Indu-Sol GmbH – Specialist in Industrial Networks

PROscan® Active

User Manual
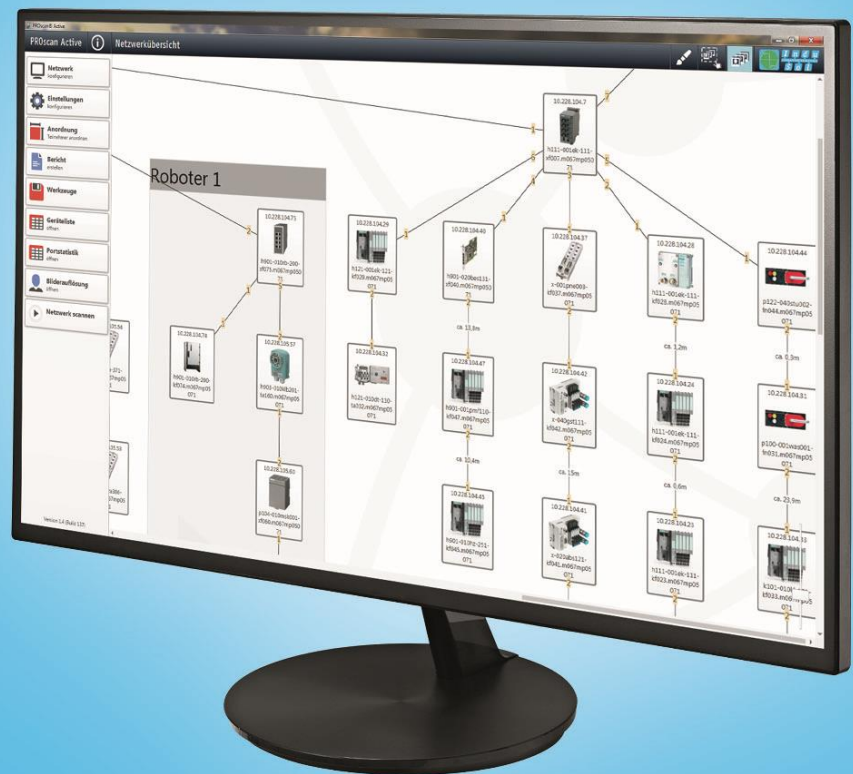
Diagnostic and service tools for PROFINET / Ethernet

Revision overview

Date	Revision	Change(s)
29.04.2013	0	First version – First steps
13.08.2013	1	Expansion: Licensing
03.8.2016	2	PROscan Active V2

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Caution!

This device may only be put into operation and operated by qualified personnel. Qualified personnel, as referred to in the safety-related information of this manual, are persons who are authorised to put into operation, to earth and to label devices, systems and electrical circuits in accordance with the standards of safety engineering.

Contents

1 General information

Please read this document thoroughly from start to finish before you begin installing the device and putting it into operation.

1.1 General

The PROscan® Active software makes it possible to create a clear and simple PROFINET topology. In addition to the PROFINET devices, it is also possible to visualise Ethernet devices that support the LLDP and SNMP protocols, independent of the manufacturer and device type.

1.2 Disclaimer

Indu-Sol GmbH does not guarantee that the hardware and software will work properly in all application situations. With the technical means available today, it is not possible to develop software that perfectly meets all application requirements without errors. Indu-Sol GmbH therefore rejects any liability for direct or indirect damage arising from the operation of the hardware and software and the usability described in the manual.

1.3 Prerequisites for a functioning topology scan

To achieve a problem-free topology scan with the PROscan® Active software, the switches and devices that are used by the PROscan® Active have to have certain basic functions.

Firstly, the switches need to be manageable. They have to be equipped with SNMP functionality to enable data export and to have LLDP or routing tables available.

Additionally, the PROFINET-specific parameters can only be displayed if these are provided by the devices.

Devices that do not support this or have not been detected correctly are displayed graphically in a grid at the right in the visualisation in PROscan® Active.

1.4 Scope of supply

The scope of supply comprises the following individual parts:

- PROscan Active licence stick containing the software and the licence

1.5 System requirements

Operating system

- Windows 7   32 bit and 64 bit
- Windows 8   32 bit and 64 bit
- Windows 10   32 bit and 64 bit
- Windows 2003 Server
- Windows 2008 Server
- Windows 2012 Server
- Windows 2016 Server

Hardware requirements

- Intel Atom 800MHz or better
- 1GB RAM or better
- Min. 400MB hard disk space

2   Installing PROscan® Active

To start the installation, double-click the **setup.exe** file, which can be found on the USB stick/licence stick, or can be downloaded from the website.

If not all required Windows components have been pre-installed (e.g. NET Framework 4), the missing components will automatically be installed with the software.

Subsequently the PROscan® Active software has to be configured.

In the first step, the installation language has to be selected (see Figure 1) and the end user licence agreement has to be accepted. Subsequently the installation directory is selected (see Figure 3).

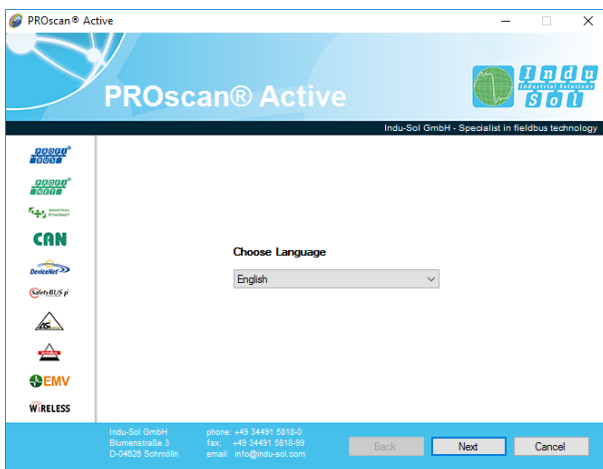Figure 1: Selecting the installation language

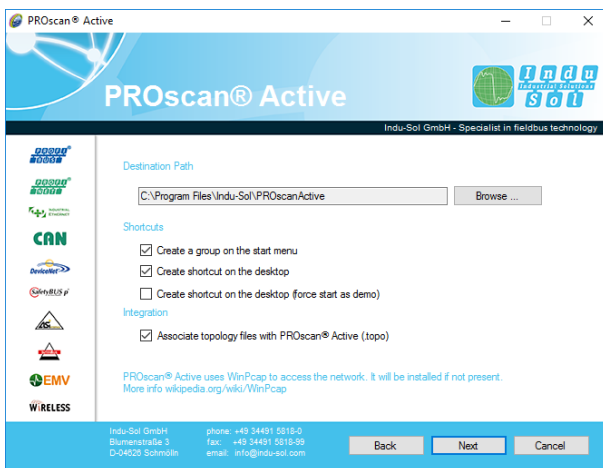
Figure 2: Accepting the end user licence agreement

Figure 3: Selecting the installation folder

The licensing requires that a hardware driver is installed for the USB stick. To this end, the device driver installation wizard is run automatically. The driver installation is performed and completed as soon as **Next** is pressed in the confirmation prompt window.

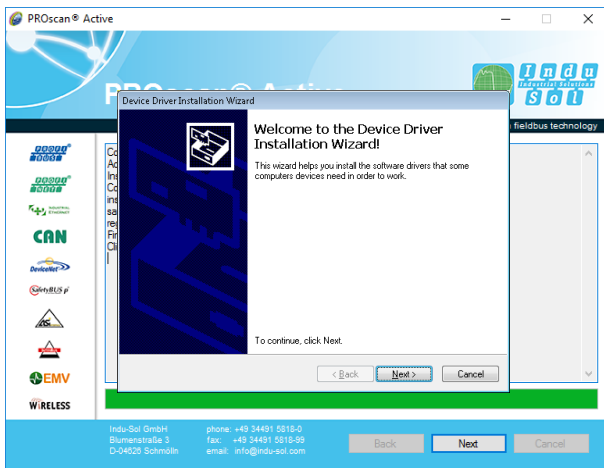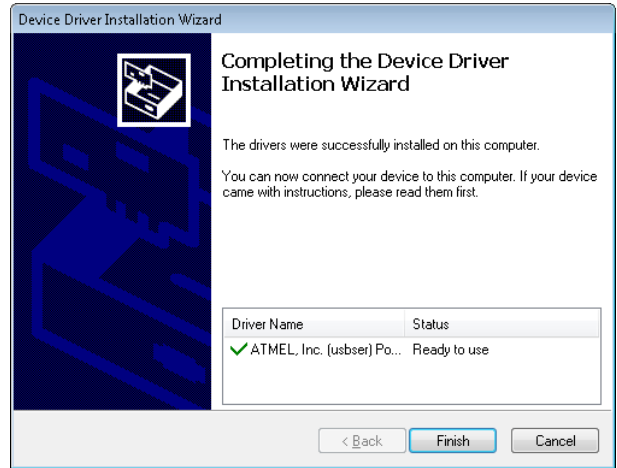Figure 4: Installing the driver for the licensing

Figure 5: Completing the driver installation

Subsequently, the required software components are installed automatically. After the installation has been completed, the "Start Licence Agent" option (see Fig. 7) can be selected to perform the licensing (see No. 3).
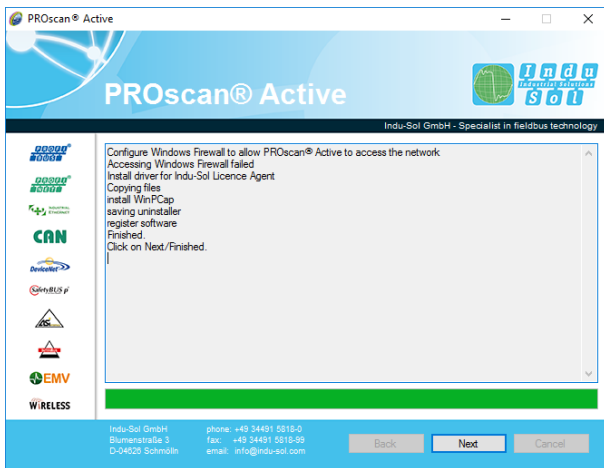

Figure 6: Completing the entire installation
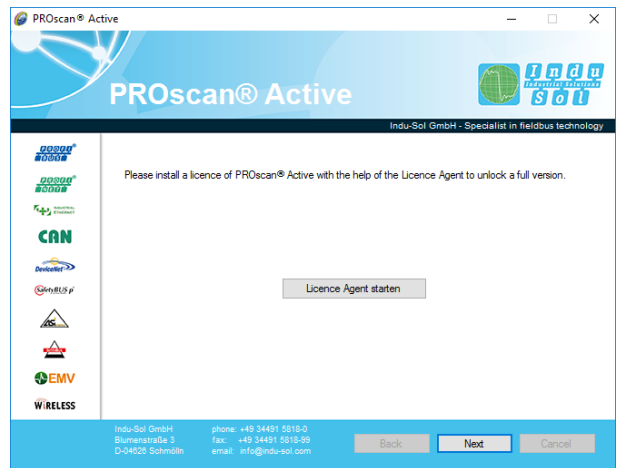
Figure 7: Starting the Licence Agent

3 Licensing PROscan® Active

Each PROscan® Active licence can only be used on one PC at a time.

If run without a licence, the program stays in DEMO mode, in which it is not possible to perform a live scan or to open an existing topology.

After the installation has been completed, the supplied Licence Agent should be started in order to activate the installed software with a licence.

Figure 8: Licence Agent start screen

In addition to displaying the various functions of the program, the bottom of the window shows the total number of licences and the number of licences left on the connected stick.

With the **Install** button, it is possible to transfer a licence to the current PC system and to activate the software with it.

Figure 9: Selecting and transferring the licence

Never, under any circumstances, pull out the licence stick during the transfer of the licence. This will cause the licence to be destroyed and cause the full loss of the license.

Once the licence has been transferred successfully, PROscan® Active is enabled and can be used without restriction. The **Uninstall** button can be used to return the licence to the stick.
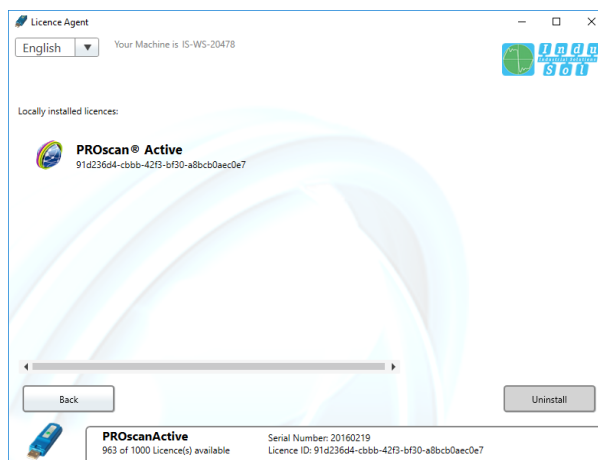
Figure 10: Selecting and withdrawing the licence

> A licence can only be restored to the original licence stick.
>
> If it is no longer clear which licences are assigned to which devices, the assignments can be viewed at 'Extras > Device List.'

If a licence has been lost due to Windows problems or a hard disk fault, it is possible to restore the licence through the internal hardware identification.

A Windows upgrade from Windows 7 to Windows 10 causes the licence to be lost. The licence therefore has to be withdrawn before an upgrade is performed.

Figure 11: Destroying the licence

> The 'Destroy' option irrevocably deletes a licence and is only used in cases where a USB stick is defective or has gone missing.

4 The user interface

In this chapter, the individual menu items are explained.

Figure 12: Web interface of PROscan® Active

4.1 Overview

This option can be used to return to the topology view at any time.

4.1.1 The header

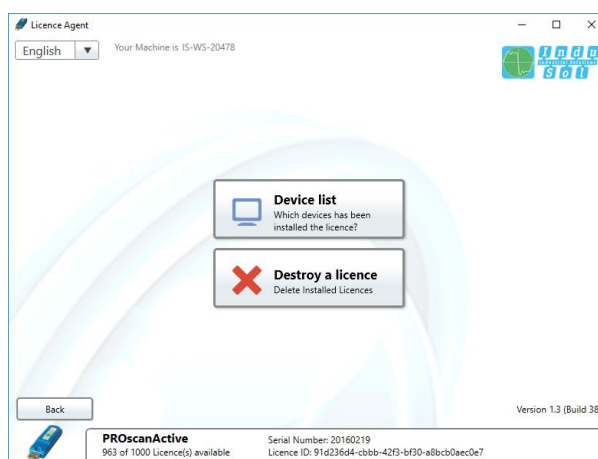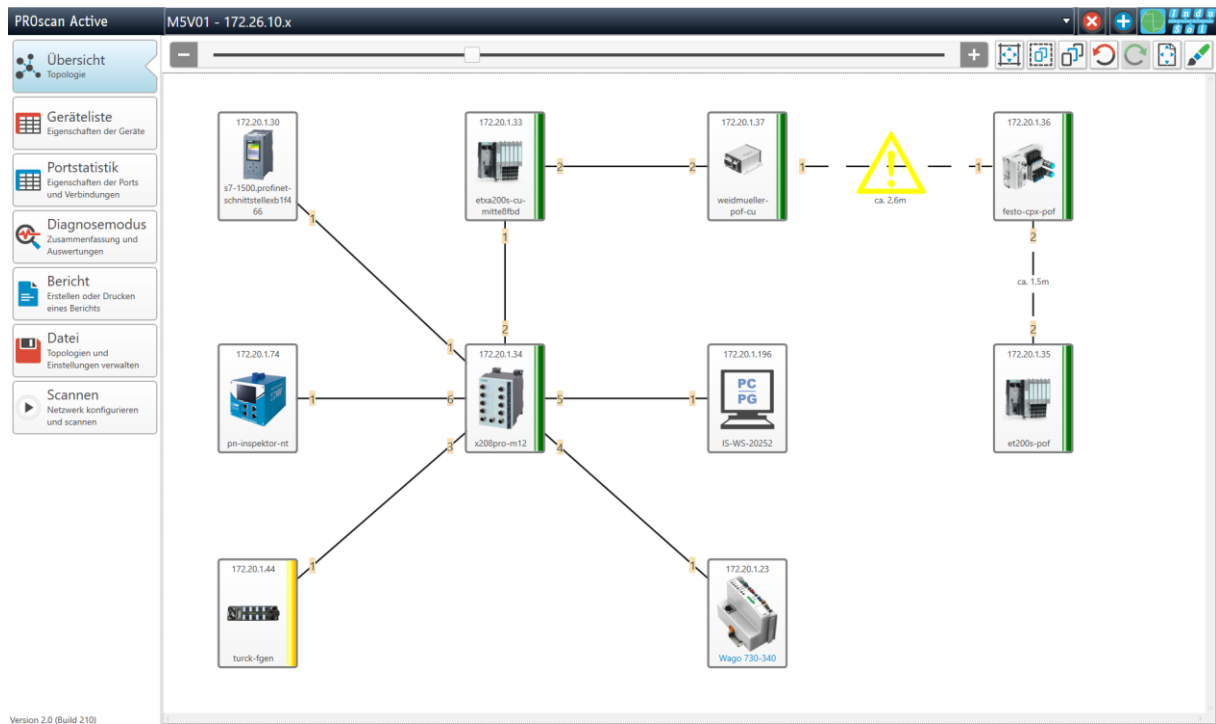The header shows which topology is currently open. With the arrow next to the topology, you can select between the different individual topologies. With this icon ⊗ you can delete the current topology and with this icon ⊕ you can create a new topology.

The slider with the plus and minus icons can be used to zoom in on or out from the topology.
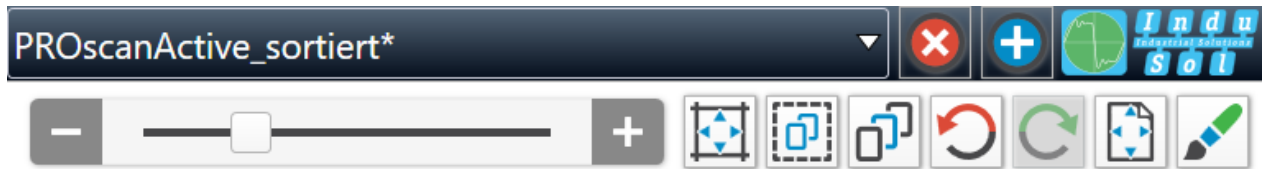
Figure 13: Editing mode

- Button for adapting the topology to the current screen size – Zoom factor for the topology is adapted.

- Multiple selection frame: This option makes it possible to draw a frame with which several device nodes are selected or deselected simultaneously. (The Shift key fulfils the same function)

- Multiple selection: Devices can be added to or removed from the selection by clicking on them. (The Ctrl key fulfils the same function)

- Undo. The last change is undone. This function can be applied repeatedly.

- Redo. Undone changes can be applied again. This function can be applied repeatedly.

- With this function, the print margins can be displayed and the print area can be adapted to the topology.

- Editing mode (see No. 4.1.2)

4.1.2 Editing mode

The editing mode is activated by means of the brush icon at the top right corner. Subsequently a menu opens on the right-hand side. Add Node: Command is executed by clicking on an unused area.

- **Add Node:** Command is executed by clicking on an unused area.

- **Add Connection:** Establishes a new connection between device nodes at unused ports.

- **Add Group:** Can be used to group device nodes in the visualisation. Creates a border that can be given a heading.

- **Add Background Image:** Adds a graphic as background element.

- **Add Text:** Creates free text for describing objects.

- **Delete Element(s):** Can be used to delete connections and devices.

- **Add Element(s) to Scan Reference:** After a comparison scan has been made, new devices that have been detected can be added to the scan reference.

- **Add All Elements to Scan Reference:** After a comparison scan has been made, all new devices that have been detected can be added to the scan reference.

- **Realign Graph in Whole:** After the root or the arrangement has been changed in the settings, this button can be used to apply the setting.

- In this list, a root for the tree view can be selected. The root is displayed as the topmost device.

- Button for aligning selected elements horizontally.

- Button for aligning selected elements vertically.

- Button for updating images of existing devices; this button is used to apply the created picture rules.

4.2 Device list

- View a list of all devices of the scanned network. Contains: IP address, subnet, MAC address, device name, hardware version, software version, notes, device type name, order number, vendor ID, device ID, name of the controller, real-time class.
- The search bar can be used to find entries (e.g. a specific IP address).
- To place the focus on a specific device in the topology view, double-click the desired entry.
- With the action button, it is possible to jump to the website of the device (default browser opens) or directly to the port overview.
- *Save as CSV:* This list is saved as a CSV-file (comma-separated values) and can be further processes in a table calculation program such as Microsoft Excel.

4.3 Opening the port statistics

- List of all devices of the scanned network and their ports, as well as their assignments.
- The following detailed information is displayed for each port: Discards (telegrams that were discarded by the switch, e.g. due to an overload), Errors (destroyed telegrams), Octets (bytes sent and received), ohmic resistance and shield current.
- To place the focus on a specific connection in the topology view, double-click the desired entry.
- *Save as CSV:* This list is saved as a CSV-file (comma-separated values) and can be further processes in a table calculation program such as Microsoft Excel.

4.4 Statistics

In this mode, the most important information about a network is available in summarized form. This data is divided into the following categories:

- **Device Statistics:** Number of PROFINET devices, number of Ethernet devices, devices with the highest line depth (devices that are the furthest away from the controller)
- **Connection Statistics:** This tab lists all devices and their ports that generated errors or discards, as well as the ports with the lowest attenuation reserve in the network (only in the case of polymer fibres).
- **IP Statistics:** In this view, max. 20 available IP addresses in the scanned address range are shown.
- **Version Statistic:** This tab provides an overview of the devices used, with the respective hardware and software version. Devices with a deviating hardware or software version are marked, see Figure 14.

	Device Type Name	Order Number	SW Version	HW Version	Device Count
	AXL BK PN-ME	2688132	V1.2.0	5	1
!	BNI PNT-502-102-Z015	BNI006C	V2.2.0	5	1
!			V2.3.0	5	1
	Cube20S	57106	V1.3.6	1	1
	ET200SP	6ES7 155-6AU00-0CN0	V3.1.0	4	1
	FL SWITCH GHS 4G/12	2700271	V2.62.0	6	1
	FL SWITCH SMCS 8TX-PN	2989103	V4.40.0	5	1
	FTS3100-A	20781104000	V2.2.2	256	1
	Helmholz PN-Switch	700-850-4PS01		0	1
	IM151-3	6ES7 151-3BB23-0AB0	V7.0.5	3	1
	IM153-4	6ES7 153-4AA01-0XB0	V4.0.0	2	1
	PN-INspektor NT	124030100			1
	PROscanActive	117000014	2.0.0.218		1
	S7-300	6ES7 318-3FL01-0AB0	V3.2.6	5	1
!	SCALANCE X-200	6GK5 208-0BA10-2AA3	V5.1.0	6	1
!			V5.1.3	6	1

Figure 14: Version Statistic

4.5 Report

This option can be used to print or save individual reports and topology plans. The following options are available:

- **Overview (Single-Sided):** The entire topology is printed/saved on the selected paper size.
- **Acceptance Report:** A report with all important information and remarks is generated (A4 portrait format). The system automatically evaluates whether or not the network has been accepted.
- **Report:** Here you can decide what information should be combined into a report. The options are 'Topology', 'Device list' and 'Port allocation'.

Figure 15: Input mask

4.6   File

In this menu, basic settings are configured, such as the language and the way the topology is displayed. Additionally, individual topologies can be opened and saved.

- **Open:** Here a previously scanned topology can be opened, additionally an overview of the most recently opened topologies is shown.
- **Save:** This option is used to save a topology.
- **Settings:** Here the settings for the language and for displaying the topology are configured.

With borders   Without borders   Without IP   Without picture   Without name   Device status

Figure 16: Visual appearance of the devices

With port index   Without port index   With cable length   With POF warning
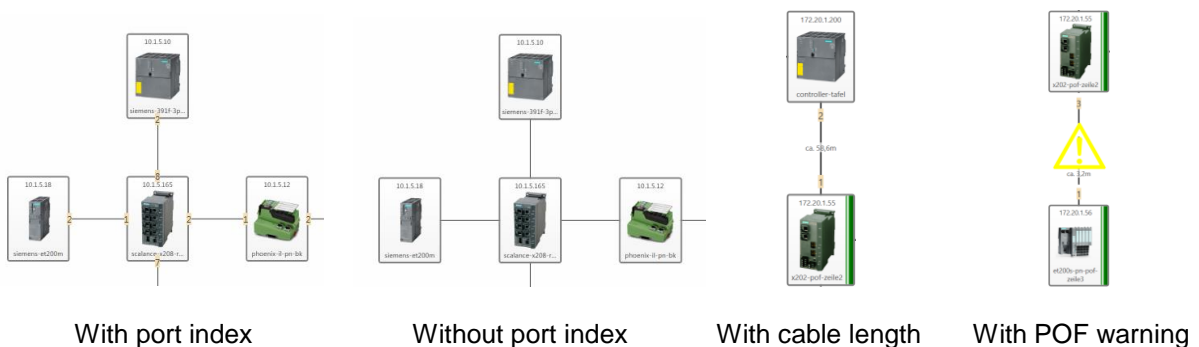
Figure 17: Visual appearance of the connections

- **Picture Rules:** PROscan® Active already includes numerous pictures for device types. However, due to the growing number of devices, this picture archive can never be fully up to date. Therefore it is possible to automatically assign own pictures based on parameters.
- A new rule is defined by adding an element, selecting an image and determining parameters.
- Several rules can be saved for an element.
- The export and import functions can be used to save and load the created rules. When rules are imported, the existing rules are retained. (An export contains all picture files and the associated picture rules)
- The supported image formats are PNG, JPG and GIF. We recommend using PNG with a transparent background.
- The priority for an element (devices) is determined by the position in the list, with the top position having the highest priority.

- Individual values and designations can be compared using the available operators (starts with, ends with, contains, Regex, =, >, >=, <, <=)

- **About PROscan Active:** Here you can find contact details, software and licence information, among other data. The Licence Agent can be started directly from here to work with the licence. For support enquiries, there is a button for opening the folder that contains all log files.

4.7 Scan

In this selection window, the IP address range to be scanned and the individual scan settings can be configured (see Figure 18).

- **IP Range:**

- A click on "Reset to Accessible Subnets" automatically adds the IP address ranges of all active network adapters.

- The red delete icon can be used to delete the parts of the IP range that is not needed, this significantly reduces the scan duration.

- An own "from" / "to" range can be defined. For example, if all devices are in the range between 192.168.0.1 and 192.168.0.55, this range can be defined by entering the values accordingly and subsequently selecting "Add IP Address Area". It is important to make sure that the PC has a valid IP address within the entered address ranges.

- **Scan Settings:**

- In the case of suspected connections, PROscan® Active is not 100% sure whether the connection is real. The user can select how these connections are to be connected. The options are: 'Connect', 'Connect as Unknown' and 'Do Not Connect'.

- Additionally there are four options that are selected by default. By deselecting individual options, the scan duration can be reduced, but this also reduces the quality of the scan.

- Communities for Connection Attempts: Here own SNMP communities can be set. The default setting for most devices is 'public'.

- **Start Scan/Compare:** In the case of an empty topology, this button starts the first scan. If a topology already exists, a comparison scan is generated.

- **Rescan:** In an existing topology, a completely new scan is started with the configured settings and the system asks whether the existing topology should be saved.

- **Read Diagnosis Data Again:** With this option, the Error/Discard counters and the data of the PROFINET Inspector are updated. (Short scanning duration)
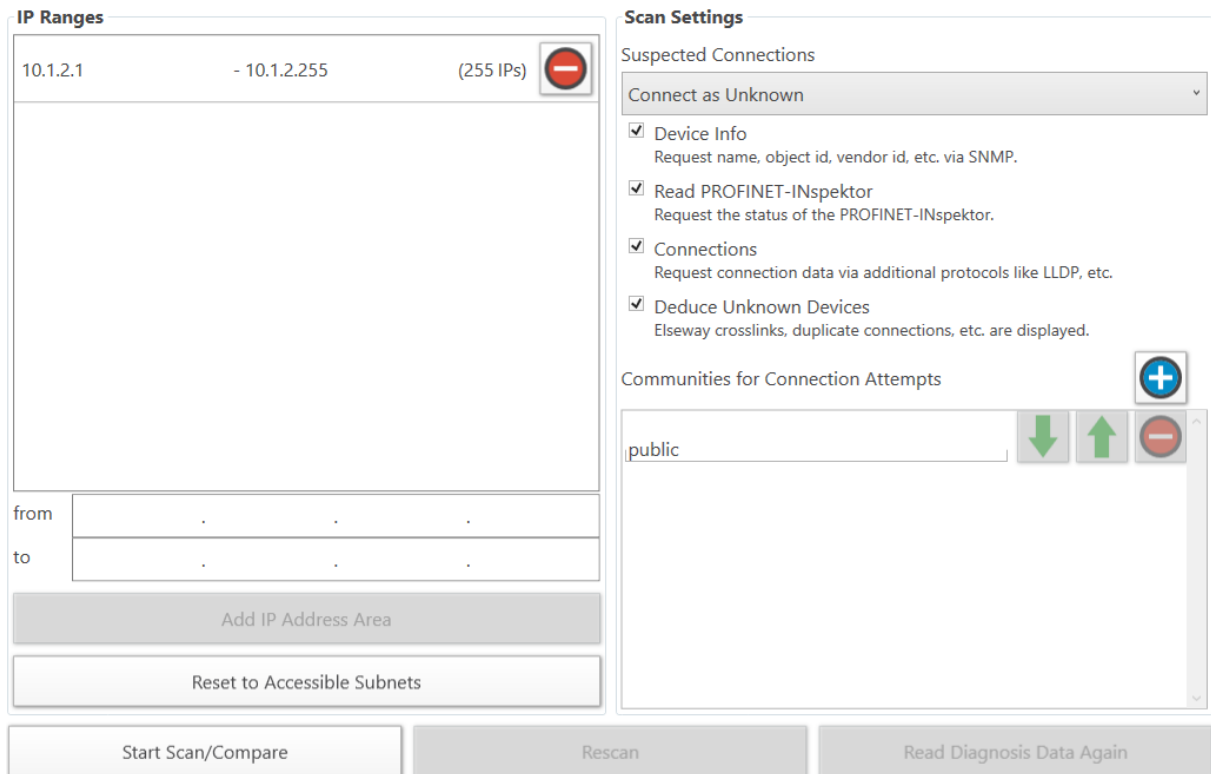
Figure 18: Scan range

5 Scanning a network

5.1 Creating a new scan of a network – Reference scan

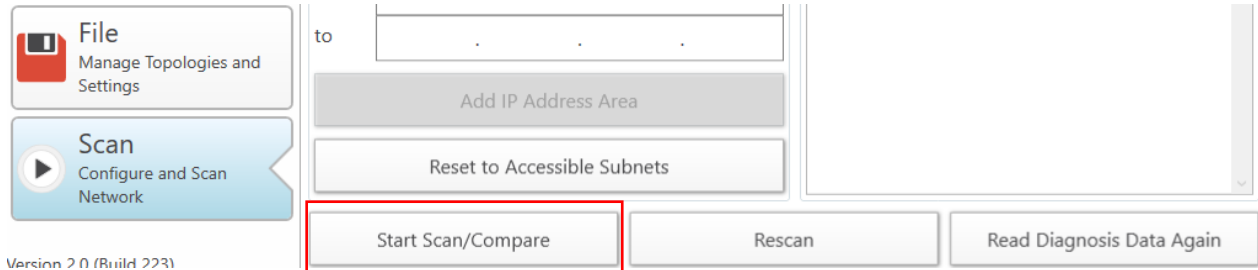The topology scan is activated by means of the 'Start Scan/Compare' button, see Figure 19.

Figure 19: Start Scan/Compare

Note: The duration of the network scan depends on the size of the network.

5.2 Repetition scan with check for changes

If changes occurred in the network, e.g. due to retrofitting/upgrade installations, or in the case of a network problem, a comparison scan can be started. To this end, the original scan has to be opened and selected. Subsequently select the 'Start Scan/Compare' option again, as shown in Figure 20. After the network scan has been completed, a message window reports the completion and provides information on the number of device nodes found in the network. Changes in the topology are displayed as follows:

- Flashing green: New devices and connections
- Flashing yellow: Connections where the port assignment has changed
- Flashing red: Devices and connections that are no longer present

In editing mode, the changes can be added to the new reference scan individually or all at the same time, or the devices and connections can be deleted.

6 Evaluating the scanned data

6.1 Properties of device nodes and connections

Selecting a device node opens the matching data sheet at the left in the menu bar.
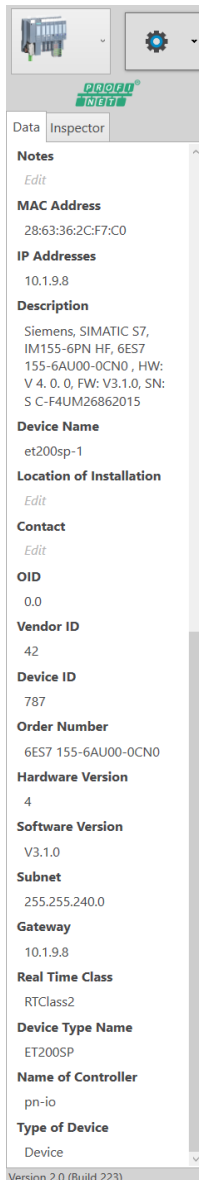
With the gear icon, you can access the website of the device or go to the device list or port statistics.

Notes – Own text can be entered here.

MAC Address

IP Address

Description

Device Name – PROFINET name / Windows name

Maximum Line Depth

Location of Installation

Contact

OID (object ID)

Vendor ID – Unique PROFINET ID of the device manufacturer

Device ID – Unique PROFINET ID of the manufacturer for its device

Order Number

Hardware Version

Software Version

Subnet

Gateway

Real-Time Class

Device Type Name

Name of Controller

Type of Device

Figure 20: Displayed device information

6.2   Properties of connections

When you click on the connection, an overview of information on the connection opens on the left-hand side, in the menu bar.

Node

192.168.0.3
port-001 (1)

Node

192.168.0.11
port-002 (2)

Type of Connection

Copper

Order Number

Edit

Cable Length

ca. 2.2m

Shield Current (mA)

Edit

Ohmic Resistance(Ω)

Edit

Notes

Edit

- The first two entries describe the two device nodes, with IP address and port designation of the connection.
- Type of Connection: e.g. copper, POF, fibre optics
- Order Number: Here you can enter an own number.
- Cable Length: This is automatically determined for Conformance Class C devices and can be manually entered for Class A and B.
- Shield Current (mA): Here the shield current for this connection, measured with a leakage current clamp, can be entered.
- Ohmic Resistance: Here the measured resistance of this connection can be entered.
- Notes: Here own information can be entered as free text.

Figure 21: Displayed connection information

7 DiagnosticDUO

Combined, the PROscan® Active software and the passive data logger PROFINET INspektor® NT form the perfect navigation system for your network: the PROFINET DiagnosticDUO. Thanks to the interaction between a topology plan and a diagnostic display, you can immediately find each device in its place in the network and assess its "health". This enables you to respond promptly and directly to any irregularities.

Intuitive traffic-light colours provide you with a network analysis at a glance. For this use case, the PN-INspektor has to be connected to the active or passive web interface on the PROFINET system by cable, and the INspektor requires an IP address on the system network. The connection is shown in Figure 22.
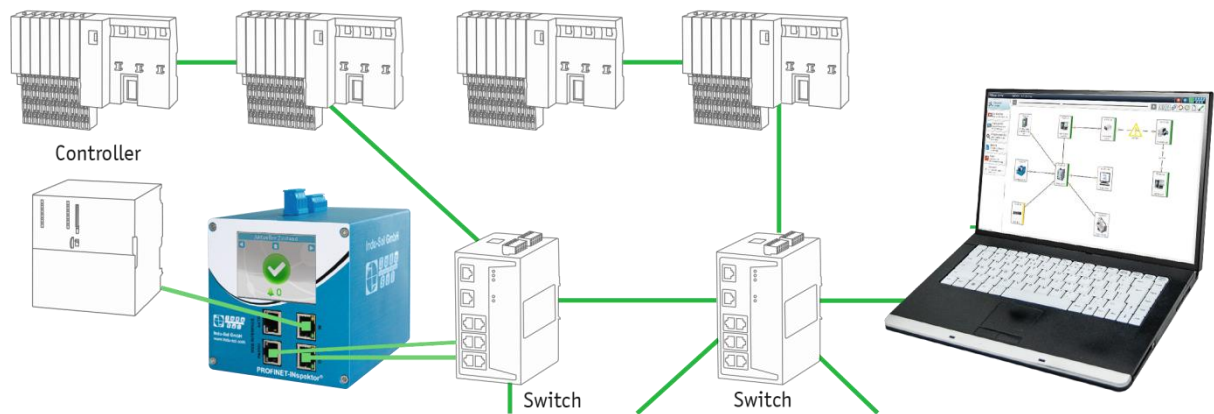

Figure 22: PROFINET DiagnosticDUO

8 Trap monitor

The trap monitor makes it possible to receive and display SNMP traps. Traps are targeted messages within the network. At a device, for example a switch, the IP address of the device to which the trap is to be sent has to be entered. These messages are alerts about errors and are loaded into PROscan® Active.

To explain this concept, an example is provided in Figure 23. In a network, a device at a switch is removed. The settings have been configured such that the PC with IP address 192.168.236.10 is to receive the messages via the installed PROscan® Active. After the device is removed, a standard diagnostic message is received, it appears on the user interface with a red marking. Another message is received when the device can be reached again. This message is marked with green. The message contains the IP address, the community, enterprise, generic trap ID, specific trap ID, the time stamp and the version.
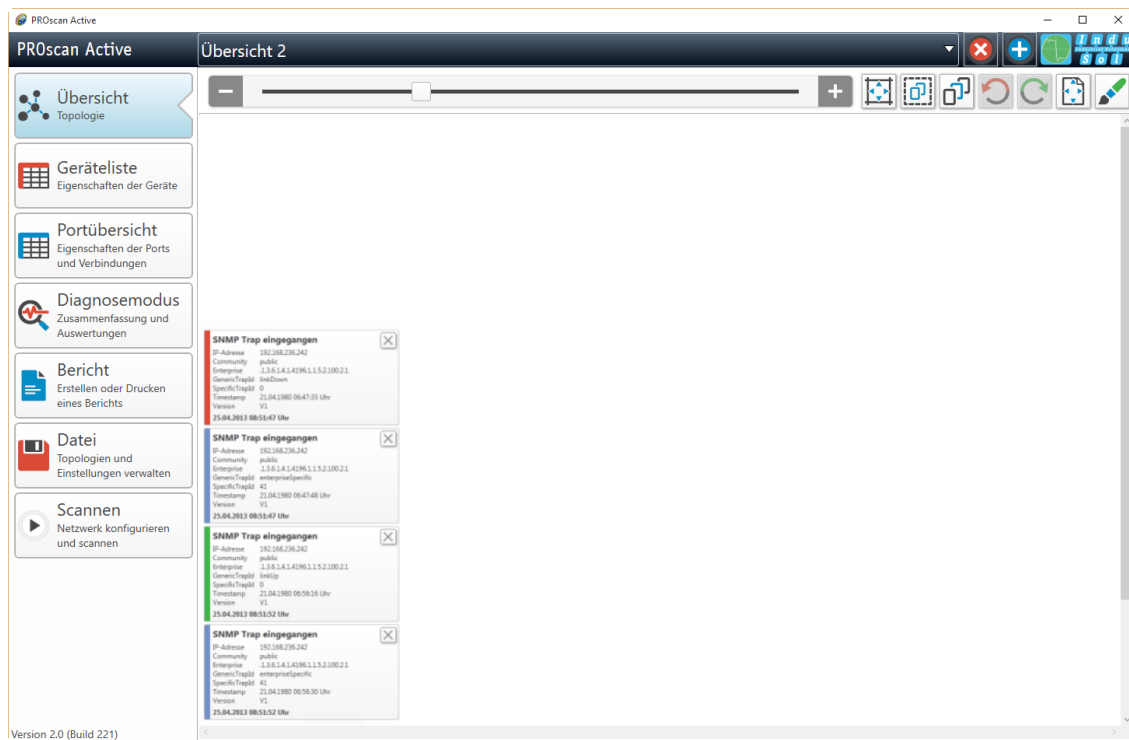

Figure 23: SNMP trap message

9 Glossary

9.1 Update rate

The update rate is a fixed value (specific to each device) set in the controller (e.g. 1 ms) indicating the time between data updates in the controller and the I/O device. The decisive criterion for the actual update rate is the network utilisation on the one hand, and the line depth, i.e. the installed network structure and the number of passing devices.

The increasing number of passing devices causes fluctuations in the transit time of telegrams, which are called jitter (see Point 9.5 Jitter). By measuring the update rates, it has to be shown that telegram jitter does not exceed half the update rate upwards or downwards (max. 50 % jitter).

9.2 Alarm (high priority / low priority)

Diagnostics messages that appear are sent to the PLC as high-priority or low-priority alarms in PROFINET. The event-based division of these alerts (e.g. the shorting of an ET200S module) is defined by each manufacturer themselves for their devices. Unfortunately, a more precise definition is therefore not possible, since the alarms are classified system- and node-specifically.

9.3 Bus device failure

In PROFINET node failures are diagnosed by means of the watchdog time of the controller or the node itself. This is determined by the set update time between the controller and node, as well as the number of accepted update cycles with missing I/O data.

If the watchdog time is exceeded, the PN-INspektor® NT reports a failure.

9.4 Bus device restart

The parameter 'Bus device restart' counts all device restarts that occur. A restart of a bus device occurs after a failure or a system start when a bus device has its parameters set by the control system without any faults and then begins the cyclical data exchange.

9.5 Jitter

PROFINET communication is based on maintaining the set update rate of each device with the controller. Positive and negative deviations from this configured update time are referred to as 'jitter' in PROFINET.

Jitter of up to 50 % of the configured update time is in an acceptable range. Jitter values that are greater than 50 % suggest network performance problems, device issues or an unfavourable layout of the network structure.

9.6 Telegram gaps

A telegram gap in PROFINET means the absence of an update time. Telegram gaps are frequently caused by lost telegrams in the network, e.g. by discards or telegram faults or are caused by incorrect firmware versions of devices. In such cases the devices do not pass on a telegram or 'forget' to send off their own telegram.

9.7 Telegram overtakes

A telegram overtake may arise in PROFINET if peak loads occur in the switch or I/O device. When circumstances are particularly bad, a new telegram may be sent before an old one in the buffer of the switch. Telegram overtakes indicate excessive utilisation or device malfunctions.

9.8 Error telegrams

This entry indicates the number of faulty telegrams detected in the PROFINET-INspektor® NT connection (checksum errors and packet fragments).

9.9 Utilisation

This includes the network load produced by all reports. This is given as a percentage based on the maximum possible load of a cable at 100 Mbit/s. For stable system operation, the network load should not exceed 20 % in new systems.