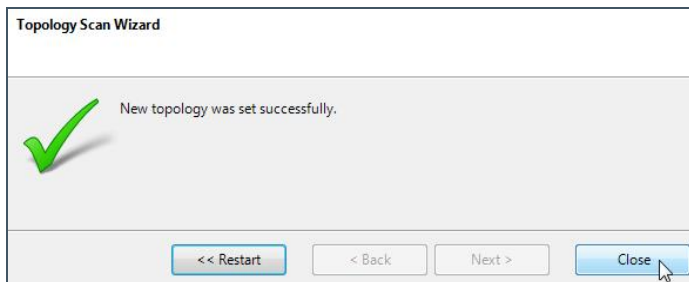


Figure 52: Closing the Topology Scan Wizard

- 5) **Connect the gateway** (see: Figure 53: Connecting the gateway to the interface).

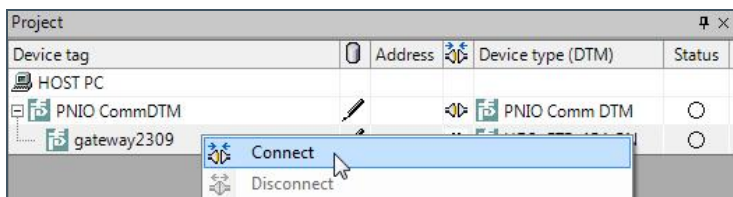


Figure 53: Connecting the gateway to the interface

- 6) **Right-click the PROFINET gateway, which has been assigned with the name gateway2309 in the example so far, then select Additional functions > Topology Scan** (see: Figure 54: Search for Topology Scan for PROFIBUS PA devices).

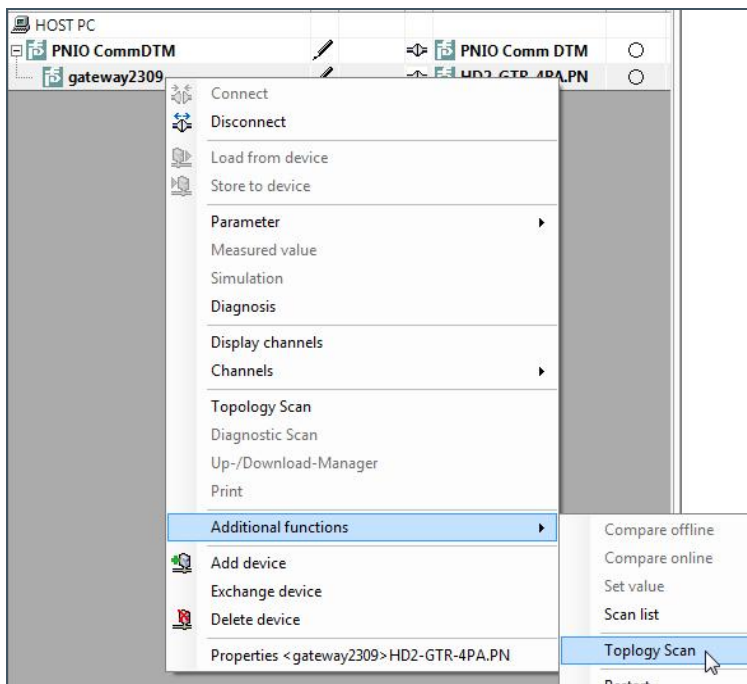


Figure 54: Search for Topology Scan for PROFIBUS PA devices

7) Click the **Start** button (see: Figure 55: Start searching for PROFIBUS PA devices).

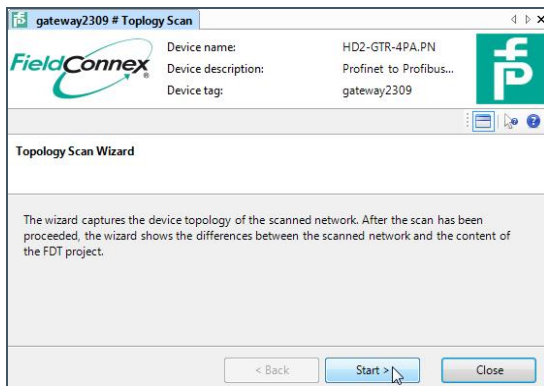


Figure 55: Start searching for PROFIBUS PA devices

8) Click **Next** to confirm the found PROFIBUS PA devices (see: Figure 56: Confirm the found PROFIBUS PA devices).

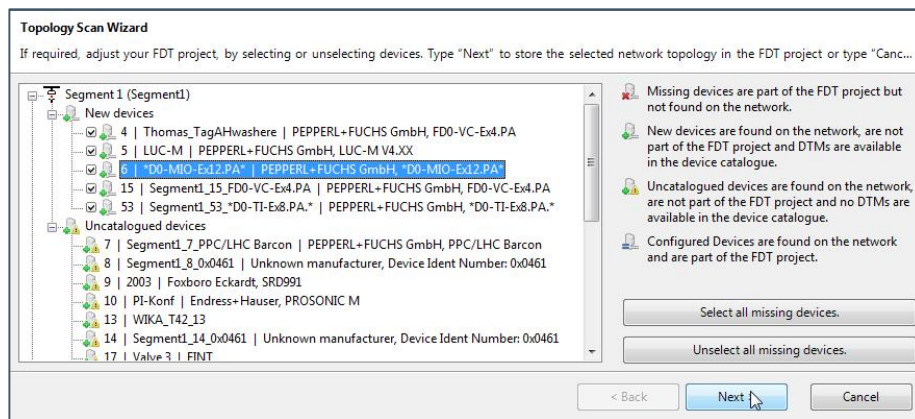


Figure 56: Confirm the found PROFIBUS PA devices

9) **Close** the Topology Scan Wizard (see: Figure 52: Closing the Topology Scan Wizard).

All the devices with physical connection with the PROFINET gateway are now added.

10) Right-click each device, then click **Connect** after one another to connect them to the PN IO via the gateway (see: Figure 57: Connect the PROFIBUS PA devices).

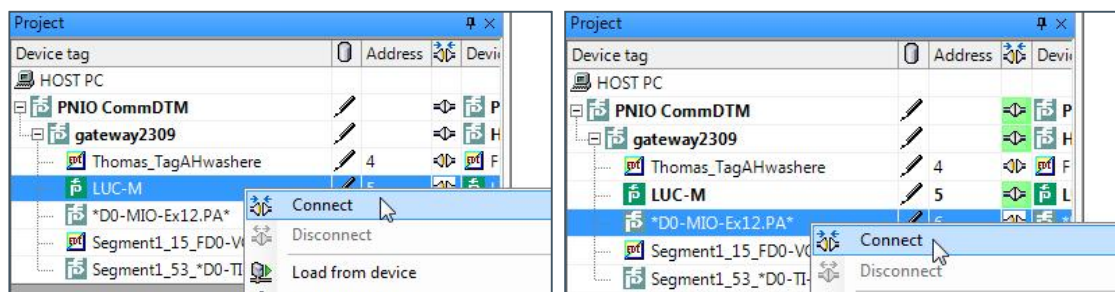


Figure 57: Connect the PROFIBUS PA devices

Alternatively, the operating personnel can opt to add PROFINET gateway and field devices manually (see chapter 8.4: Adding the PROFINET gateway and field devices manually).

7.4 Parameterizing and diagnosing the network participants

The PROFINET gateway and PROFIBUS PA devices can be parameterized online after connection. This way, the device parameters will be first loaded into the software, and the parameterization is then performed. Alternatively, they can first be parameterized offline and the settings are then stored to the device. If the gateway and PROFIBUS PA devices are online, they can also be diagnosed via PACTware.

7.4.1 Online parameterization inside PACTware

- 1) After the network participants are online, right-click the intended gateway or PROFIBUS PA device such as the Multi-Input/Output Device ***D0-MIO-Ex12.PA** for the example 2. Then select **Load from device**. This will load the hardware parameters to the program (see: Figure 58: Load parameters from device to software).

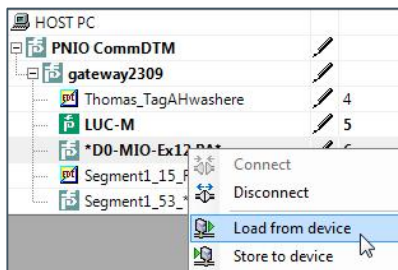


Figure 58: Load parameters from device to software

- 2) Right-click the field device again, then select **Parameter > Online parameterization** (see: Figure 59: Search for online parameterization).

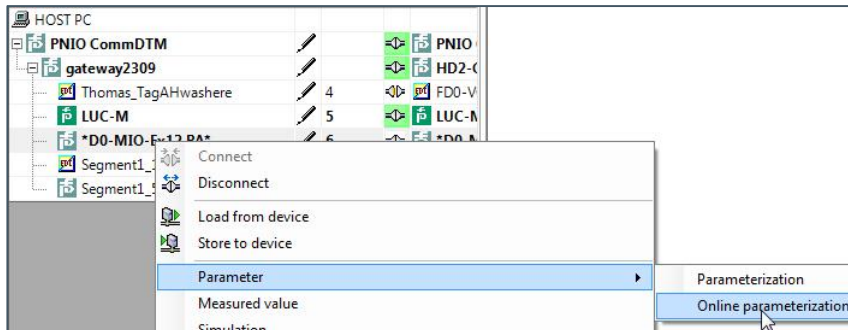


Figure 59: Search for online parameterization

- 3) Manipulate the parameters as necessary (see: Figure 60: Setting parameters of device online).

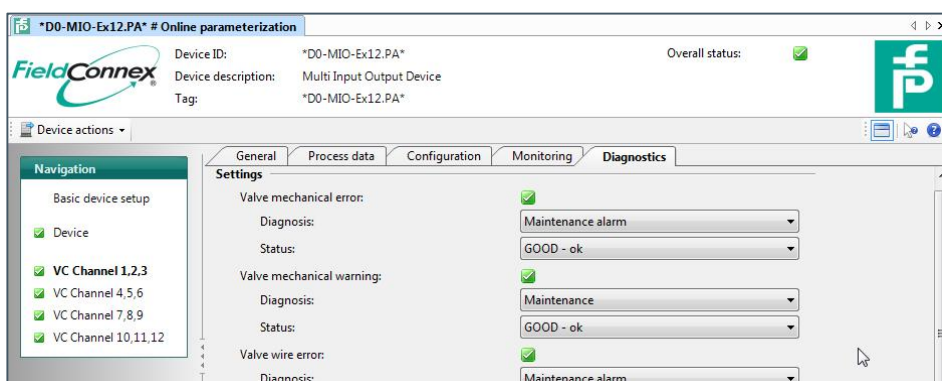


Figure 60: Setting parameters of device online

7.4.2 Diagnosis inside PACTware

- 1) After the network participants are online, the gateway or PROFIBUS PA devices can be diagnosed. For example, right-click the intended **gateway**, then **Diagnosis** (see: Figure 61: Search for Diagnosis).

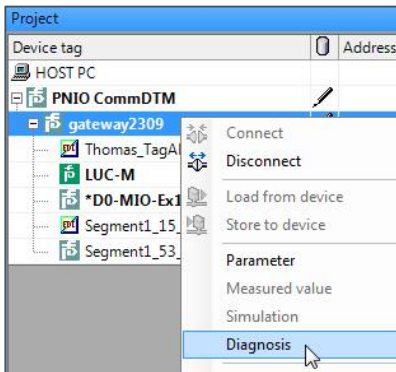


Figure 61: Search for Diagnosis

A window opens which allows navigation to the different segments of the gateway and the information tabs, i.e. Identification, Diagnosis, and Network (see: Figure 62: Diagnosis Navigation).

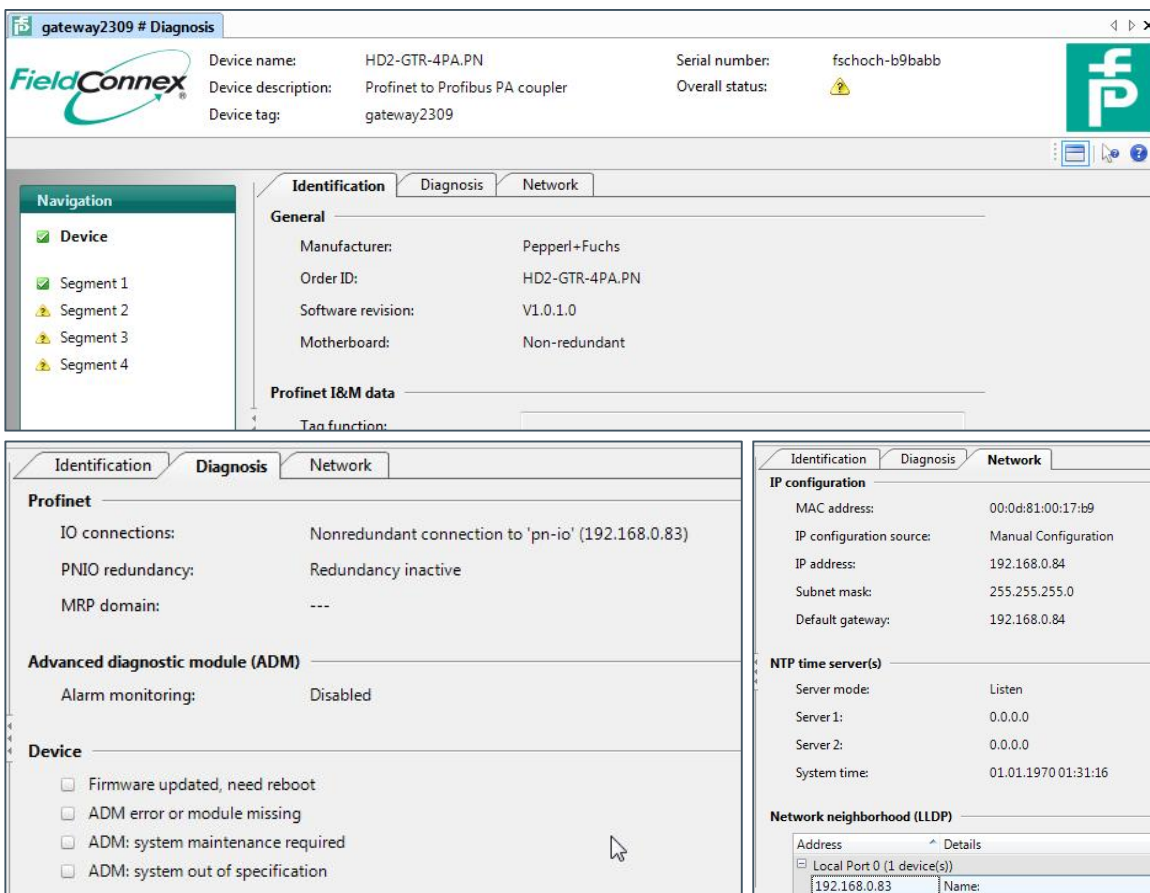


Figure 62: Diagnosis Navigation

7.4.3 Offline parameterization inside PACTware

- 1) When the network participants are still offline, right-click the intended gateway or PROFIBUS PA device such as the Ultrasonic Level Sensor **LUC-M**** for the example 1. Then select **Parameter > Parameterization** (see: Figure 63: Search for offline parameterization).

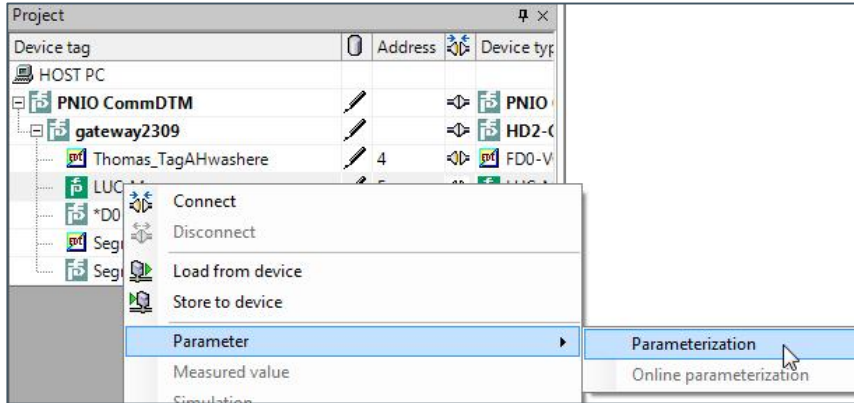


Figure 63: Search for offline parameterization

- 2) Manipulate the parameters as necessary (see: Figure 64: Setting parameters of device offline).

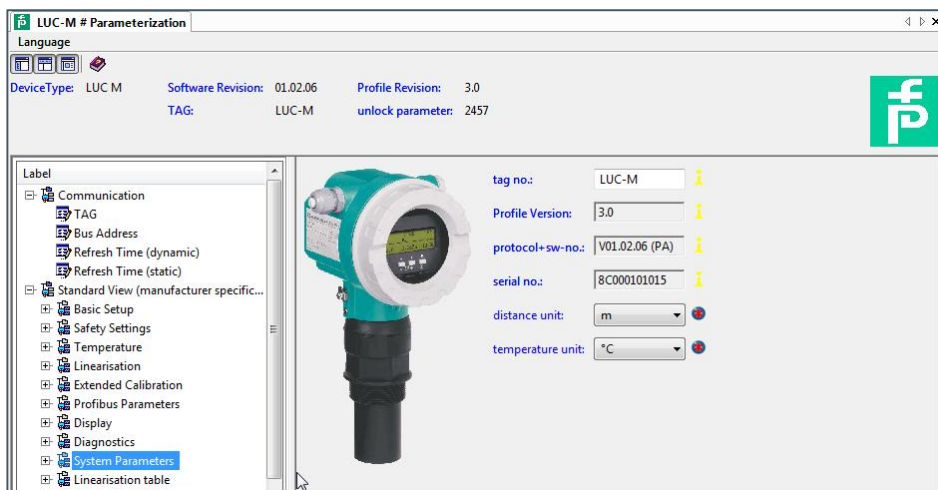


Figure 64: Setting parameters of device offline

- 3) Right-click the device, select **Store to device**. This will save settings to the device before connection (see: Figure 65: Store parameters from software to device).

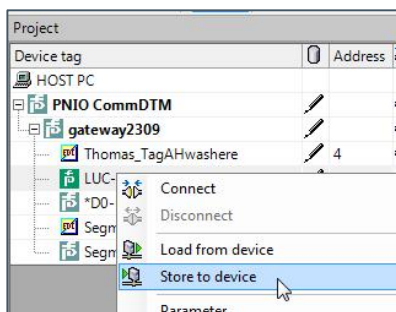


Figure 65: Store parameters from software to device

8 Annex

8.1 Naming conventions for PROFINET IO Device

The name must not be longer than 240 characters. These characters are permitted:

- § Letters "a" to "z" (only lowercase characters)
- § Numbers "0" to "9"
- § Hyphen or period

One name component in the device name - a character string between two periods - may not be longer than 63 characters.

The name may not begin or end with a hyphen.

The name may not begin with the character string "port-xyz" (x, y, z = 0 to 9).

The name may not have the form n.n.n.n (n = 0 to 9).

8.2 Alternative for IP address assignment for PROFINET gateway

- 1) During the creation of gateway name, the default option with **Assign IP address via IO controller** is removed by unchecking the box (see: Figure 66: Uncheck the default IP address assignment via IO Controller).

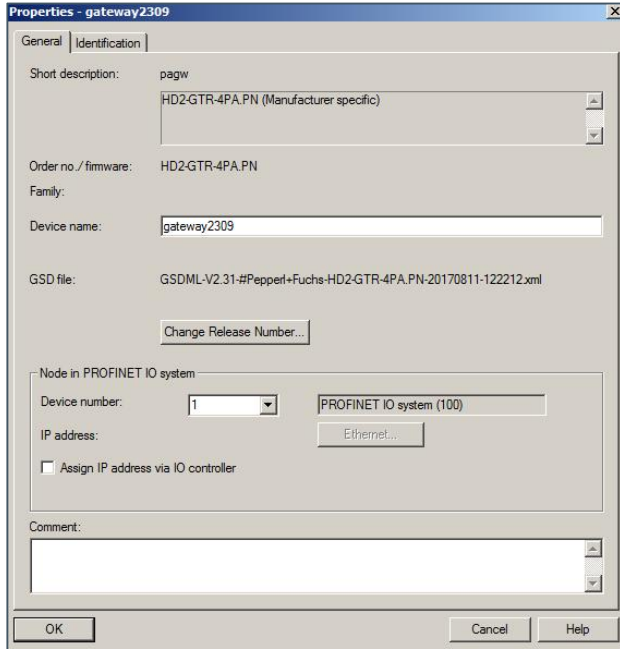


Figure 66: Uncheck the default IP address assignment via IO Controller

- 2) Select **PLC > Ethernet > Edit Ethernet Node** (see: Figure 67: Search for Edit Ethernet Node).

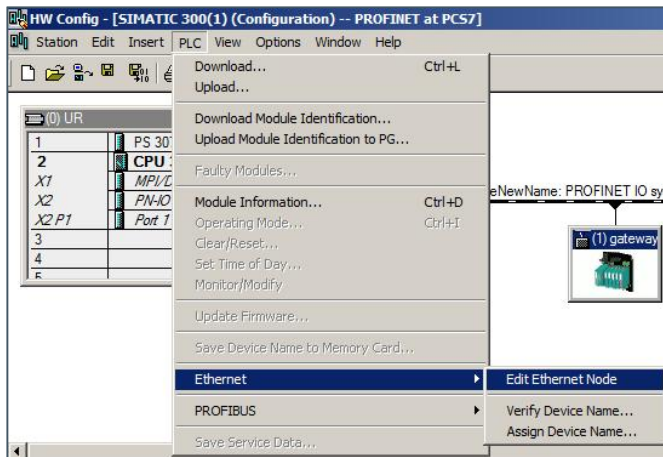


Figure 67: Search for Edit Ethernet Node

- 3) Click **Browse...** for accessible nodes online (see: Figure 68: Search for accessible nodes online).

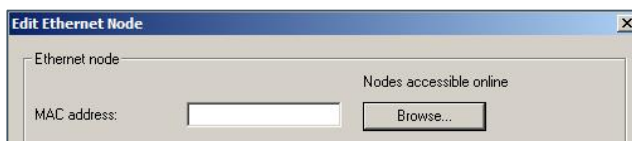


Figure 68: Search for accessible nodes online

- 4) The search will be carried out automatically. Once the gateway is detected via the MAC address, select the gateway corresponding to the **MAC address** and click **OK** (see: Figure 69: Search for the gateway with MAC address).

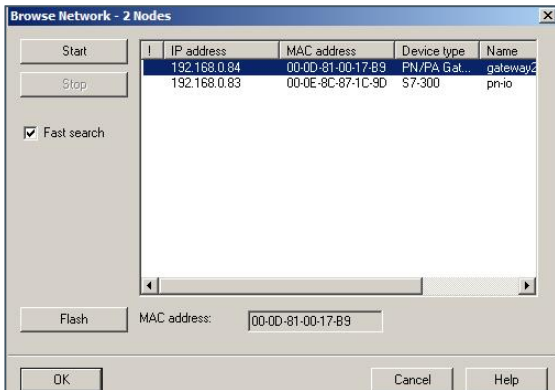


Figure 69: Search for the gateway with MAC address

Either to assign IP address manually (see: 8.2.1) or via DHCP (see: 8.2.2), the Ethernet cable must be unplugged now from the CPU unit to disconnect the PN IO communication. Connect the Ethernet cable again only after the IP address assignment is completed via the software. The diagnosis via web browser can then be conducted.

8.2.1 Manual assignment

- 1) Edit the **IP address** as required and click **Assign IP Configuration** (see: Figure 70: Assign IP address of gateway manually).

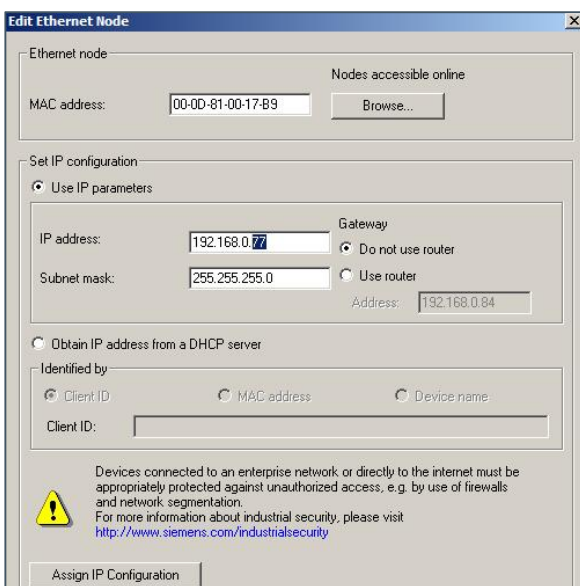


Figure 70: Assign IP address of gateway manually

- 2) Click **OK**, then **Close the Edit Ethernet Node** window (see: Figure 71: Confirm the manually assigned IP address).

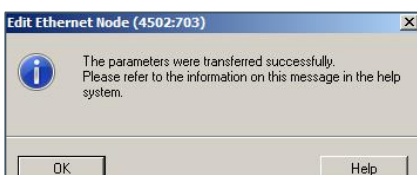


Figure 71: Confirm the manually assigned IP address

8.2.2 Automatic assignment via DHCP

- 1) Choose **Obtain IP address from a DHCP server > MAC address** and click **Assign IP Configuration** (see: Figure 72: Assign IP address of gateway via DHCP server).

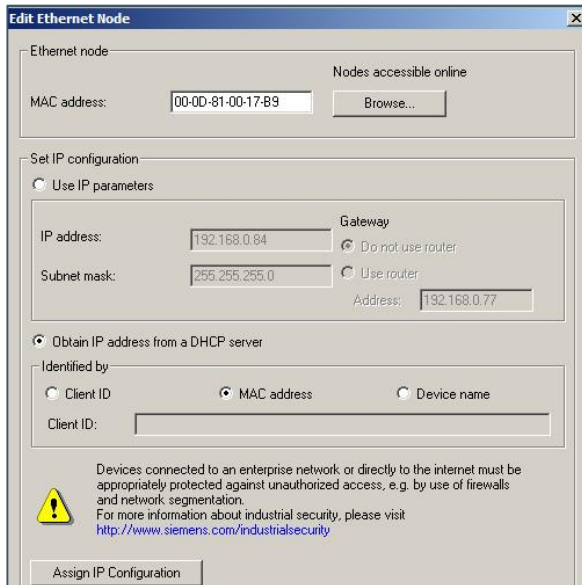


Figure 72: Assign IP address of gateway via DHCP server

- 2) Click **OK** to confirm that the PROFINET supports DHCP (see: Figure 73: Confirm that the PROFINET gateway supports DHCP).

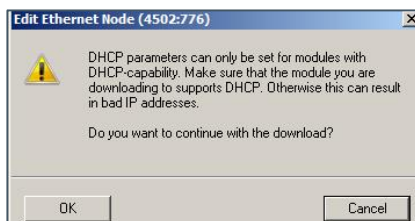


Figure 73: Confirm that the PROFINET gateway supports DHCP

- 3) Click **OK**, then **Close the Edit Ethernet Node** window (see: Figure 74: Confirm the automatically assigned IP address via DHCP server).

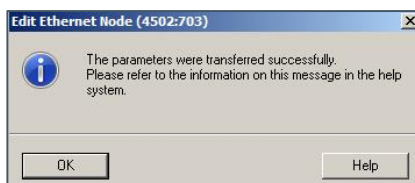


Figure 74: Confirm the automatically assigned IP address via DHCP server

8.3 Pepperl+Fuchs Discovery and Configuration Tool

Pepperl+Fuchs has its own software tool to assign IP address via operating personnel manually or via DHCP automatically. This is an alternative if the software of the DCS is not capable of doing so.

- 1) Open **Discovery and Configuration Tool** from Pepperl+Fuchs.

The IP address of the gateway is shown if the gateway is online (see: Figure 75: PROFINET gateway with the existing IP address).



Figure 75: PROFINET gateway with the existing IP address

- 2) Corresponding to 8.2.1, the IP address can be assigned manually. Select **Edit configuration...** (see: Figure 75: PROFINET gateway with the existing IP address), then click **Interface [Interface 1] > IP configuration 1** to edit the IP address as required, and click **OK** (see: Figure 76: Editing the IP address manually).

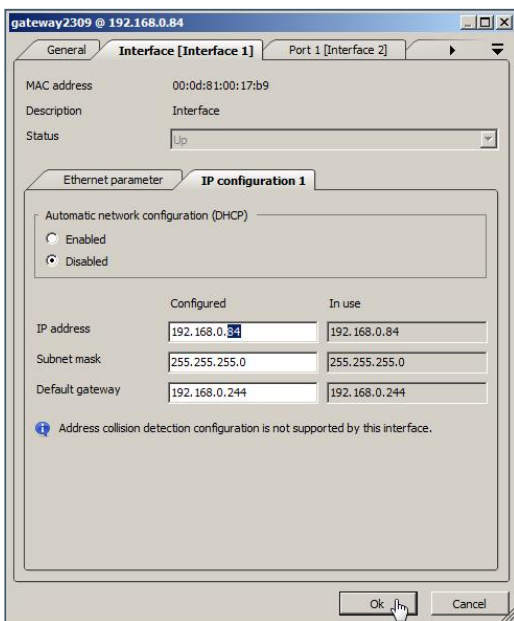


Figure 76: Editing the IP address manually

- 3) Corresponding to 8.2.2., the IP address can also be assigned automatically via DHCP. Right-click the gateway **IP address** and select **Reset to defaults...** (see: Figure 77: Obtaining IP address via DHCP).

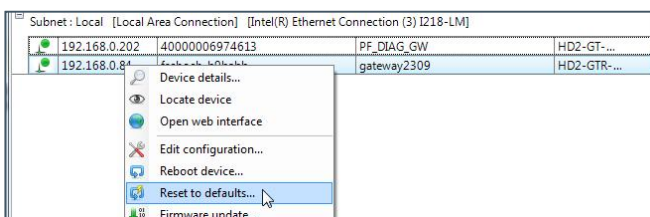


Figure 77: Obtaining IP address via DHCP

8.4 Adding the PROFINET gateway and field devices manually

- 1) Right-click **PNIO CommDTM**, then select **Add device** (see: Figure 78: Search PROFINET gateway manually).

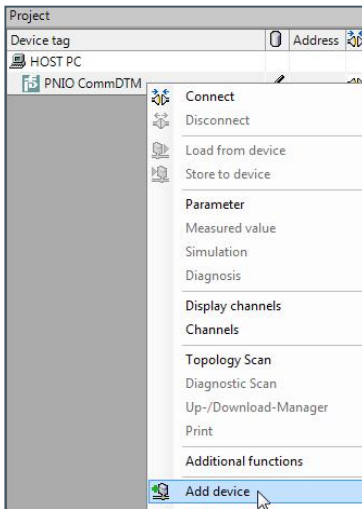


Figure 78: Search PROFINET gateway manually

- 2) Select the Pepperl+Fuchs PROFINET gateway **HD2-GTR-4PA.PN** and click **OK** see: Figure 79: Add PROFINET gateway manually).

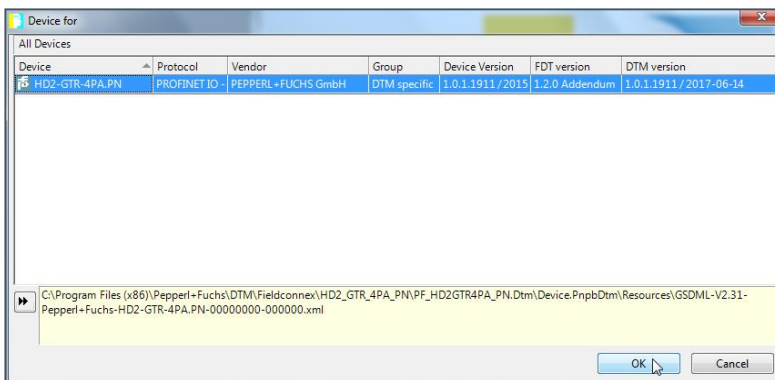


Figure 79: Add PROFINET gateway manually

- 3) Right-click the PROFINET gateway **HD2-GTR-4PA.PN**, and then select **Add device** (see: Figure 80: Search for PROFIBUS PA devices manually).

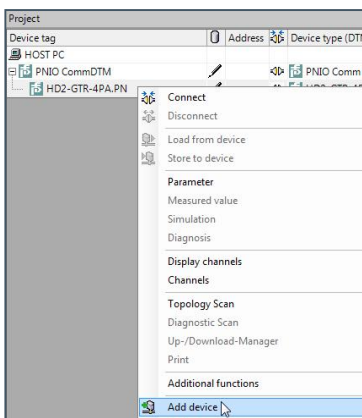


Figure 80: Search for PROFIBUS PA devices manually

- 4) Select the PROFIBUS PA devices to use. For the example 2, select Multi-Input/Output Device ***D0-MIO-Ex12.PA*** and click **OK** (see: Figure 81: Select the PROFIBUS PA device to use).

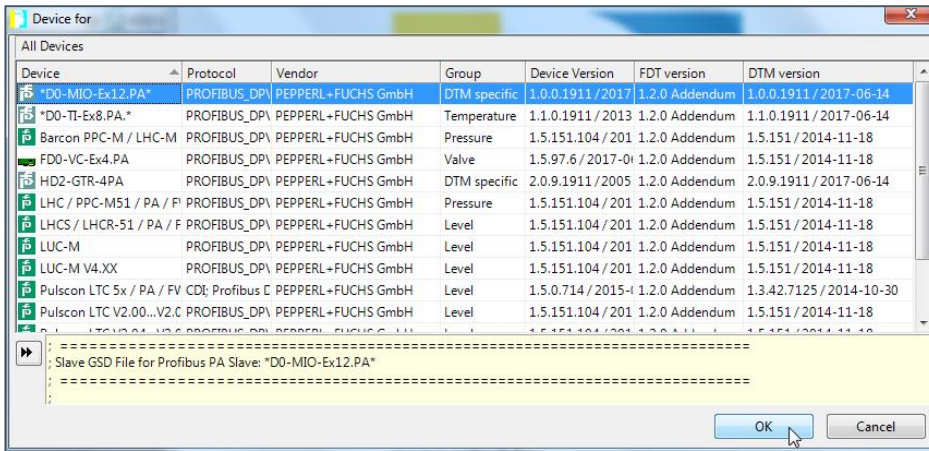


Figure 81: Select the PROFIBUS PA device to use

- 5) Choose the segments where the selected PROFIBUS PA device is meant to be connected to. For the example 2, choose **Segment1** and then click **OK** (see: Figure 82: Selecting the PROFIBUS PA segment that is used for the PROFIBUS PA devices).

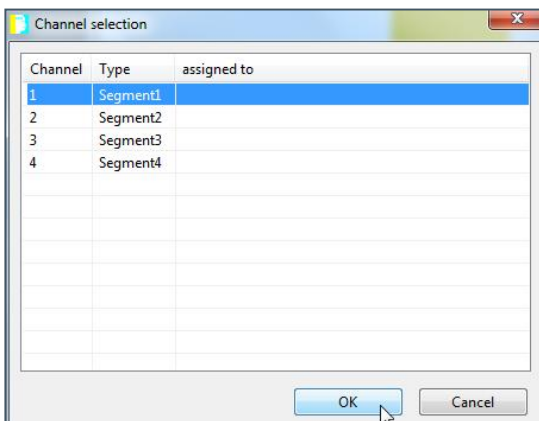


Figure 82: Selecting the PROFIBUS PA segment that is used for the PROFIBUS PA devices

Repeat steps 3 to 5 for additional PROFIBUS PA devices. In this example, only one more DTM for Ultrasonic Level Sensor LUC-M** (example 1) is added. All the added DTM shall appear after one another under gateway.

- 6) Right-click the PROFINET IO interface **PNIO CommDTM**, then select **Parameter** (see: Figure 83: Search for parameterizing the IO Device IP address).



Figure 83: Search for parameterizing the IO Device IP address

- 7) Key in the gateway IP address, then select **Apply**, then **Close** (see: Figure 84: Keying the gateway IP address to the PROFINET IO interface).

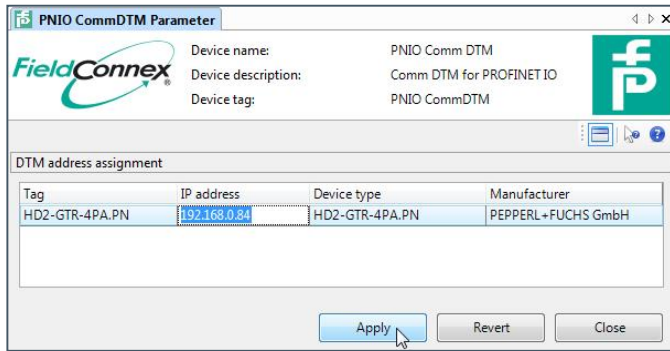


Figure 84: Keying the gateway IP address to the PROFINET IO interface

- 8) Right-click the PROFINET gateway **HD2-GTR-4PA.PN**, then select **Parameter** > **Parameterization** (see: Figure 85: Search for setting to assign correct PROFIBUS PA device slots).

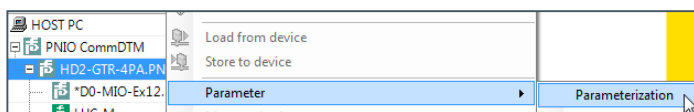


Figure 85: Search for setting to assign correct PROFIBUS PA device slots

- 9) Input the corresponding device slot address, such as **6** and **5** respectively under segment 1 for the examples so far. Then click **Apply** and **Close** (see: Figure 86: Setting the correct slot addresses at the corresponding segment).

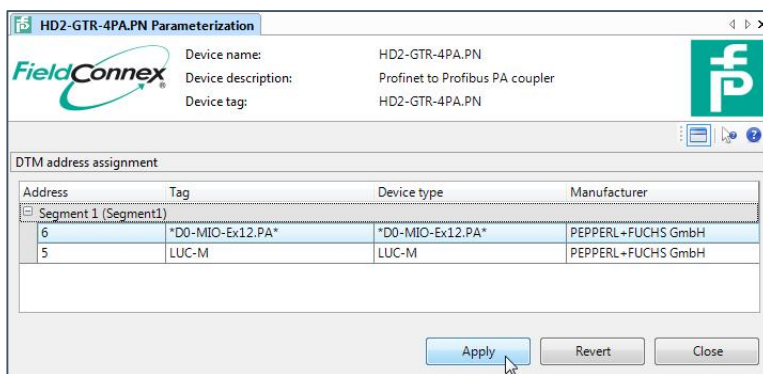


Figure 86: Setting the correct slot addresses at the corresponding segment

- 10) Right-click one of the PROFIBUS PA device, then click **Connect** to connect the network participants via this PROFIBUS PA node. Then do the same for the rest of the PROFIBUS PA nodes to add them individually to the network (see: Figure 87: Connecting the PROFINET network participants with the PROFIBUS PA nodes).

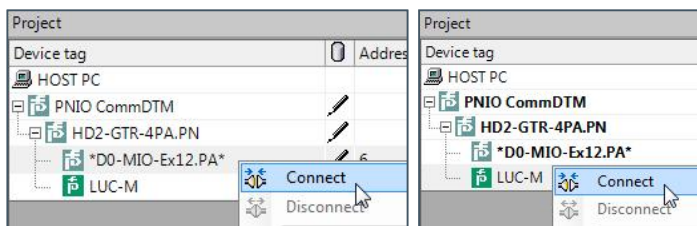


Figure 87: Connecting the PROFINET network participants with the PROFIBUS PA nodes

8.5 Troubleshooting the PROFINET Gateway

The gateway provides LEDs showing status and diagnosis information about the gateway itself, the PROFINET communication, and the four PROFIBUS PA segments (see: Table 4: Indication of gateway LEDs).

Table 4: Indication of gateway LEDs

LED	Information	Symptom	Possible Cause/Status	Remedy/Next Steps
LED PWR	Status of gateway power supply	Green on	Power available	-
		Off	No power within the specification available. Gateway defective.	Check power supply. Restart gateway. If problem persists, send gateway to Pepperl+Fuchs.
LED ERR	Error status of gateway	Red on	Hardware error.	Check segment diagnoses for details
LED Red.	Status of gateway redundancy	n/a	Currently without function. Reserved for future use of gateway	-
LED Seg 1 ... 4	Status of the PROFIBUS PA segments	Red 2 Hz flashing	Watchdog time too short. PROFIBUS PA devices communication error. PROFIBUS PA devices configuration or parameterization fault.	Increase the watchdog time. Check the communication settings of the PA devices. Check the GSDs of the PA devices.
		Red on	PROFIBUS PA medium attachment unit (MAU) error.	Check the MAU hardware for faults.
LED ETH1 LINK	Connection status of Ethernet port 1	Green on	Ethernet link available.	-
		Off	No Ethernet link available.	Check Ethernet connections in the network.
LED ETH1 ACT	Communication status of Ethernet port 1	Yellow on/flashing	Ethernet communication activity	-
		Off	No communication activity.	-
LED ETH2 LINK	Connection status of Ethernet port 2	Green on	Ethernet link available.	-
		Off	No Ethernet link available.	Check Ethernet connections in the network.
LED ETH2 ACT	Communication status of Ethernet port 2	Yellow on/flashing	Ethernet communication activity.	-
		Off	No communication activity.	-

8.6 PROFINET Redundancy Concepts

The gateway module of FieldConnex PROFINET Power Hub supports S2 redundancy according to the PROFINET specification. A redundant pair of PROFINET IO controllers is connected to one gateway each at one port (see: Figure 88: HD2-GTR-4PA.PN gateway in S2 redundancy).

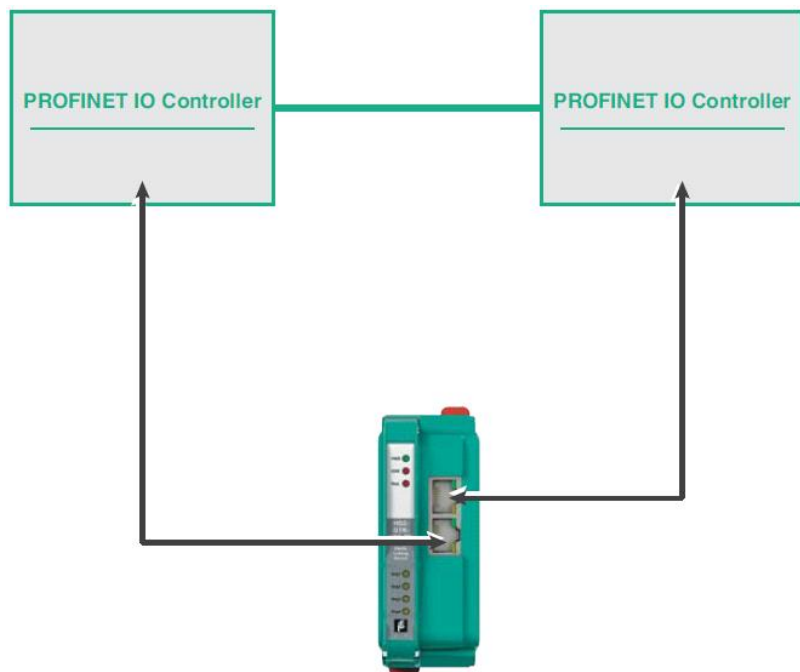


Figure 88: HD2-GTR-4PA.PN gateway in S2 redundancy

Besides, redundant PROFINET communication can also be implemented via a so-called media redundancy protocol (MRP) topology- The HD2-GTR-4PA.PN gateway supports MRP in a ring according to the PROFINET specification (see: Figure 89: HD2-GTR-4PA.PN gateway in MRP ring redundancy)

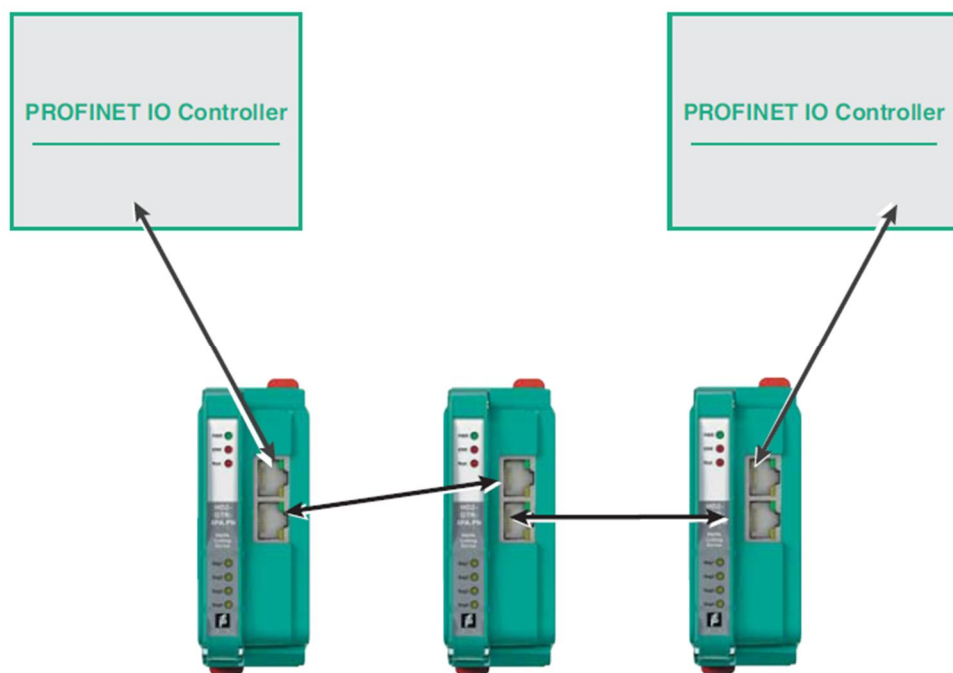


Figure 89: HD2-GTR-4PA.PN gateway in MRP ring redundancy

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