SIEMENS

Operating manual

SINETPLAN

Siemens Network Planner

Edition 02/2019

support.industry.siemens.com

SIEMENS

SINETPLAN
Siemens Network Planner

Operating Manual

Introduction 1
Getting Started 2
Installation 3
Working with SINETPLAN 4
Opening and importing projects 5
Scanning networks 6
Dataflows 7
Dataflow templates 8
Analyzing captured data 9
Device descriptions 10
Device groups 11
Analyzing networks 12
Reducing the traffic load 13
Settings 14
Validating networks 15
Topology details 16
Information about the project 17
Project reports 18
Project image 19
Service & Support A
Appendix B

02/2019
A5E37575946-AD

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Siemens AG
Division Digital Factory
Postfach 48 48
90026 NÜRNBERG
GERMANY

A5E37575946-AD
℗ 02/2019 Subject to change

Table of contents

1 Introduction 6

1.1 Some useful information about the Siemens Network Planner 7

1.2 Simulation of the data traffic 8

2 Getting Started 10

2.1 How to use the Siemens Network Planner 10

2.2 Export from STEP 7 10

2.3 Analyzing STEP 7 projects 11

2.4 Extending and analyzing STEP 7 projects 13
2.4.1 Requirements 13
2.4.2 Adding devices 14
2.4.3 Adding devices to the device catalog 15

2.5 Required data for network analysis 16
2.5.1 Requirements 16

2.6 Threshold values for buffers and traffic load 18
2.6.1 Setting thresholds 18
2.6.2 Color scheme of the thresholds 19

2.7 Example production plant 20

3 Installation 30

3.1 Installation 30

3.2 Installing SINETPLAN 32

4 Working with SINETPLAN 33

4.1 Topology view 40
4.1.1 Topology view toolbar 40
4.1.2 Devices with multiple interfaces 43
4.1.3 Devices with pluggable port modules 44
4.1.4 Wiring devices 46
4.1.5 Copying devices 48
4.1.6 Creating dataflows 49
4.1.7 Searching for devices 50
4.1.8 Replacing devices 50

4.2 Topology details 52
4.2.1 Overviews and tables 52
4.2.2 Device overview 55
4.2.3 Exporting a device list 57

4.3 Saving or exporting a project 58

5 Opening and importing projects 59

5.1 Opening a SINETPLAN project 59

5.2 Importing projects from STEP 7 60
5.2.1 Applying data from STEP 7 60
5.2.2 Configuring STEP 7 Classic for export 61
5.2.3 Exporting the topology and dataflows from STEP 7 62

5.3 Importing projects from STEP 7 (TIA Portal) 62
5.3.1 Apply data from STEP 7 V14 SP1 or higher 62
5.3.2 Direct import of projects from STEP 7 (TIA Portal) 63
5.3.3 Indirect import of projects from STEP 7 (TIA Portal) 64
5.3.4 Importing redundant systems from STEP 7 (TIA Portal) 68

5.4 Importing AutomationML data 69
5.4.1 Automation Markup Language 69
5.4.2 AML devices and network structure 70

5.5 Importing SINETPLAN projects 74
5.5.1 Adding a SINETPLAN project to the current project 74

6 Scanning networks 75

6.1 Network Scanner 75

6.2 Scanning and analyzing networks 77

7 Dataflows 78

7.1 Properties 79

7.2 Managing dataflows 80
7.2.1 Overview 80
7.2.2 Importing dataflows 80
7.2.3 Creating dataflows 81
7.2.4 Changing dataflows 84
7.2.5 Copying dataflows 85
7.2.6 Exporting dataflows 85
7.2.7 Deleting dataflows 86

8 Dataflow templates 87

8.1 Information about dataflow templates 87

8.2 Properties 88

8.3 Managing dataflow templates 88
8.3.1 Importing and exporting dataflow templates 89
8.3.2 Creating and exporting dataflow templates 90
8.3.3 Changing dataflow templates 92
8.3.4 Saving dataflow templates globally 93
8.3.5 Deleting dataflow templates 93

9 Analyzing captured data 94

9.1 Generating dataflows from capture files 94

9.2 Recording dataflows of a redundant system 98

10 Device descriptions 103
10.1 Managing device descriptions 104
10.1.1 Importing device descriptions 104
10.1.2 Creating device descriptions 105
10.1.3 Creating device descriptions with an XML editor 114
10.1.4 Editing device descriptions 114
10.1.5 Searching for devices 118
10.1.6 Deleting device descriptions 119
11 Device groups 120
11.1 Managing groups 124
12 Analyzing networks 129
12.1 Requirements 129
12.2 Analyzing networks 131
13 Reducing the traffic load 135
14 Settings 138
14.1 Setting thresholds 140
14.2 Settings for Network Scanner 142
14.3 Settings for validating networks 144
15 Validating networks 145
15.1 Checking networks 145
16 Topology details 147
16.1 Overviews and tables 147
16.2 Device overview 150
16.3 Exporting a device list 152
17 Information about the project 153
17.1 Inserting information about the project 153
18 Project reports 156
18.1 Generating reports 156
19 Project image 158
19.1 Generating a project image 158
A Service & Support 159
B Appendix 162
B.1 Manually configuring the export from STEP 7 162
B.2 Exporting dataflows and topology from STEP 7 164
Index 165

Introduction

1

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that can be implemented, please visit (https://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customers' exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed visit (https://www.siemens.com/industrialsecurity).

1.1 Some useful information about the Siemens Network Planner

SINETPLAN supports you in planning and designing PROFINET networks.

Information on PROFINET topologies and data traffic can be found in the PROFINET manual (https://support.industry.siemens.com/cs/ww/en/view/49948856) and in the Communication manual (https://support.industry.siemens.com/cs/ww/en/view/59192925).

SINETPLAN calculates the data traffic in the network and points out critical segments in which the traffic load is too high.

To do so, the tool simulates:

- Real-time data traffic between IO controllers and IO devices (real-time communication),
- Data traffic between regular Ethernet devices, such as TCP/IP data or UDP data (non-real-time communication).

As a result, you will have an overview of the dynamics and utilization of the planned network prior to installation and commissioning.

If SINETPLAN displays critical network segments, you can easily revise your plans and start the simulation once again.

That way you optimize the planned network and prevent problems from occurring during commissioning or in production.

This procedure increases the availability of the production plant and the operational reliability.

What's new in SINETPLAN V2.0?

The following function extensions improve your planning workflow with SINETPLAN so that you benefit from an even more efficient simulation:

- Import of topology data from plant planning with AutomationML; a format that you can generate with various engineering tools, such as with TIA Portal, with the TIA Selection Tool and with EPLAN.
- Export of topology data to an AutomationML file with modified settings from SINETPLAN (e.g. customized names of devices and their interfaces, corrected IP address suites, modified connections)
- Topology export possible for SINETPLAN from current STEP 7 (TIA Portal) version (V15.1).
- Additional consideration of additional dataflow types such as broadcast dataflows and H-Sync dataflows from high-availability automation systems S7-1500R.
- Calculation and display of additional information from the network analysis, such as PROFINET I/O update times and their fluctuations (jitter).
- Integration of additional device descriptions and dataflow templates.
- In addition to German and English, the Chinese language can now also be selected as user interface language.
- In addition, SINETPLAN offers numerous usability enhancements, especially for the efficient management of large amounts of data. As an example, filter options in tables, such as the device overview, facilitate the targeted editing of objects with specific criteria.

Manual (version of help)

The Siemens Network Planner manual can be found here (https://support.industry.siemens.com/cs/ww/en/view/109485570).

Information in the Online Support

Here you can find an overview of the most important technical information and solutions in the Siemens Industry Online Support.

Additional support for SINETPLAN (https://support.industry.siemens.com/cs/us/en/ps/22637)

1.2 Simulation of the data traffic

Estimation of the traffic load

SINETPLAN simulates the data traffic of a planned plant.

The simulated data traffic does not exactly reflect the actual data traffic in the real network, because the calculation is based on worst-case scenarios.

Only a measurement in the finished network in full operation (by means of a Test Access Port) taking the different plant states into consideration would be completely exact.

SINETPLAN enables you to make a meaningful calculation of the traffic load in the future network.

The goal is to arrive at a reliable estimation through simulation prior to installation of the automation system. With the help of this estimation you notice if the traffic load is too high in some network segments or in the entire network prior to installation of the network.

For the simulation, you can access data from STEP projects in various project formats:

- STEP 7 project (*.s7p)
- TIA Portal (*.ap*, whereby the second * is the version of TIA Portal)
  SINETPLAN V2 can import the projects of TIA Portal as of version 14 SP1.
- SINETPLAN project V1 (*.xml)
- SINETPLAN project V2 (*.spp2)
- SINETPLAN - project exported from TIA Portal (*.spe2 or *.xml file of the TIA Portal Project Exporter)
- AML project (*.aml)

1. Open the SINETPLAN start page.
2. Select the "Create new project" button.
   The "Network analysis" view is displayed.
3. Click the "Import project" toolbar button.

   SINETPLAN displays the dialog for importing a project.

4. In the "Browse for project" area, select the main directory of the project that you want to analyze.
5. Locate the project file and select the corresponding project type from the drop-down list in the dialog window on the bottom right.
6. Import the project into SINETPLAN.

Note

When you make estimations regarding dataflows and device properties, you always assume the worst-case scenario.

By using the worst-case scenario the actual traffic load is always lower in the future network than in the simulated network.

Getting Started

2

2.1 How to use the Siemens Network Planner

Working with SINETPLAN

This section shows you how to work with SINETPLAN. You have created a project in STEP 7 and you want to simulate in SINETPLAN how high the traffic load is in the individual segments of the network.

You learn:

- What you need to observe when you extend or edit the imported STEP 7 project in SINETPLAN.
- Which information SINETPLAN needs to analyze the traffic load.
- Which basic settings of SINETPLAN are available and what you have to observe when you make changes.

A specific example will show you how to work with SINETPLAN.

2.2 Export from STEP 7

Requirements for the export from STEP 7

STEP 7 stores important data for SINETPLAN (devices in a configuration, dataflows, topology) in the STEP 7 project directory when the following requirements have been met:

- The export is configured from STEP 7.

  Two options are available for this:

  – SINETPLAN is installed on a computer on which STEP 7 is installed as well.

    In this case you do not need to make changes on the STEP 7 computer.

    All necessary changes are automatically made during the installation of SINETPLAN. The export is configured after restarting STEP 7.

  – SINETPLAN is installed on a computer on which STEP 7 is **not** installed.

    In this case you must make changes on the STEP 7 computer (see Manually configuring export from STEP 7 (Page 162)).

- You use STEP 7 V5.5 SP4 HF9 or higher.
- You have specified the topology of a project in the Topology editor of STEP 7 and have saved and compiled the project in HW Config. The exact procedure is available in section Exporting dataflows and topology from STEP 7 (Page 164).

2.3 Analyzing STEP 7 projects

Importing the STEP 7 project

To analyze a STEP 7 project with SINETPLAN, execute the following steps:

1. Start SINETPLAN.

   The Start dialog is displayed.

2. In the Start dialog, click "Create New Project".

   The "Network Analysis" view is displayed.

3. Click the "Import project" toolbar button.

   SINETPLAN displays the dialog for importing a project.

4. In the "Browse for project" area, select the main directory of the STEP 7 project you want to import and analyze.

5. Locate the project file and select the entry "STEP 7 project (*s7p)" from the drop-down list in the dialog window on the bottom right.

6. Click "Import project".

   If no data is saved for SINETPLAN in the project directory, see the explanations under Export from STEP 7 (Page 10)).

   SINETPLAN executes the following steps:

   – The configured devices are placed in the editor (Topology view).
   – The ports of the devices are interconnected.
   – The devices are added to the "Device overview".
   – SINETPLAN adds the dataflows between the devices to the list of dataflows ("Dataflows" tab).
   – SINETPLAN assigns the device descriptions to the devices that are available in the SINETPLAN device catalog.

     If there is no device description, SINETPLAN uses the general device descriptions for these devices.

     Device descriptions for Siemens devices are available in the device catalog.

     For devices from other manufacturers you have to import the device descriptions into the device catalog (see Importing device descriptions (Page 104)) or create them (see Creating device descriptions (Page 105)).

Calculating the traffic load

Click the "Analyze topology" icon in the toolbar to simulate the data traffic in the configured network:

SINETPLAN starts the analysis:

When an error occurs during analysis, it is stopped and an error message is output.

If no errors occur, the analysis is completed.

Result of the analysis

SINETPLAN visualizes the result with colored data packets between the devices:

Color scheme of the data packet:

- A green data packet means: The traffic load is okay in this segment. The available bandwidth of the network (the network capacity) is only used partially.
- Yellow data packet: The first threshold was exceeded.
- Red data packet: The second threshold was exceeded.

You set the thresholds under "Settings > Thresholds" (see Setting thresholds (Page 18)).

2.4 Extending and analyzing STEP 7 projects

2.4.1 Requirements

Initial situation

You have already carried out a configuration in STEP 7.

You have determined that not all devices on the PROFINET/Ethernet network are included in this project.

The next steps

1. Import the STEP 7 project (see Analyzing STEP 7 projects (Page 11)).
2. In SINETPLAN add the devices that are still missing to map the entire configuration of the PROFINET/Ethernet subnet Adding devices (Page 14).

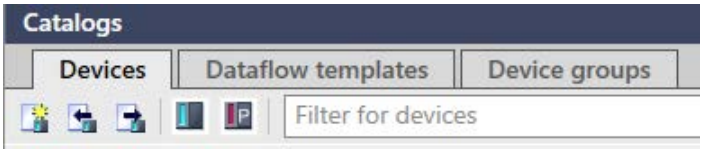
   These may be standard Ethernet devices (such as PCs) or third-party automation devices that cannot be configured in STEP 7.

2.4.2 Adding devices

Adding devices to a project

To add a device to a project, execute these steps:

1. Select the "Network analysis" view.
2. Click the "Devices" tab in "Catalogs":



3. In the device catalog, select the device you wish to add to the project.

   Use filters for the devices. You can filter according to the following criteria:

   – Name
   – Main family
   – Product family
   – Article number
   – SW version
   – Device type
   – Vendor

4. Double-click the device.

   SINETPLAN displays the device in the editor to the right of the device inserted last (or in the next line if there is not enough space).

   Otherwise:

   Adding a device via drag & drop.

   To do so, click the device you wish to add to the project in the device catalog.

   Keep the left mouse button pressed and move the mouse to the location in the editor where you want to place the device.

   Release the mouse button.

   SINETPLAN now adds the device to the project and shows it in the editor at the location where you have placed it.

If the device is not included in the device catalog, you need to first create the device in the device catalog (see Adding devices to the device catalog (Page 15)).

See also

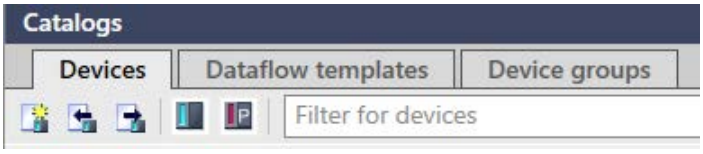
Exporting a device list (Page 57)

2.4.3 Adding devices to the device catalog

Creating devices

To add a new device in the device catalog, execute the following steps:

1. Select the "Network analysis" view.
2. Click the "Devices" tab in "Catalogs":



3. Click the "Create new device" icon in the device catalog:

   A dialog with two tabs, "General" and "Configuration", is displayed.
4. Enter the properties of the device (see Creating device descriptions (Page 105)).
5. Save the device description.

   SINETPLAN displays the new device in the device catalog.

Exporting devices

You can export all devices that are used in a project as CSV files (see Exporting a device list (Page 57)).

2.5 Required data for network analysis

2.5.1 Requirements

Requirements for network analysis

To calculate the traffic load in a PROFINET network, SINETPLAN requires the following information:

- Which devices exist in the network?

  This includes all PROFINET and standard Ethernet devices in the network.

- How are these devices networked with each another?

  The topology of the network: Which device port is connected to which port of another device?

- Which dataflows exist between these two devices?

  How high is the data traffic between the devices?

  The dataflows indicate how much data is sent from one device to another device.

  Dataflows are characterized by the following parameters (see also Creating dataflows (Page 81)):

  – Transmission type: Unicast or broadcast

  – Real-time class: Real-time data (PROFINET IO Class 1 to 3) or NRT data (Non-real-time).

  – Maximum size of a data packet: The number of bytes in a data packet.

  – Maximum size of a burst: The number of all bytes in data packets that are sent one right after the other (in one block).

  – Average rate: Number of bytes that are sent in one second.

  The dataflows depend on the respective configuration, for example, the type and number of inserted modules.

- Which dataflows can be processed by the utilized devices?

  This information is included in the device descriptions.

  For Siemens devices this information is already included in SINETPLAN in the device catalog.

  A device description specifies which dataflows a device can process and forward.

  Here the properties and the behavior of internal device switches is extremely important.

  The internal devices are characterized by the following parameters (see also Creating device descriptions (Page 105)):

  – Number and properties of the interfaces.
  – Number and properties of the ports of the individual interfaces.
  – Number and properties of the queues (buffers) of the individual ports.
  – Size of the queues.
  – Priority of the queues.

2.6 Threshold values for buffers and traffic load

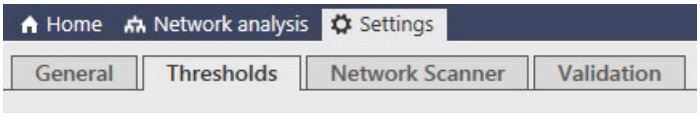
2.6.1 Setting thresholds

Setting the thresholds for bandwidth and queues

You set the thresholds for bandwidth and queues (buffers) under "Settings > Thresholds".

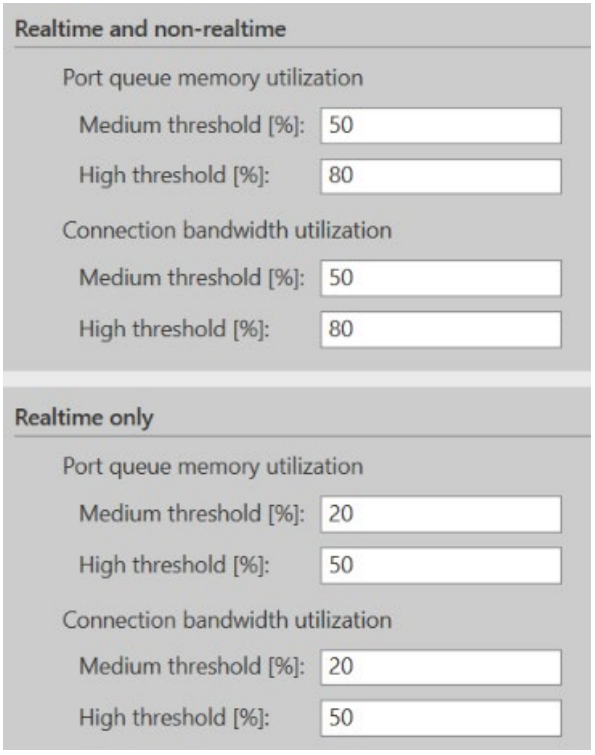
Follow these steps:

1. Select the "Settings" view.
2. Click on the "Thresholds" tab.



3. Set the thresholds for buffer and bandwidth according to the specifications in your company.

   The figure below shows the settings in accordance with the PROFINET planning guideline of the PROFIBUS User Organization:



2.6.2 Color scheme of the thresholds

Green, yellow and red

SINETPLAN symbolizes the result of the network analysis with colored data packets between the devices.

In addition, the tool displays the device ports in yellow or red when their thresholds were exceeded.

Color scheme:

The colors green, yellow and red symbolize the result of the analysis.

- Green data packets means:

  The traffic load is okay in this segment. The bandwidth of the network (the network capacity) is only used partially.

- Yellow data packets and ports mean:

  The first (average) threshold was exceeded here. We recommend that you check the planned network.

- Red data packets and ports mean:

  The second (higher) threshold was exceeded here. You must take measures to reduce the traffic load.

2.7 Example production plant

This section uses an example to show you how to work with SINETPLAN.

We are using a production plant with multiple CNC machining centers and robots.

Initial situation: You have configured the plant with STEP 7.

In addition, a system for image processing is to be integrated into the plant which can automatically detect faults in the workpieces.

A camera should be installed in the plant to accomplish this.

The software for image processing runs on a PC outside the plant.

The camera is connected to the PROFINET network.

You must now clarify whether the traffic load is too high due to the image processing: The camera creates a high volume of image data that are sent to the PC outside the plant.

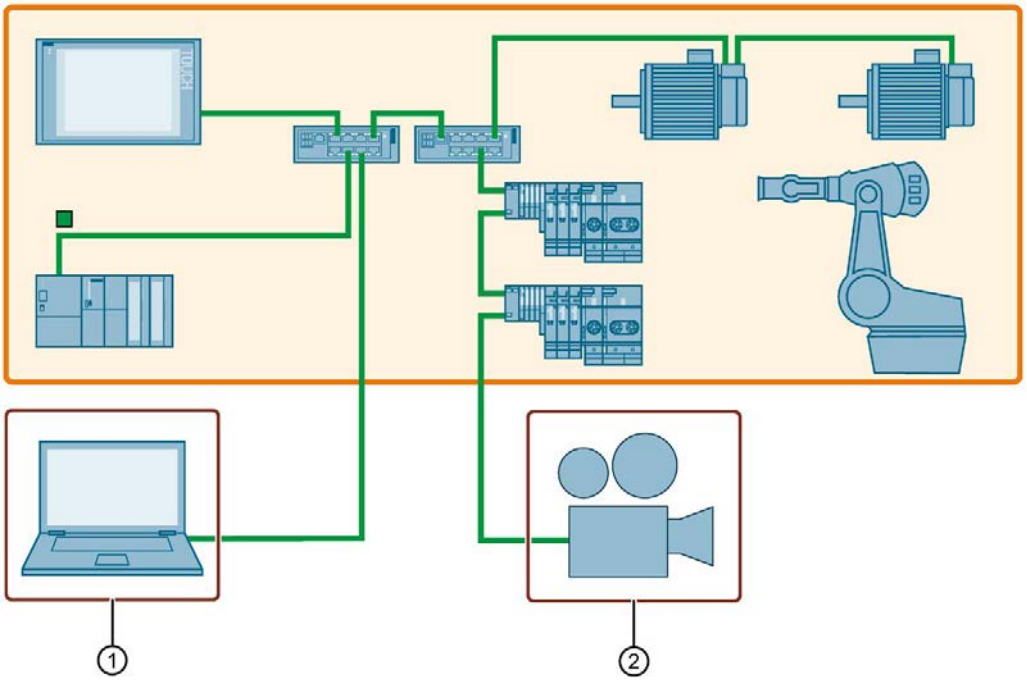
Does the additional dataflow put an undue burden on the PROFINET network of the plant?

Could it cause loss of data or even a failure of the plant?

You will get a clear answer with the help of SINETPLAN.

The figure below shows the operating principle:

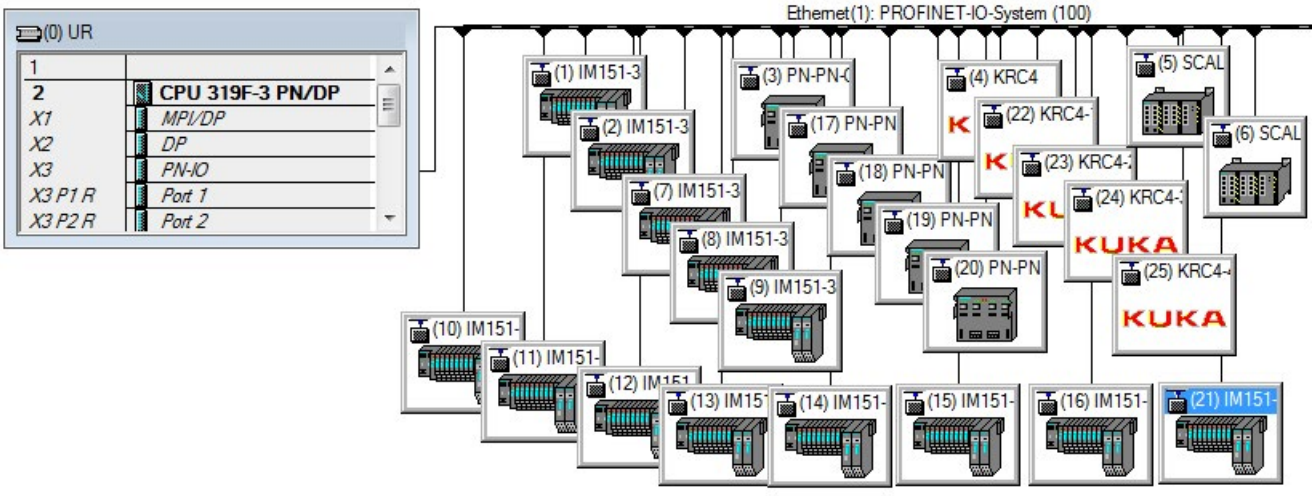
- The camera ② is connected at the end of the PROFINET line behind the distributed I/O.
- The software for image processing runs on a PC ① outside the plant:



The camera captures the surface of the workpieces and creates a dataflow of image data that is fed in at the end of the PROFINET line. This dataflow also flows through the network in addition to the real-time data of the plant.

Is the traffic load too high?

The figure below shows the configuration in STEP 7:



Step 1: Importing the STEP 7 project

First start by applying the STEP 7 configuration.

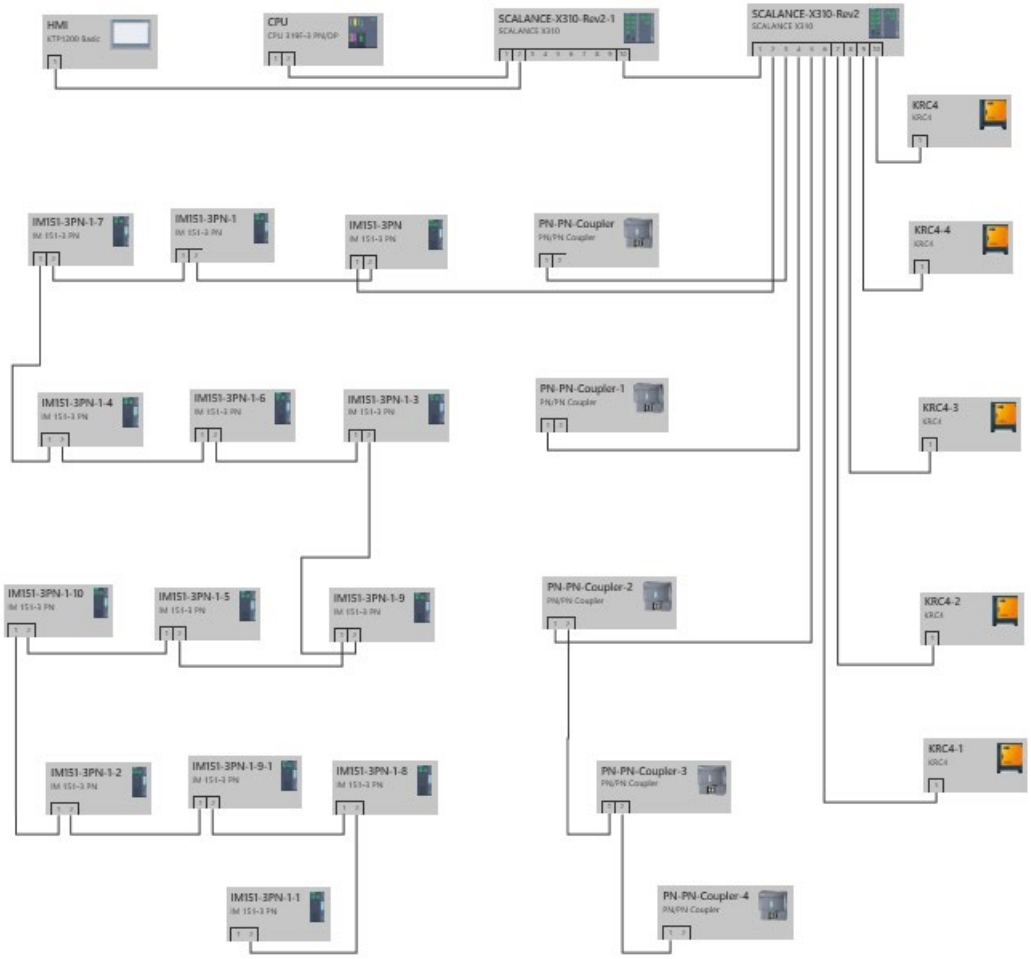
To do this, click the "Import project" icon in the "Network analysis" view:

A dialog box appears for selecting files.

Select the directory of the STEP 7 project you want to import into SINETPLAN.

Select the entry "STEP 7 project" from the drop-down list in the dialog window on the bottom right.

The figure below shows the imported project in the SINETPLAN editor:

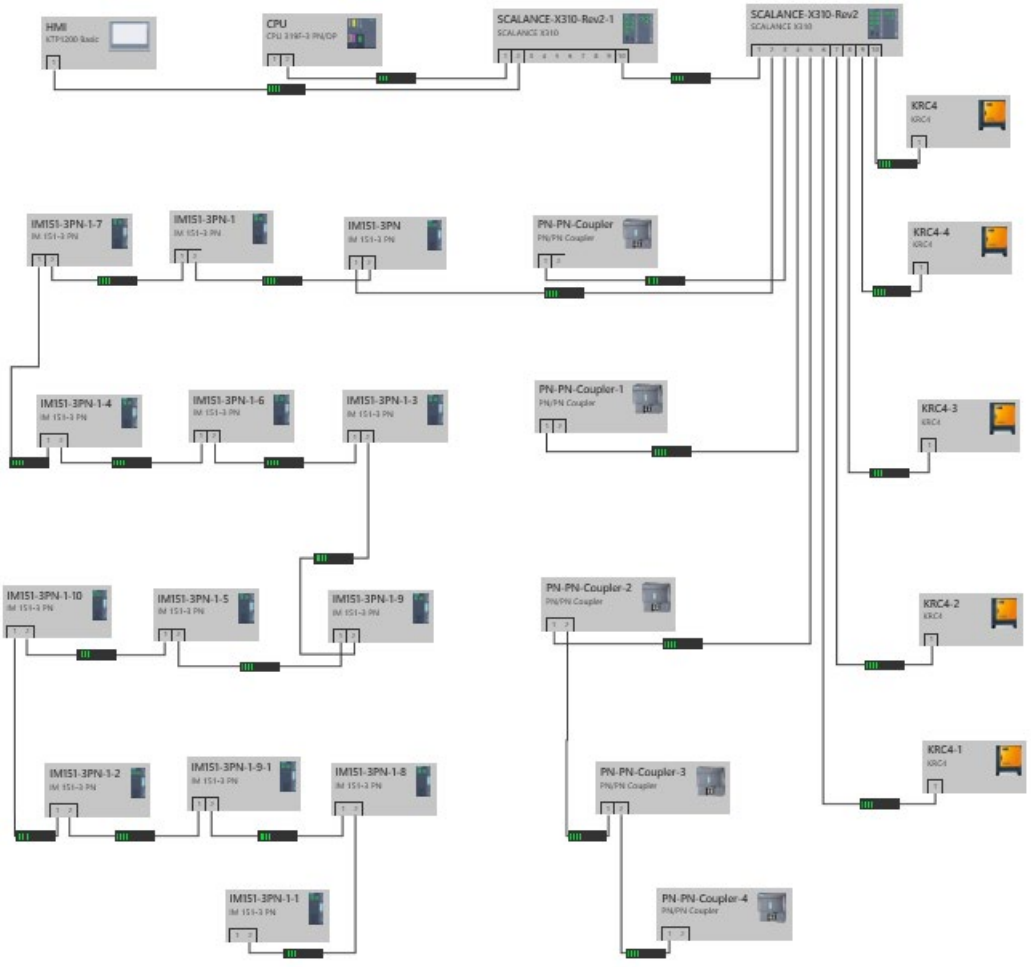


Step 2: Analysis of the STEP 7 project

Click the "Analyze topology" icon in the toolbar:

SINETPLAN starts the analysis.

- If not all Information exists, error messages are displayed and the analysis is canceled.
- When all information is available, SINETPLAN calculates the traffic load and displays the result in the editor:



Zoom function

You can use the zoom function to enlarge individual network areas.

1. Click the "Zoom selection" icon in the toolbar.

2. In the editor, click in front of the area you want to enlarge.
3. Hold down the left mouse button and draw a rectangle.
4. Now release the left button.

   The area of the rectangle is now shown enlarged:

Step 3: Adding missing devices to the device catalog

By importing the STEP 7 project, SINETPLAN has applied the following information:

- The configured PROFINET devices.
- The networking of these PROFINET devices with each other (topology).
- The dataflows between these PROFINET devices.

The device descriptions are not imported.

For the most part, these descriptions are already included in the SINETPLAN device catalog (as for all Siemens devices).

In the following cases you will have to enter the device descriptions later:

- If you have configured devices with STEP 7 for which descriptions do not yet exist in the device catalog.
- If you are using additional devices in SINETPLAN for which descriptions do not yet exist in the device catalog.

Two options are available for this:

- You receive a device description (an XML file) from the device manufacturer and import it into SINETPLAN (see Importing device descriptions (Page 104)).
- You create your own device description for the respective device (see Creating device descriptions (Page 105)).

Step 4: Adding additional devices to the project

Now you add the additional devices to the project, such as the camera and the PC for image processing in the example:

To do so, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Devices" tab under "Catalogs".
3. Double-click the devices you wish to add to the project in the device catalog.

   The following devices are added to the project in the example:

   – The PC on which the software for image processing is executed.
   – The camera which takes pictures of the workpiece surfaces.

Step 5: Connecting new devices

Connect the new devices.

To do so, follow these steps:

1. Move the mouse pointer to the output port of a device.

   When the mouse pointer is above the port, it is highlighted in blue.
2. Click on the port.
3. Hold down the left mouse button and draw a line to the target port.
4. Release the left mouse button above the target port.
   SINETPLAN now draws the line between the connected ports.
5. Assign IP addresses to the newly added devices.

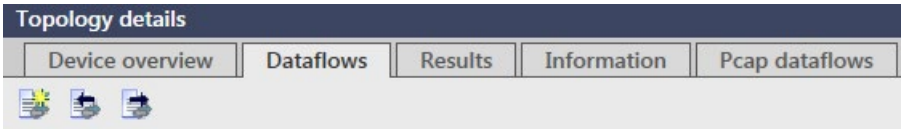
Step 6: Inserting dataflows for the additional devices

Create dataflows for the additional devices.

A separate dataflow is required for each direction.

To generate a dataflow follow these steps:

1. Click the "Dataflows" tab under "Topology details".



2. Click the "Create dataflow" icon.

3. The "Edit dataflow" window is displayed to the left of the "Topology view".

   Enter the properties of the dataflow (see Creating dataflows (Page 81)).

   In the example it is assumed that the camera sends five images per second with one MB each to the PC for image processing.

4. Click "Create".

Step 7: Include NRT data in the analysis

The camera sends the image data as standard Ethernet packets. The network analysis must also take into account the NRT data (Non-Real-Time).

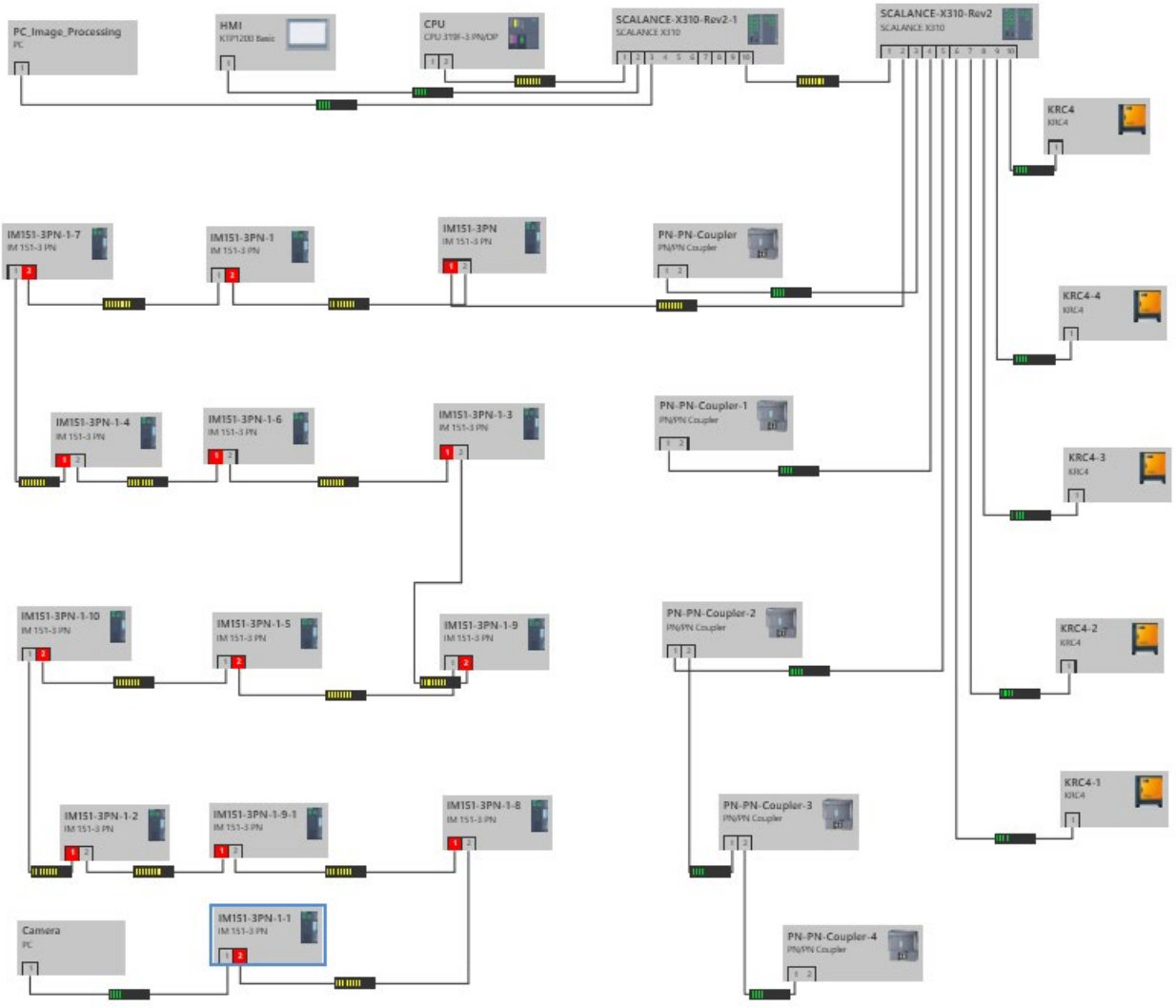
For this reason, select the option "Include Non-Real-Time dataflows" in the "Results" tab.

Step 8: Starting analysis of the extended project

To start the network analysis, click the "Analyze topology" icon in the toolbar:

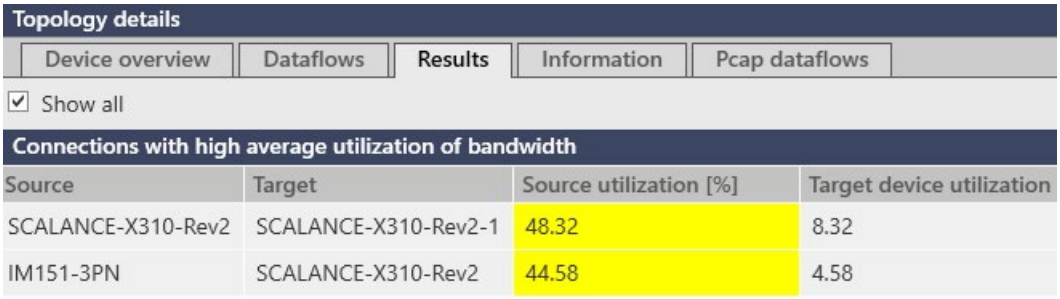
If not all the information for the network analysis is available, SINETPLAN issues error messages.

When all information is available, SINETPLAN calculates the traffic load and displays the results in the editor:



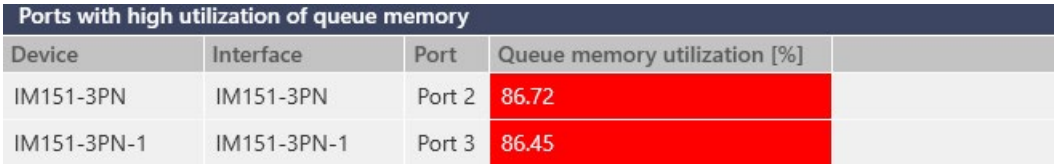
SINETPLAN lists the results of the network analysis in the "Results" tab:

- All the connections where the first or second threshold for the available bandwidth is exceeded are listed under "Connections with high average utilization of bandwidth":



Source	Target	Source utilization [%]	Target device utilization
SCALANCE-X310-Rev2	SCALANCE-X310-Rev2-1	48.32	8.32
IM151-3PN	SCALANCE-X310-Rev2	44.58	4.58

- All the ports where the first or second threshold for the utilization of the queues are listed under "Ports with high utilization of queue memory":



Device	Interface	Port	Queue memory utilization [%]
IM151-3PN	IM151-3PN	Port 2	86.72
IM151-3PN-1	IM151-3PN-1	Port 3	86.45

The most important results of the network analysis

Now you have analyzed a project in SINETPLAN and receive the following results:

- A majority of the data packets between camera and PC is yellow in the editor.

  The values of the individual network segments exceed the low threshold.

- Many ports between camera and PC are red in the editor.

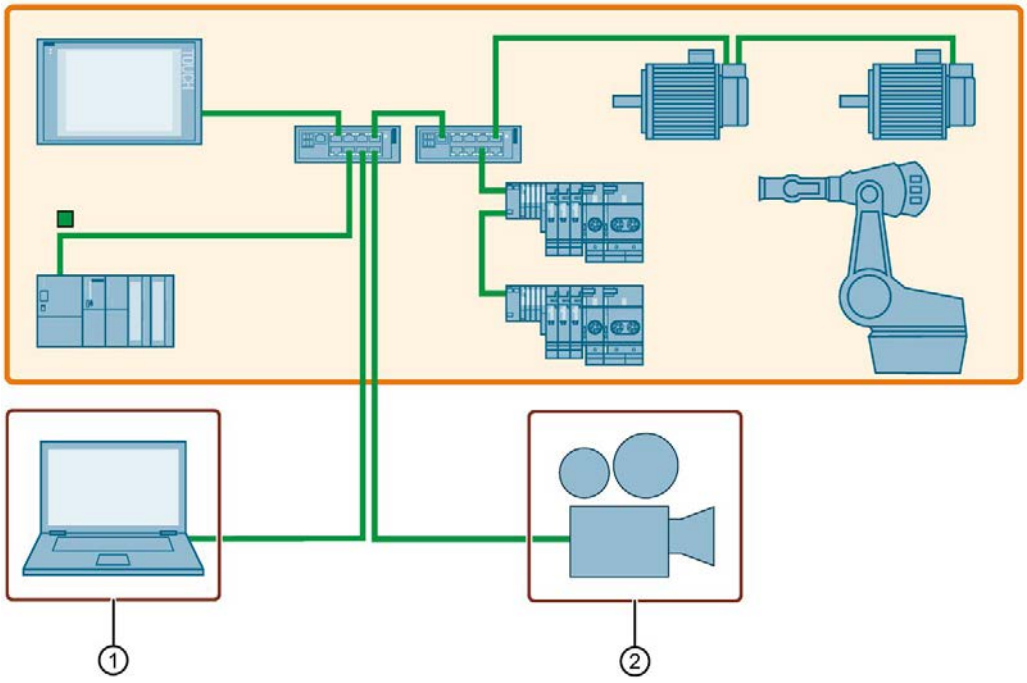
  The values of the individual ports exceed the high threshold.

Outcome of the analysis:

The camera cannot be connected to the end of the PROFINET line. You must plan the network once again.

Possible solution: The dataflows of the plant and image processing are to be managed separately.

The figure below shows the configuration in newly planned interconnection of the devices.



Here, the PC ① and the camera ② are directly connected to a switch.

Installation 3

3.1 Installation

Requirements

SINETPLAN supports the following operating systems (64-bit):

- Windows 7 Professional SP1
- Windows 7 Enterprise SP1
- Windows 7 Ultimate SP1
- Windows 10 Home Version 1809 (OS Build 17763)
- Windows 10 Pro Version 1809 (OS Build 17763)
- Windows 10 Enterprise Version 1809 (OS Build 17763)

SINETPLAN supports the 64-bit version of each operating system.

Additional requirements:

- SINETPLAN uses the "WinPcap" library.

  Install the library if it is not already installed.

  The setup program for WinPcap can be found on the SINETPLAN DVD in the directory "Support".

- SINETPLAN uses the Microsoft framework .NET 4.5.

  If the framework is not yet installed on the PC, it will be installed automatically during the setup.

- A license is required for SINETPLAN.

  Use the "Automation License Manager" (ALM) tool to save a license to the PC on which SINETPLAN is being run.

  SINETPLAN V2.0 is compatible with the latest ALM version. ALM is supplied on DVD and installed from Setup. The upgrade causes no problems with the license.

Available licenses:

SINETPLAN V2.0 supports the following license types:

- 21-day trial version (one-time trial version).

  The following functions are **not** available with the 21-day trial version of SINETPLAN:

  – Importing a STEP 7 project
  – Importing a TIA Portal project (directly or indirectly)
  – Reporting
  – Importing and exporting AML files
  – PCAP analysis (table of PCAP dataflows is not visible)

- Unlimited (floating, unlimited)

For information about your license type, see "Info" in the title bar on the right.

Compatibility:

SINETPLAN V2.0 can open the projects from SINETPLAN V1.0. After editing, save the project in spp2 format or export it as ".aml".

SINETPLAN V2.0 is not backward compatible to SINETPLAN V1.0:

- SINETPLAN V1.0 stores projects in ".xml" format.
- SINETPLAN V2.0 projects have introduced a separate file name extension ".spp2". This new extension is assigned to SINETPLAN V2.0 and enables the SINETPLAN to be started and opened by double-clicking on a project with the file extension "* .spp2" in Windows Explorer.
- SINETPLAN V1.0 cannot open projects with the new extension ".spp2".

Configuring STEP 7

The installation program for SINETPLAN configures your PC so that STEP 7 or TIA Portal stores important data for SINETPLAN (devices in a configuration, dataflows, topology) in the project directory.

If STEP 7 is installed on a different PC, you must set the export of important project data manually on this other PC; see Configuring manual export from STEP 7 (Page 162).

3.2 Installing SINETPLAN

Procedure

Follow these steps to install SINETPLAN:

1. Insert the SINETPLAN DVD into the DVD drive.
2. Double-click the "Start.exe" application.

   The installation program is started.

   A user account control dialog is displayed.

   In the general settings of the setup, you can remove individual components such as the TIA Administrator (software management) or the Automation Software Updater from the product configuration. We recommend that you keep the default settings, as you will be informed about these programs when new versions of SINETPLAN are available.
3. Click the "Yes" button to allow the "Siemens Installer Assistant" program to carry out changes to the computer (in other words, to install SINETPLAN and other components).

   The installation program now carries out the installation.

Working with SINETPLAN

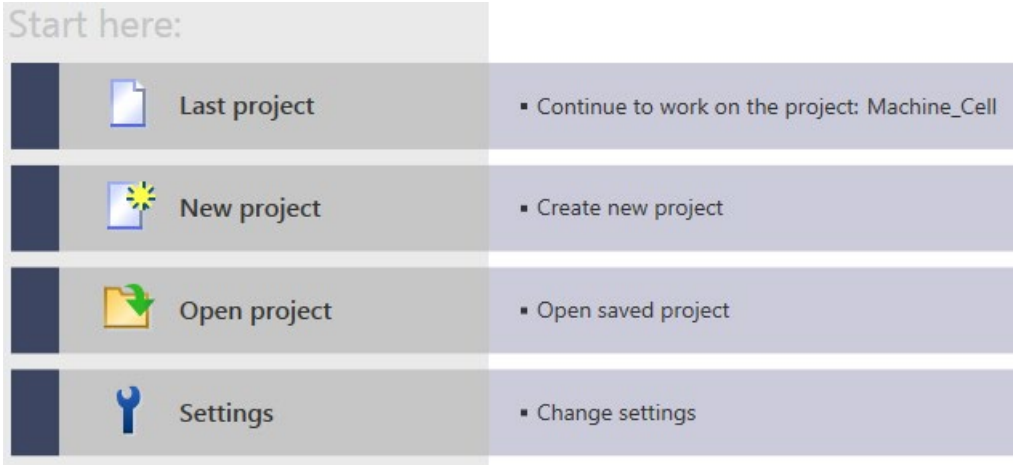
4

SINETPLAN offers the following views:

- Home page
- Network analysis
- Settings

Home page

After the start, SINETPLAN displays the start page with the following options:

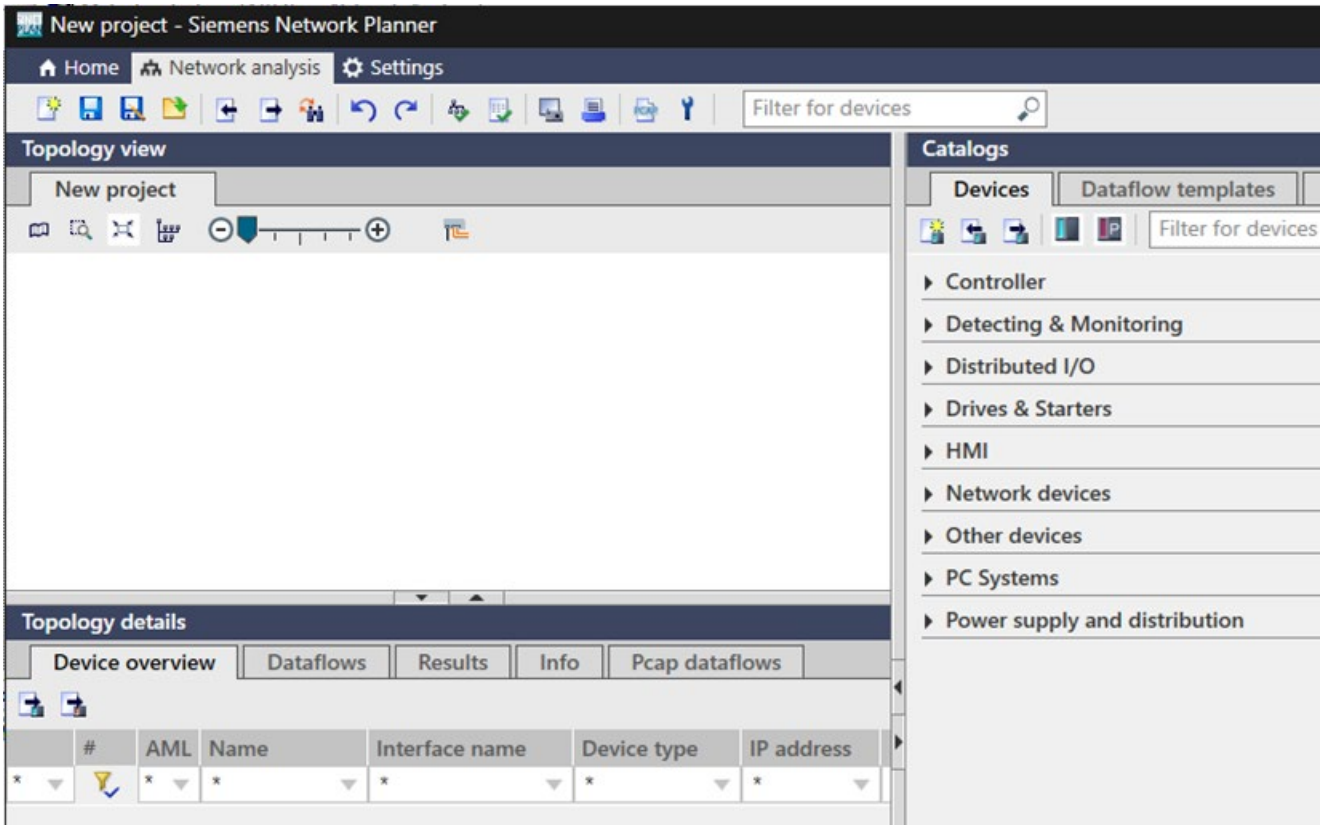


Click one of the buttons. You can execute the following actions:

- Continue working on the current project if a project was already edited.
- Create a new project:
  - Import data from TIA Portal
  - Import AML data
  - Import SINETPLAN projects as of V1.0
  - Create a new topology directly in SINETPLAN
- Open an existing project:
  - As of SINETPLAN version 2.0 (*.spp2 format)
  - SINETPLAN Version 1.0 (*.xml format)
- Change the settings.

Network analysis

The "Network analysis" view is displayed in the figure below:



The Network analysis view is divided into the following areas:

- Toolbar (top)
- Catalogs (right)
  - Devices:

    You can insert a device in the current project from the device catalog by double-clicking or via drag & drop.
  - Dataflow templates

    This catalog contains the dataflow templates which you can use per drag-and-drop operation when creating or editing dataflows.
  - Group catalog:

    This group catalog includes a list of groups. A group includes several devices or groups, for example, all devices of a production cell (e.g. robot, valve terminal, welding tongs). You can insert a device group in the current project from this catalog by double-clicking or via drag & drop.

- Topology view (middle)

  An editor is available to you here (details under Topology view (Page 40)).

  SINETPLAN displays the current project in the first tab. Device groups are displayed in further tabs after they have been opened (by double-clicking the group).

  You can execute the following actions, for example:

  – Delete devices.

  – Set up Ethernet connections between devices.

  – Assign a device description to a device.

- Topology details (bottom)

  – Device overview

    A list of all devices and groups of the selected tab (project or device group) in the topology view. You can sort and filter the entries, and add or remove table columns. Details are available at Overviews and tables (Page 52).

  – Dataflows

    A list of all dataflows of the selected tab (project or device group) in the topology view. You can sort and filter the entries, and add or remove table columns. Details are available at Overviews and tables (Page 52).

  – Results

    Results of the network analysis.

    SINETPLAN displays two lists after the network analysis:

    - The traffic loads of the connections between two devices.

    - Loading of the buffers (queues) of the device port.

  – Information

    List of status messages, e.g. "STEP 7 Import", "Missing device description".

  – Pcap dataflows

    Dataflows which SINETPLAN has generated from capture files. You can sort and filter the entries, and add or remove table columns. Details are available at Overviews and tables (Page 52).

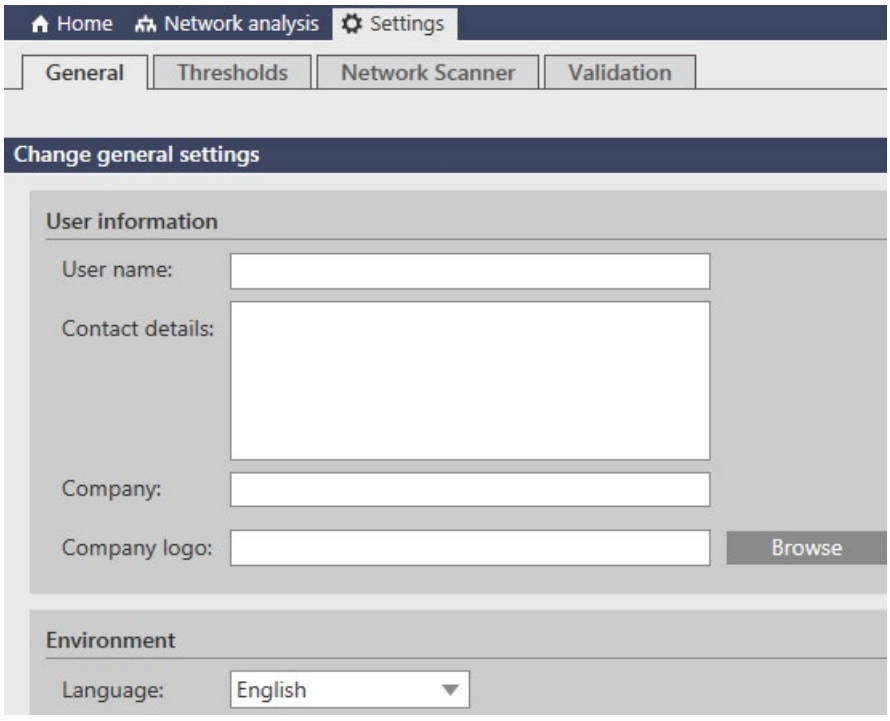
Settings

The "Settings" view has the following tabs:

- General
- Thresholds
- Network Scanner
- Validation

General

The "General" tab is displayed in the figure below:



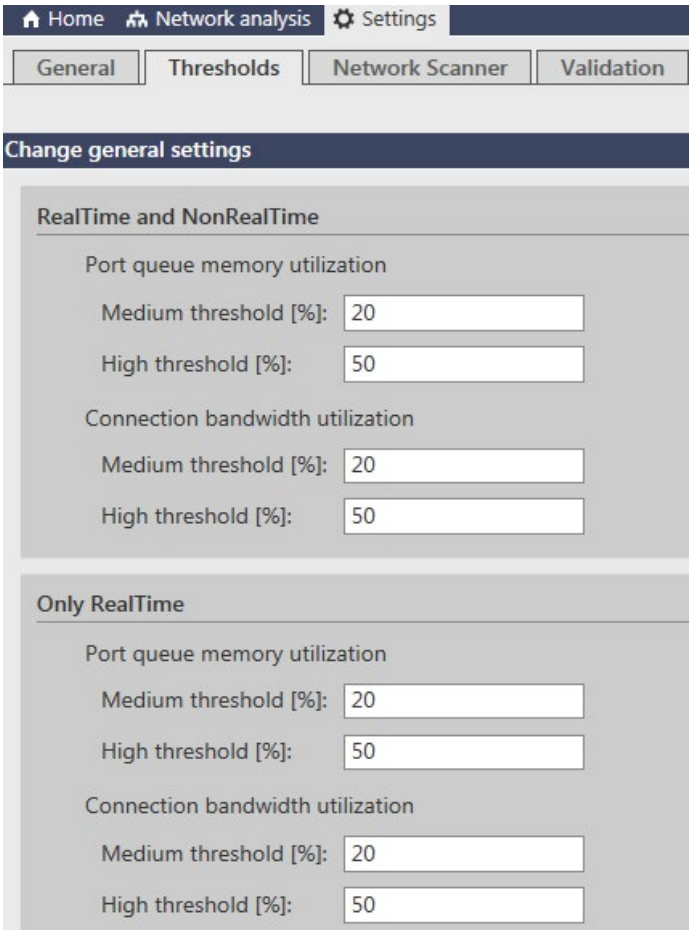
Enter the name of the user, the contact data and details about the company under "User information".

You can also select the company's logo.

Set the display language for SINETPLAN (German, English or Chinese) under "Environment".

Thresholds

The "Thresholds" tab is displayed in the figure below:



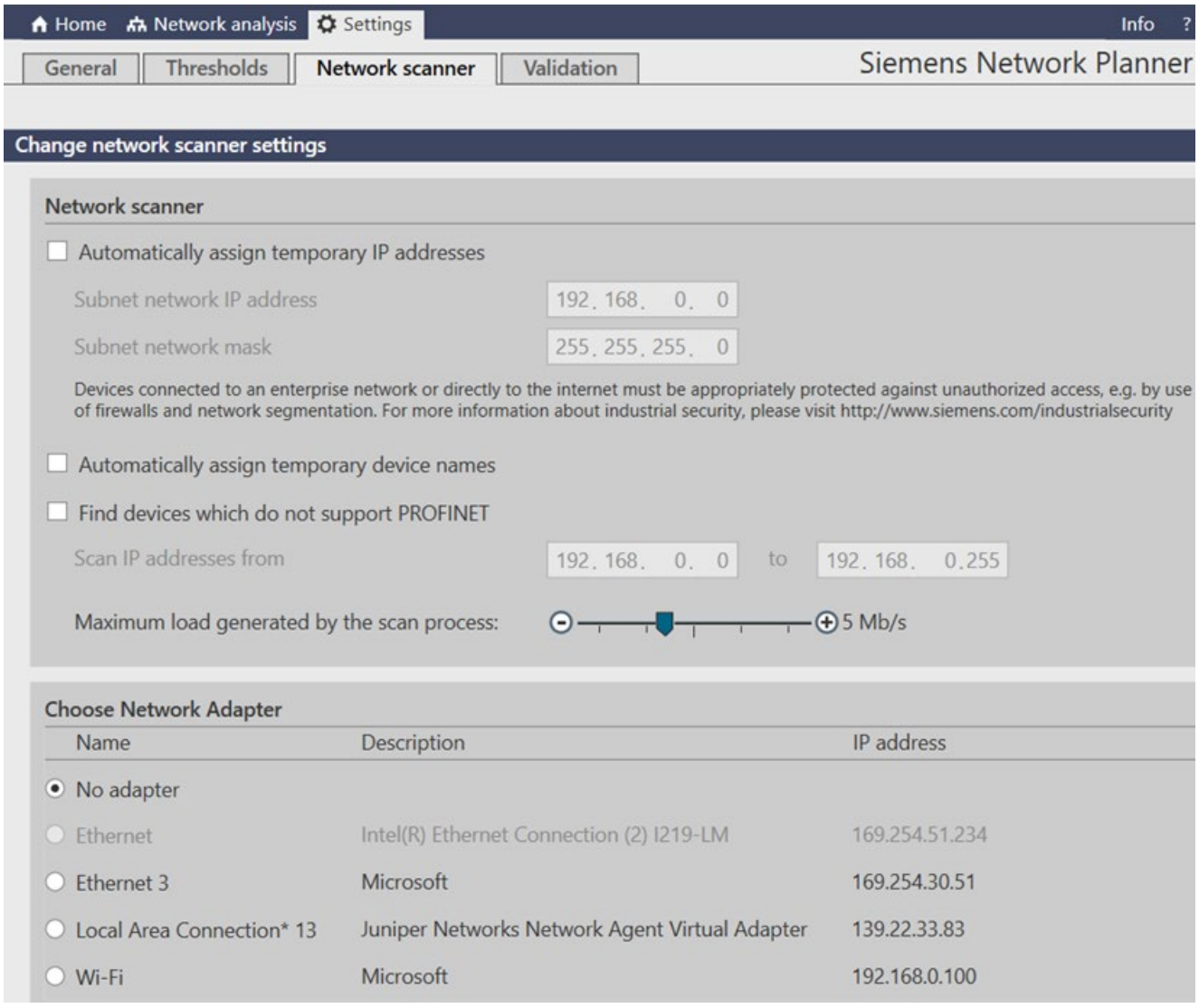
In this area, you set the thresholds for the network analysis.

Under "RealTime and NonRealTime" enter the thresholds which are used if the network analysis calculates both real-time and non-real-time data.

In "Only RealTime" enter the thresholds to be used if the network analysis only calculates the real-time data (see Setting thresholds (Page 140)).

Network Scanner

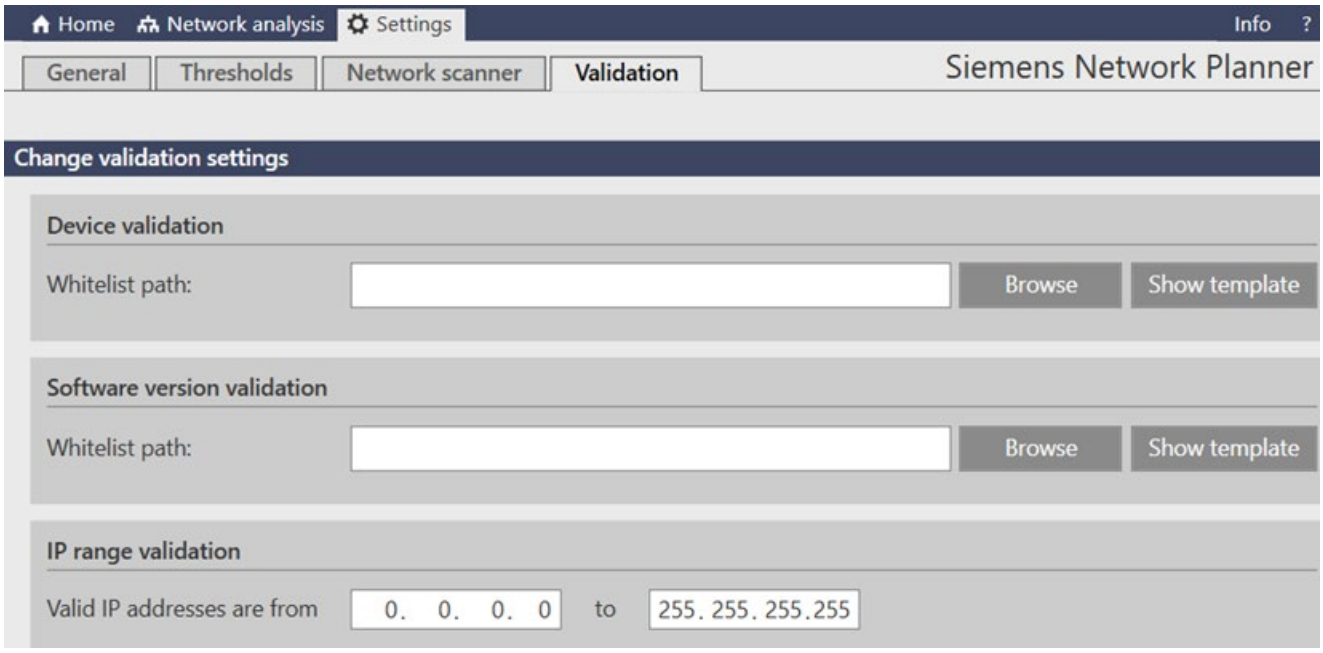
The "Network Scanner" tab is displayed in the figure below:



Set the parameters for the network scanner (see Settings for Network Scanner (Page 142)).

Validation

The "Validation" tab is displayed in the figure below:



With SINETPLAN you can check whether a configuration only uses permitted devices (see Settings for validating networks (Page 144)).

The SW checks whether the devices and their firmware are on the white list. The SW also checks the validity of the IP address.

4.1 Topology view

4.1.1 Topology view toolbar

Functions for navigating in large projects

For an easier overview in large projects, SINETPLAN offers the following functions in the toolbar of the topology view:

- **Show topology overview**

  To show the topology overview, click the following icon in the toolbar of the topology view:

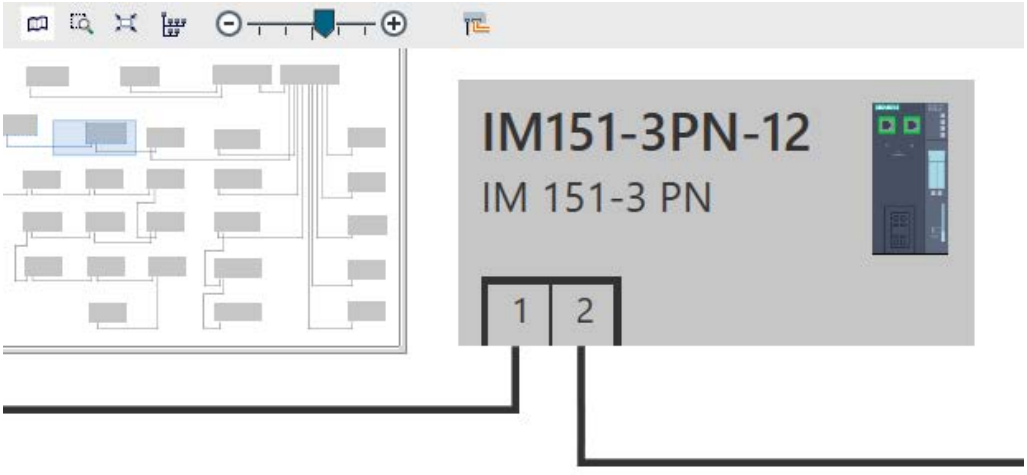
  SINETPLAN now also shows the current project in the topology overview (top left in the topology view).

  The current project is minimized and shown in its entirety in the topology overview.

  For easier orientation in a large project, a light blue rectangle in the topology overview indicates the position of the devices that are shown in the topology view.

  In the example below, only one device is shown in the topology view (IM151-3PN).

  The position of this device within the entire project can be seen on the left in the topology overview (blue rectangle):

- **Zoom selection**

  To maximize an area of the project, follow these steps:

  – In the toolbar of the topology view, click the "Zoom selection" icon:

    The icon is now shown with a light background. The function is active.

  – In the topology view, click the area you want to enlarge.

  – Keep the mouse button pressed and drag it across the area you want to enlarge so that a light blue rectangle is shown which covers the area that you want to enlarge.

  – Release the mouse button.

    SINETPLAN now only shows the enlarged area of the project in the topology view. All other areas of the project are not shown.

- **Fit zoom area to screen**

  To show a project completely in the area currently selected in the topology view, follow these steps:

  – In the toolbar of the topology view, click the "Fit zoom area to screen" icon:

  The icon is now shown with a light background. The function is active.

  The entire project is now shown in the topology view.

  If you reduce the "Topology details" area, for example, more space is available for the topology view. SINETPLAN will therefore show the project in a larger format.

  This function remains active until you click the "Fit zoom area to screen" icon once again and thus disable the function.

- **Topology alignment**

  – In the Topology view toolbar, click the "Align topology" icon:

  Alternatively, you can press the F4 key as in SINETPLAN V1.0.

- **Zoom screen section**

  This function enables users to zoom in or out continuously:

  To do this, follow these steps:

  – In the toolbar of the topology view, click the arrow of the slider:

  – Hold down the mouse button.

  – Drag the mouse pointer to the right to zoom in.

  Or drag the mouse pointer to the left to zoom out.

  You can also zoom in or out gradually:

  – To do so, click the circle with the plus sign or the circle with the minus sign.

- **Displaying connection media**

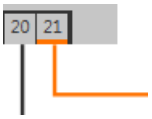
  To show the fiber optic cables in the topology view in color, click the following icon in the toolbar of the topology view:

  The icon is now shown with a light background. The function is active.

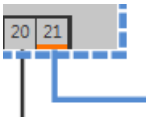
  To disable highlighting of fiber optic cables, click the icon once again.

  When this function is enabled, SINETPLAN draws the connection with fiber optic cables in orange:

  Exception:

  When you select a connection between two devices (by clicking on the line), this connection is shown in blue (just like other selected connections). However, the ports to which fiber optic cables are connected are marked with an orange line:

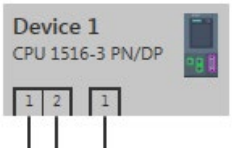
  

4.1.2 Devices with multiple interfaces

Multiple PROFINET interfaces

Devices with multiple PROFINET/Ethernet interfaces are shown with multiple icons for interfaces in the topology view.

The example below shows a device with two PROFINET/Ethernet interfaces:



4.1.3 Devices with pluggable port modules

Devices with pluggable port modules (e.g. SCALANCE XR-500 managed) must be configured in SINETPLAN, because SINETPLAN has no knowledge of the structure of these devices.

Even if you import these devices from STEP 7 (TIA Portal), for example, SINETPLAN cannot determine the position at which the existing ports are located.

Note

Rules for the configuration of devices with pluggable port modules

Plug all port modules into the device in ascending order. This configuration requires SINETPLAN for the analysis.

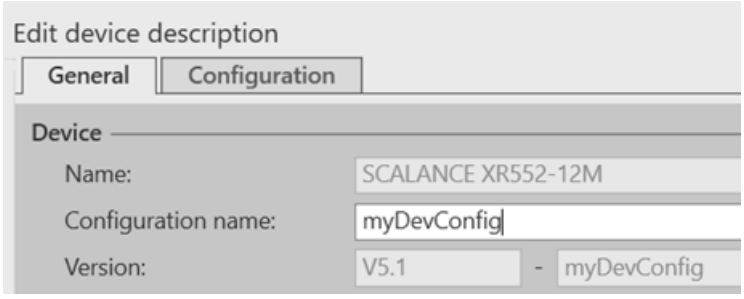
Adapting the device description

The device information from devices with pluggable port modules is only partially encrypted.

You can activate or deactivate the individual ports. You can save the changed configuration under an extended name (existing device name+version+configuration name). You can edit the configuration name; the device name and the version are read-only.

1. Drag-and-drop the device to the topology view.
2. Select the device in the topology view and select the shortcut menu "Edit device description".

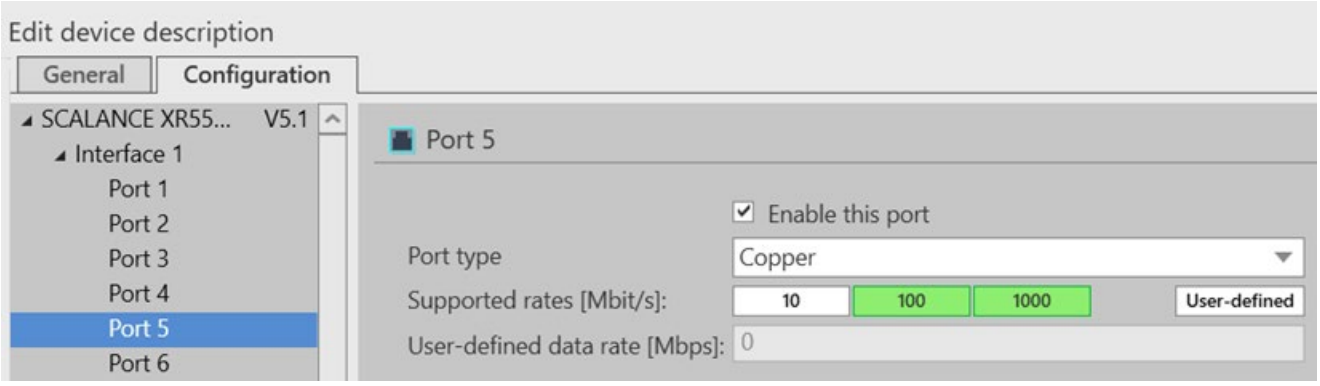
   The following dialog is displayed:



3. Select a suitable configuration name.

4. Select the "Configuration" tab and edit the properties of the ports according to the actual port configuration.

   Example: Port 5 exists and is therefore enabled. Additional properties can be adapted, depending on the performance range of the port.



5. You save the changed device description under the extended name ("Save as" button).

Editing the port directly

You can also access the individual port of the device description directly:

1. Select the port in the topology view and select the shortcut menu "Edit device description".

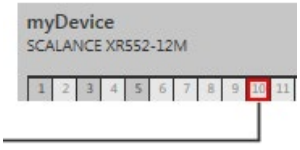
   Result: The "Edit port description" dialog is opened directly at the location that describes the selected port. You enable the port now to be able to connect it afterwards.

2. Proceed as described above to save the changed configuration.

   Next, you can connect the enabled ports to other devices.

Port is disabled and interconnected

When the port is disabled and you drag a connection to this port, SINETPLAN marks the port as faulty:



4.1.4 Wiring devices

Defining wiring of the devices

Alternative 1

1. Select the "Network analysis" view.
2. Left-click on a port of the selected device and hold down the left mouse button.
3. Go to the port you want to connect to and release the mouse key.

Rewiring is also possible in this way, but only works if the action is executed from a free port to an already connected port.

Alternative 2

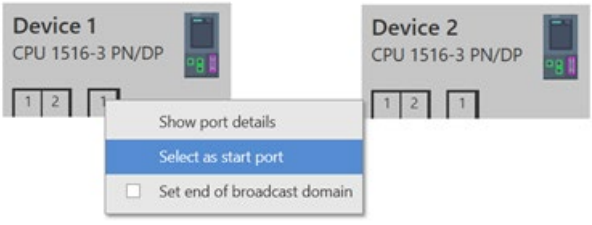
Use the shortcut menu of the device port. To do so, follow these steps:

1. Select the "Network analysis" view.
2. In the topology view (in the editor), select the device to be connected.

   The editor shows the selected device with a blue border.
3. Click on the device port with which you want to connect the device.

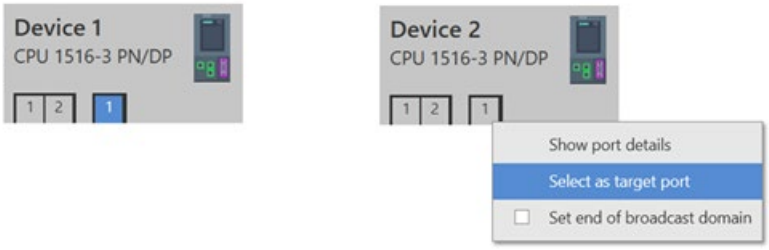
   The editor shows the port with a blue background.
4. Right-click on the device port.

   The shortcut menu of the device port is displayed:

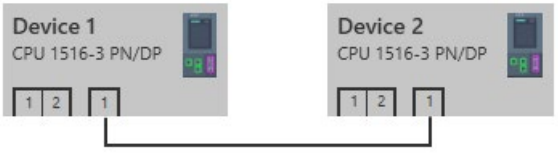


5. Select the "Select as start port" entry in the shortcut menu.

6. Now, for the second device, select the port with which you want to connect this device (in the example "Device 2").
7. Select the "Select as target port" entry from the shortcut menu:



The following figure shows the wiring:



4.1.5 Copying devices

Procedure

You can select and copy one or more devices, and insert these again in the topology view by using the corresponding shortcut menus or the usual key combinations.

To do so, follow these steps:

1. Select the "Network analysis" view.
2. In the topology view (in the editor), select the device or devices to be connected.

   The editor shows the selected device / devices with a blue border.
3. Select the "Copy to Clipboard" shortcut menu by right-clicking, or use the shortcut <Ctrl+C>.
4. Right-click in an empty area of the topology view.
5. In the shortcut menu, select the entry "Paste from clipboard" or use the shortcut <Ctrl+V>.

The contents of the clipboard are inserted into the topology view:

- All copied devices are inserted. SINETPLAN adds the names of the inserted devices so that they are unique in the project.
- If there are connections between the copied devices, the connections are also copied and pasted.
- If dataflows between the copied devices are configured, the dataflows are also copied and inserted. The names of the dataflows are unique names. SINETPLAN also adapts the names of the source and target devices of the inserted dataflows.
  - If the target device was not copied, the dataflow from the source device is copied and inserted, but SINETPLAN only adjusts the name of the source device. This is the new, uniquely created name of the inserted source device. The name of the target device is retained during insertion - this is the name of the target device that was not copied.
  - The same applies to source devices that are not copied: If the source device was not copied, the dataflow to the target device is copied and inserted, but SINETPLAN only adjusts the name of the target device. This is the new, uniquely created name of the inserted target device. The name of the source device is retained - this is the name of the source device that was not copied.

  For this reason, check the resulting dataflows after the devices have been copied. Adjust source and target devices if necessary or delete no longer required dataflows.

4.1.6 Creating dataflows

Creating dataflows in the topology view

You can create a new dataflow by using the shortcut menu of the devices.

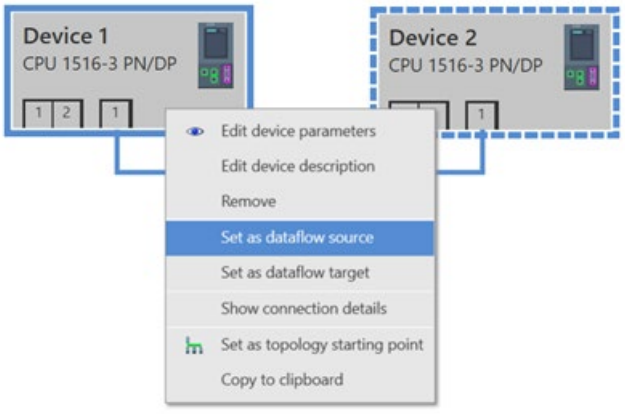
To do so, follow these steps:

1. Select the "Network analysis" view.
2. In the topology view (in the editor), select the device from which the new dataflow starts.

   The editor shows the selected device with a blue border.
3. Right-click on the device.

   The shortcut menu of the device is displayed.
4. Select the "Select as dataflow source" entry in the shortcut menu.

   You thus define that the dataflow starts from this device:



   SINETPLAN now enters this device as the source of the new dataflow in the "Create dataflow" dialog.
5. In the topology view, select the device to which the new dataflow leads.
6. Right-click on this device.
7. Select the "Select as dataflow target" entry in the shortcut menu.

   SINETPLAN now enters this device as the target of the new dataflow in the "Create dataflow" dialog.

See also

Creating dataflows (Page 81)

4.1.7 Searching for devices

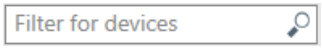
Search function for the topology view

You can search in the topology view for specific devices.

To do this, follow these steps:

1. Select the "Network analysis" view.

   You will see the following search box in the toolbar:

2. Enter a term, for example, "PLC":

   All devices that were found are now shown in color in the topology view, in the example "plc_1":

4.1.8 Replacing devices

Applications

- Replacing a non-connected device.

  The device is replaced without any difficulty.

- Replacing a connected device with a device with multiple ports or interfaces.

  The connections and dataflows remain intact.

- Replacing a connected device with a device with few ports or interfaces.

  It may happen that the connection to the source or target device is interrupted.

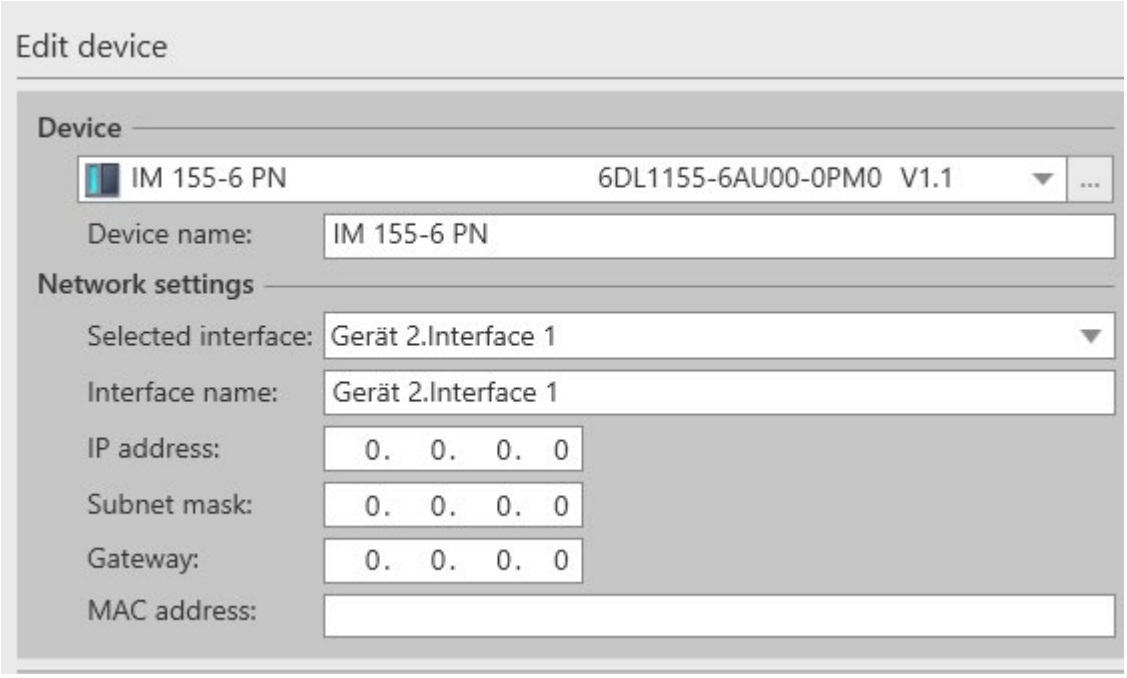
You will be informed that replacing the device may result in data loss. You can confirm or cancel the change.

Procedure

There are two options for replacing the device.

In the "Edit device parameters" dialog box

1. Select the new device in the "Edit device parameters" dialog box.
2. Right-click on the selected device.
3. In the "Edit device parameters" dialog box, click on the arrow in the above line:



4. Select the desired device from the drop-down list.

By dragging and dropping from the catalog

1. Select the device that you want to replace.
2. Left-click on the desired device in the catalog and keep the mouse button pressed.
3. Drag the cursor over the old device and release the mouse.

4.2 Topology details

4.2.1 Overviews and tables

Overviews

SINETPLAN provides the following overviews under "Topology details":

- Device overview

  All the devices and device groups that you use in the current project or in the current group are listed in the "Device overview" tab.

  When you mark devices and device groups in the editor, the devices and device groups have a blue background in the device overview.

- Dataflows

  All the dataflows that you use in the current project or in the current group are listed in the "Dataflows" tab.

- Results

  SINETPLAN lists the results of the network analysis here.

- Information

  SINETPLAN enters log entries about the actions that are currently being carried out, for example "STEP 7 import".

- Pcap dataflows

  If you generate dataflows from capture files, these dataflows are listed in the "Pcap dataflows" tab.

Topology details are arranged in tables. Each row of the table belongs to a device or a device group.

The columns show the individual device parameters. The entries in the columns can be sorted alphanumerically upwards or downwards.

You can also use filters for the tables of the devices, dataflows, and Pcap dataflows.

Sorting entries

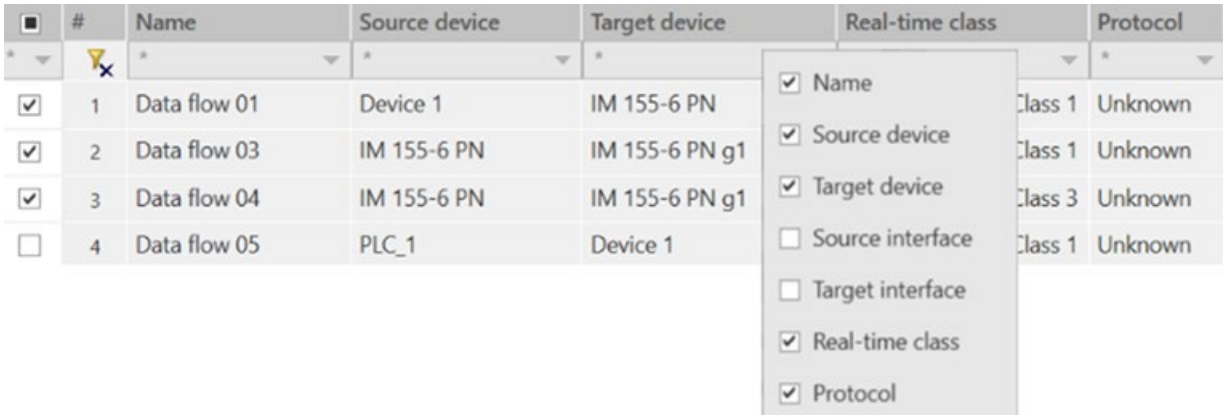
Click in the header of a table column. A white arrow appears. All entries in the list (table) are sorted alphanumerically in ascending order after this column.

When you click in the header of the table column again, the sort order of the entries is reversed.

Adding or removing table columns

Right-click in the header of a table.

A option button with available table columns appears:



To add the desired column to the table, activate the selection (set the check mark).

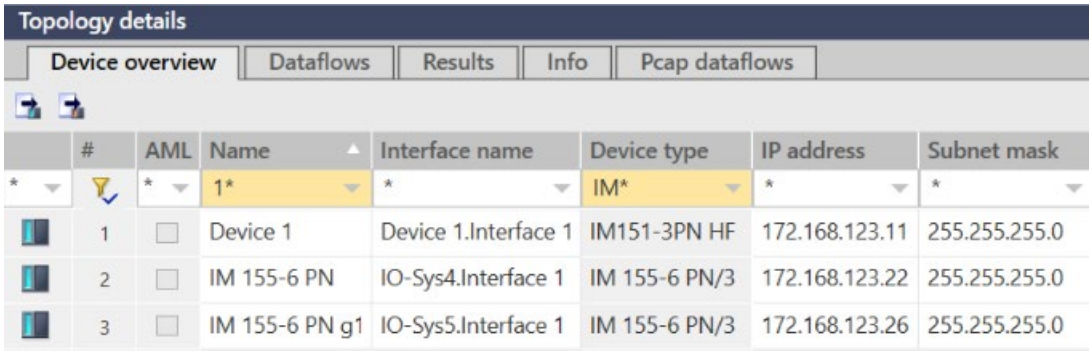
To remove the column, deactivate the selection (clear the check mark).

Sorting entries

A combination of text filter and count filter is available for the tables of devices, dataflows and Pcap dataflows.

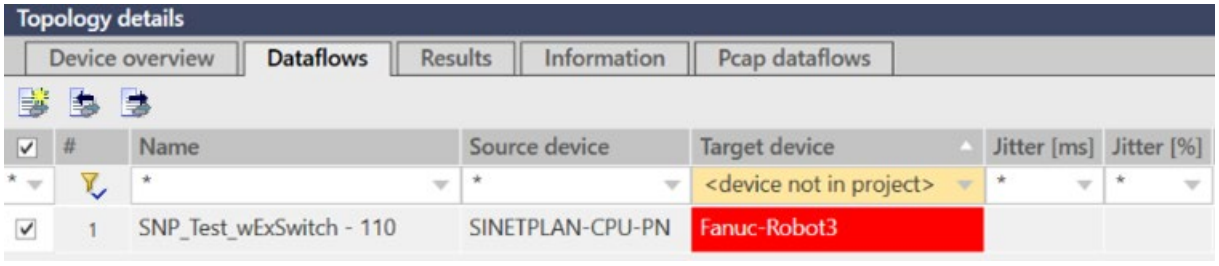
1. In the table of devices, dataflows or Pcap dataflows, click the selection box in the second row of the # column. This activates the filter function in all columns.
2. Filter the entries by column.
   - Select one of the available values.
     If you select <empty> from the drop-down list, the filter finds the rows with an empty field in the selected column.
     This means, for example, that it very quickly finds all dataflows without source or target.
   - Write your search term in the second line of the table instead of the placeholder "*".
3. SINETPLAN shows only the rows where your search term appears in the selected column.
   The field with the search term turns yellow.

4. Use a combination of wildcard and search term as needed (1* in the "Name" column and IO in the "Interface name" column in the example in the figure below):



5. Click in the header of a table column if you want to sort the selected entries. A white arrow appears. All entries of the filtered list are sorted alphanumerically in ascending order after this column.

In the table of dataflows you can also select the search term <device not in project> in the source and target device columns to find the dataflows to devices that do not exist.



4.2.2 Device overview

Overview of all devices of a project

"Device overview" lists all devices that are contained in the project or in the group currently shown in the topology view.

SINETPLAN adds a line for each device in this list.

Each line contains the following items:

- Number of the line in the device list

  This number is assigned by SINETPLAN and cannot be changed.

- Icons

  SINETPLAN uses the following icons:

  – For groups of devices:

  – For devices that are available in all projects (global devices):

  – For devices that are only available in the current project (project-specific devices):

  – For devices for which no device descriptions exist in SINETPLAN.

  SINETPLAN uses general, generic device descriptions for such devices:

- Name

  The device name.

  You can change the name in the "Edit device" dialog (see "Changing the properties of a device").

- Interface name

  This is the name of the PROFINET/Ethernet interface.

  For devices with more than one PROFINET/Ethernet interface, SINETPLAN uses the device name and the interface name separated by a period, for example, "Device1. Interface1".

  You can change the interface name in the "Edit device" dialog (see "Changing the properties of a device").

- Converted name

  The "Converted name" column displays the converted name for the relevant interface of the PROFINET device. This converted name complies with the DNS conventions for PROFINET devices - just as the name is stored in the PROFINET device and goes "via the line".

  SINETPLAN automatically creates the converted name from the configured name of the PROFINET device interface.

  The converted name only differs from the configured name of the device if the name of the device does not comply with the rules of IEC 61158-6-10.

  Example: The name "device-1.machine-1.plant-1.vendor" is not converted. This procedure facilitates the correct assignment of PROFINET device names.
- Device type
- IP address
- Subnet mask

Selecting a device

You select a device in the device list by clicking the line in which the device is entered.

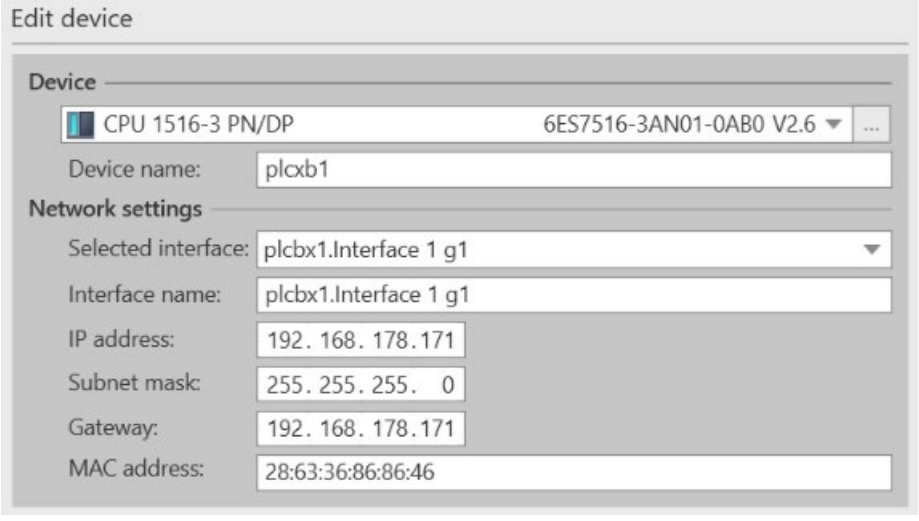
SINETPLAN then shows the topology of the current project or the current group so that the selected device is in the center of the editor. In addition, the selected device is shown with a blue border.

For devices with more than one PROFINET/Ethernet interface, SINETPLAN now shows two (or more) additional lines in which the interface names of this device are entered.

Changing the properties of a device

To change the properties of a device, double-click the line in the device list which the device is entered.

The following dialog is displayed:



The same content is shown in the fields "Selected interface" and "Interface name".

To change the name of the interface, enter the changed name in the "Interface name" field.

For devices with more than one PROFINET/Ethernet interface, follow these steps to change the name of an interface:

1. For "Selected interface" select the interface whose name you want to change.
2. Enter the changed name in the "Interface name" field.

4.2.3 Exporting a device list

Exporting a device overview to a CSV file

SINETPLAN lists all devices used in the project in the "Device overview" tab.

This overview can be exported as a CSV file.

To do this, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Device overview" tab under "Topology details".
3. To export additional details about the devices, right-click in the table.

   Then select additional columns in the shortcut menu.

   If you deactivate table columns, these details are not exported to the devices.
4. Click the "Export device list" icon:

   The "Export devices" dialog is displayed.
5. There, select the file path for the CSV file to which SINETPLAN should export the device lists.
6. Enter the name of the CSV file.
7. If you do not want to export a device, click the check mark in the appropriate row: The check mark is no longer displayed and the device is not included in the CSV file.
8. Click "Export".

See also

Exporting dataflows (Page 85)

4.3 Saving or exporting a project

Below you will find the options for saving the topology created with SINETPLAN and exporting individual objects.

Save the project

To save a project, click on "Save" or "Save as" in the toolbar.

What is saved with the project?

Device descriptions and dataflow templates that you have created in the project are saved in the project, regardless of whether or not these have been used in the project.

Example: You create new dataflows in SINETPLAN due to Pcap analyses and adapt them to be used as dataflow templates. These dataflow templates are then available for each new project that you create and save.

In addition, these template objects are also available to employees who open the project on their PCs.

Device group templates (catalog - "Device groups" tab) are not saved with the project but can be exported and imported into another project.

See also

Exporting dataflows (Page 85)

Saving dataflow templates globally (Page 93)

Editing device descriptions (Page 114)

Generating a project image (Page 158)

Generating reports (Page 156)

Exporting a device list (Page 57)

Installation (Page 30)

Managing device descriptions (Page 104)

Opening and importing projects

5

5.1 Opening a SINETPLAN project

The function "Open project" is used to open an already created SINETPLAN project.

It does not matter with which version you have created the project:

- SINETPLAN V1 projects are saved as XML file
- SINETPLAN V2 projects have the extension *.spp2.

Requirement

You have already created a project with SINETPLAN (V1 or V2) and know the path to the project.

Procedure

1. When the home page is open or the Topology view is open, select the command "Open project".

   Icon for the "Open project" command:

2. Select the path to the project.

5.2 Importing projects from STEP 7

5.2.1 Applying data from STEP 7

Requirement

Projects can be imported from STEP 7 as of version 5.5 SP4 HF9.

Procedure

A lot of data from STEP 7 projects can be imported into SINETPLAN.

SINETPLAN uses this data to simulate the dataflows in the planned network and to detect critical network segments.

The following information is imported from STEP 7:

- The devices that were configured with STEP 7.
- The real-time dataflows between these devices (RT and IRT dataflows)
- The connections of these devices to each other, the network topology.

The following information is not included in the STEP 7 project:

- Device descriptions of devices that were configured with STEP 7. These descriptions are included in the device catalog of the Siemens Network Planner. The equipment descriptions that are not stored in the device catalog must be added.
- The NRT dataflows between the devices that were configured in STEP 7. NRT dataflows are dataflows of non-real-time data.

To find out how to import STEP 7 projects, see the section Analyzing STEP 7 projects (Page 11).

5.2.2 Configuring STEP 7 Classic for export

Export from STEP 7 must be enabled

STEP 7 Classic (as of V5.5.4.9) only provides information for SINETPLAN when the export of this data is enabled for STEP 7.

You have the following options:

- You install SINETPLAN on a computer on which STEP 7 is installed as well.

  In this case, SINETPLAN makes all necessary changes.

  STEP 7 applies the changes when you start (or restart) STEP 7.

- You install SINETPLAN on a computer on which STEP 7 is not installed.

  In this case you must make all necessary changes on the computer on which STEP 7 is running.

  Select one of the following options:

  – Reg file

    Download a Reg file from the Siemens Online Support (https://support.industry.siemens.com/cs/ww/en/view/109740338).

    Save the file on your computer.

    Double-click the icon of this Reg file.

    Confirm that you want to make changes to the Windows Registry.

  – Manual changes

    You enter the necessary keys in the registry (only recommended for experts, see Configuring export from STEP 7 manually (Page 162)).

5.2.3 Exporting the topology and dataflows from STEP 7

Exporting data for SINETPLAN from STEP 7

Proceed as follows to export information for SINETPLAN (devices in a configuration, topology and dataflows) from STEP 7:

1. Check to make sure that the export of this information is enabled.

   The export from STEP 7 must be configured (see Configuring STEP 7 Classic for export (Page 61)).

2. Open the project in STEP 7 Classic.
3. Open the hardware configuration of the project in HW Config.
4. Open the topology editor (right-click the PROFINET line, then click "PROFINET IO Topology").
5. Close the topology editor once again (click "OK").

   A dialog is displayed.

6. In the dialog, click "Yes" to apply the changed data.

   The topology editor now saves the project topology in the "topology.xml" file in the "Global" directory in the main directory of the project.

7. Save and compile the project in HW Config.

   HW Config now adds several XML files to the main directory of the project which contain information about the dataflows of the project.

8. Close HW Config.

5.3 Importing projects from STEP 7 (TIA Portal)

5.3.1 Apply data from STEP 7 V14 SP1 or higher

Requirements

To import projects from TIA Portal:

- SINETPLAN as of Version V1.0 SP1.
- STEP 7 (TIA Portal) as of V14 SP1.

  If you want to import a project that was created with an older version of TIA Portal, you must first upgrade this project.

Upgrading a TIA Portal project

To upgrade a project with STEP 7 (TIA Portal), follow these steps:

1. Open the project in STEP 7 V14 SP1 or V15.
2. In the TIA Portal menu bar, click on "Project".
3. Click "Upgrade".
4. In the "Upgrade project" dialog, click "OK".

Procedure

The following options are available to import projects from TIA Portal in SINETPLAN:

- You import a project from TIA Portal directly into SINETPLAN.
- You first export a project to an spe2 or *xml file and then read in this file in SINETPLAN.

The procedures are described in detail in the following sections.

See also

Direct import of projects from STEP 7 (TIA Portal) (Page 63)
Indirect import of projects from STEP 7 (TIA Portal) (Page 64)

5.3.2 Direct import of projects from STEP 7 (TIA Portal)

Requirements for direct import

The following requirements exist for direct import of projects from STEP 7 (TIA Portal):

- The following programs must be installed on a computer:
  - TIA Portal V14 SP1, V15 or V15.1

    SINETPLAN finds the correct version based on the information provided by the operating system.
  - TIA Openness for TIA Portal V14 SP1, V15 or V15.1

    TIA Openness is supplied with TIA Portal. The installation file is stored under "Support" on DVD_2.
  - SINETPLAN V1.0 SP1 or later version

Importing project from STEP 7 (TIA Portal)

To import a project from STEP 7 (TIA Portal), follow these steps:

1. Select the "Network analysis" view.
2. Click the "Import project" toolbar button.

   SINETPLAN displays the dialog for selecting a project.
3. Select the project:
   - from the list of the most recently opened projects.
   - using manual navigation (file path) in the area "Browse for project". From the drop-down list in the dialog window on the bottom right select the corresponding project type, e.g. "TIA Portal project (*.ap*)".
4. If you want to add the project as a group, select the box "Add project as grouped element".
5. Click "Import project".

   SINETPLAN starts TIA Portal via TIA Openness, opens the selected project and reads the topology and device data from the project.

   You can see the current status at "Status \ Progress".

   If you are adding the project as a grouped element, you will see a dialog in which you can change the group description. Click "OK".

   SINETPLAN shows the project in the topology view.

Tip: Import runs quicker if you have opened the project in TIA Portal.

5.3.3 Indirect import of projects from STEP 7 (TIA Portal)

Indirect import via "TIA Portal Project Data Exporter"

If SINETPLAN and TIA Portal are not installed on the same computer, then use the following steps to apply a project from TIA Portal:

1. Export the TIA Portal project to an *spe2 or *xml file.
2. Import this file into SINETPLAN.

Requirements

The following requirements exist for indirect import of projects using an *spe2 or *xml file:

1. The following programs are installed on a computer:
   - TIA Portal V14 SP1, V15 or V15.1
   - TIA Openness for TIA Portal V14 SP1, V15 or V15.1

     This program is supplied with TIA Portal. It is saved on DVD_2 under "Support".
   - TIA Portal Project Data Exporter

     This program is supplied with SINETPLAN. The program is saved on the computer on which SINETPLAN is installed during installation of SINETPLAN.

     As portable application it can simply be installed on a computer on which TIA Portal is installed. An installation is not required.

     You can find this program on the installation DVD of SINETPLAN, in the directory "Support", subdirectory "SINETPLAN – TIA Project Data Exporter".
2. The following program is installed on a different computer:
   - SINETPLAN V1.0 SP1 or later version.

Importing projects from TIA Portal

To import a project indirectly, follow these steps:

1. Start the "TIA Portal Project Data Exporter" program on the computer with TIA Portal.
2. Select the TIA Portal project to be exported.

   To do so, click the following icon:

   Select the directory in which the project is saved.
3. Click on the project.

   If you have selected a TIA Portal project, the "Select" button is shown with a dark background.
4. Select the folder in which you want to save the Spe2 or XML file with the project data.

   To do so, click the following icon next to "Output folder" and select the folder:

   
5. Click "Export".

   SINETPLAN starts TIA Portal via TIA Openness, opens the selected project and reads the topology and device data from the project. The "Progress/Status" display shows the current status.

   If you have opened the project in TIA Portal, export runs quicker.
6. Close the "TIA Portal Project Data Exporter" program if you do not want to export another project.

7. Save the TIA export file (*.spe2 file; SINETPLAN V2 format) with the project data on the computer where SINETPLAN is installed.

   The project data for SINETPLAN V1 has the format *.xml.

8. Start SINETPLAN.
9. Select the "Network analysis" view.
10. Click the "Import project" toolbar button.

    SINETPLAN displays the dialog for selecting a project.

11. Select the directory in which the exported file is saved.
12. Under "Project type", select the corresponding entry for the TIA export file.
13. Select the project under "Project name".
14. If you want to add the project as a group, select the box "Add project as grouped element".
15. Click "Import project".

    SINETPLAN reads the TIA export file with the project data.

    If you are adding the project as a grouped element, you will see a dialog in which you can change the group description. Click "OK".

    SINETPLAN shows the project in the topology view.

Export the *spe2 file directly from TIA Portal

The "TIA Portal Project Exporter" program can be added to the external applications in TIA Portal:

1. Open your project in TIA Portal.
2. From the "Tools" menu, select "External applications" and "Configure".

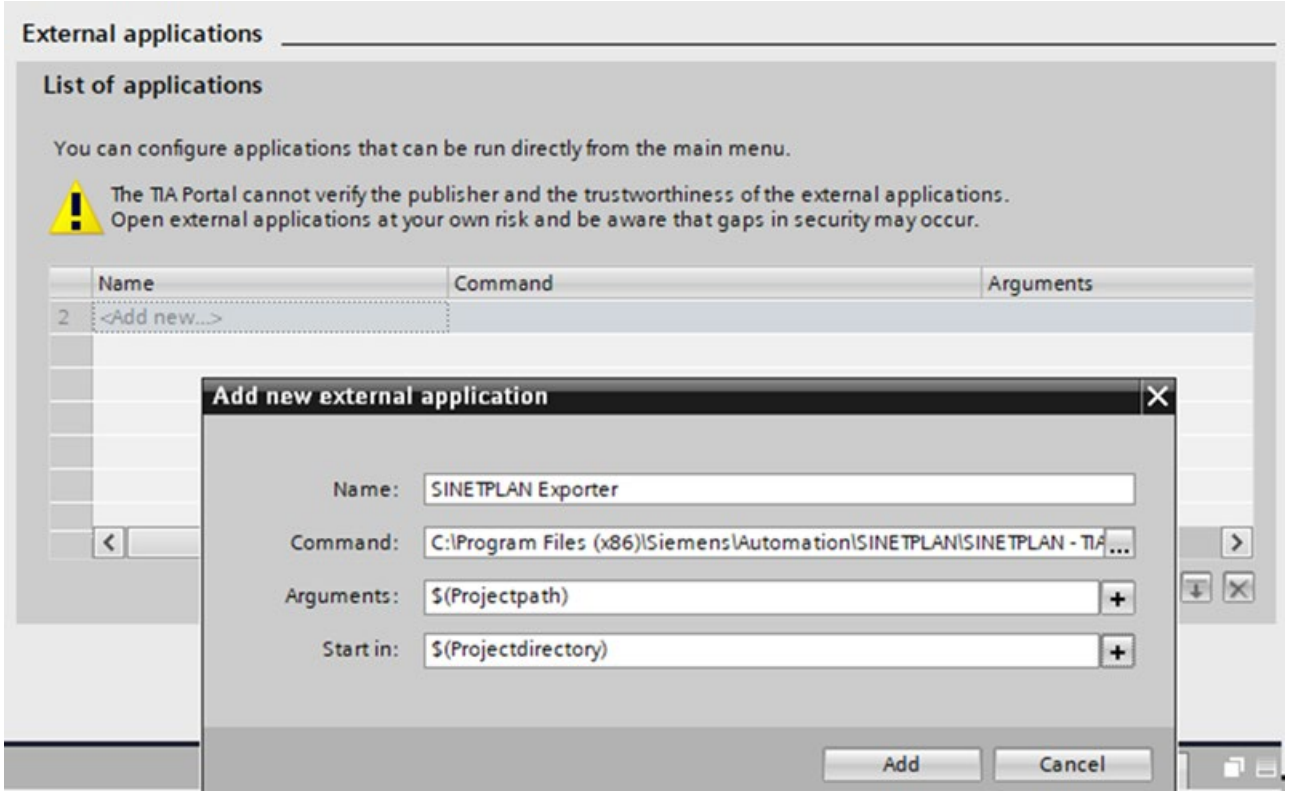


Figure 5-1 TIA_Exporter

3. Click on the <Add new...> line.
4. The "Add new external application" view opens.
5. Enter the name.
6. Under "Command", select the file path for the "Sinetplan.Tia.ProjectExporter.exe" file.
7. From the drop-down list, select " $(Projectpath)" in the "Arguments" box.
8. From the drop-down list, select " $(Projectdirectory)" in the "Start in" box.
9. Click "Add".

Now you can execute the "TIA Portal Project Exporter" directly from TIA Portal with the path to the current project.

5.3.4 Importing redundant systems from STEP 7 (TIA Portal)

H-Sync dataflows between the redundant CPUs (e.g. CPU S7-1513R-1 PN) ensure synchronization of the data management of both CPUs.

The two redundant CPUs are always shown together as one station in STEP 7 (TIA Portal). After import in SINETPLAN, both CPUs are visible as separate devices.

Requirements

To import projects with R/H systems from TIA Portal:

- SINETPLAN as of version V2.0.
- STEP 7 (TIA Portal) as of version V15.1.

Dataflows for synchronization of data between the redundant CPUs

When you import a project with R/H systems directly or indirectly from STEP 7 (TIA Portal), SINETPLAN automatically creates the following H-Sync dataflows:

- 25 Mbps in total
- 12.5 Mbps for each direction

Additional options

You can scan an existing topology with a redundant system. You record the dataflows for synchronization and can evaluate this recording.

See also

Recording dataflows of a redundant system (Page 98)

5.4 Importing AutomationML data

5.4.1 Automation Markup Language

Useful information about AutomationML

AutomationML (Automation Markup Language) is a standardized description language for the display of hierarchically structured data in the form of text data. AML uses a neutral, XML based data format for the storage and exchange of plant planning data that is available as open standard. The purpose of AutomationML is the exchange of engineering data in a heterogeneous tool landscape of modern engineering tools in various fields. The data exchange format AutomationML is standardized in IEC 62714.

AutomationML describes real plant components as objects with various aspects. An object can contain other objects and can itself be part of a larger component.

AutomationML is made up from various standards:

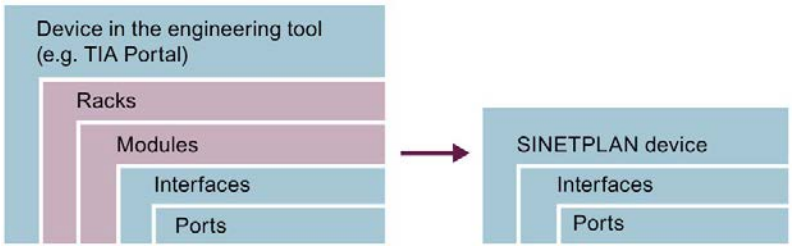
- CAEX (IEC 62424) for topology or plant structure (attributes and relationships of objects)
- COLLADA for geometry (graphical attributes and 3D information) and kinematics (connections and dependencies of objects)
- PLCopen for logic (sequences, internal behavior and I/O connections)

SINETPLAN only evaluates topology and structure information according to CAEX. The AR APC object model (application recommendations: Automation Project Configuration) occurs within the CAEX data format.

5.4.2 AML devices and network structure

How the AML import works

The display of devices in SINETPLAN is optimized for the analysis of networks. Therefore, it is simplified in comparison to the representation in TIA Portal or other engineering tools. SINETPLAN only evaluates device parameters that play a part in the management of dataflows. In SINETPLAN you will find no information about racks and modules, as the following image shows.



If you export a project or a configuration from an engineering tool as an AML file, you can import this file into SINETPLAN. SINETPLAN treats the devices described in this AML file in a special way, as described below. Therefore, we also refer to these devices as "AML devices" so that we can distinguish them from other devices that you have created in SINETPLAN, for example.

From the SINETPLAN perspective, the device information of AML devices is not complete in AML format. SINETPLAN assigns the corresponding device description from a catalog to AML devices based on the article number and the firmware version. For SINETPLAN, the device is therefore completely described and analyzable.

If SINETPLAN finds no suitable device description, it assigns a generic device description to the AML device.

SINETPLAN stores the AML data of an imported AML device independently of its own data management for the corresponding device. This ensures that the AML data can be exported again unchanged.

The following modifications are possible for the imported AML devices:

- Changing the device name
- Changing the interface name
- Changing the IP address on the communication interface
- Changing the subnet mask on the communication interface
- Grouping of AML devices
- Deleting devices

Any additional modifications to the AML devices are not exported by SINETPLAN.

The creation of AML devices is not possible because SINETPLAN uses a different internal format.

Importing XML files into SINETPLAN

Requirements

An export file is available in AML format according to the above-described specification; for example, a corresponding TIA Selection Tool or an export from EPLAN.

Procedure

1. Click "Import project".
2. In the "Open" dialog, select the path to the AML file. To select the "AML Project" project type, click the "Advanced" (...) button.
3. If the AML project is to be imported as group, activate the option "Add project as group".

Result

The devices from the import file are visible in the topology view with their connections. For devices that are in the SINETPLAN catalog, SINETPLAN uses the information from the catalog for display and analysis. If the device is not present in the catalog, SINETPLAN uses a generic representation of the device.

Special characteristics of AML imports

AML import into SINETPLAN is supported as of version V2.0.

- During the AML import, the AML data is stored internally. These devices are marked as "AML devices" and can only be edited to a limited extent.
- Importing GSD devices

  SINETPLAN article number and firmware version cannot be determined when importing devices configured by means of GSD file. However, this data is mandatory for the identification of the device and assignment of the correct device description.

  For this reason, SINETPLAN creates generic devices for the imported GSD devices.

  To get a more accurate analysis, you should replace these devices by the appropriate devices from the SINETPLAN catalog.

Handling of PROFIBUS devices

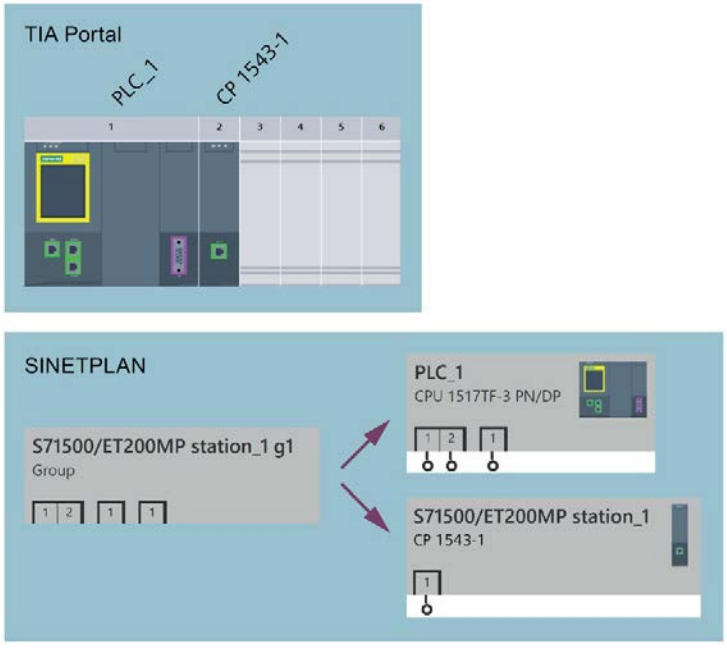
SINETPLAN does not import devices without Ethernet interface.

PROFIBUS devices are kept in the background and exported again to AML. In the protocol window, you are informed about non-imported devices and about the handling of PROFIBUS devices.

Station as device group

SINETPLAN only supports devices with PN/Ethernet interfaces and ports. Modules (assemblies) with PN/Ethernet interfaces are treated as separate devices in the SINETPLAN environment. Therefore, these modules are identified and allocated as separate devices. If two modules with PN/Ethernet interfaces are plugged into a station, e.g. an S7-1500, the modules are shown grouped together (AML group). There are two devices in the group.

The figure below shows an example for the display of a station with two modules with PROFINET/Ethernet interfaces. In TIA Portal, they are considered to be one device (station). After the AML export from TIA Portal and import into SINETPLAN, a group with two devices is created.



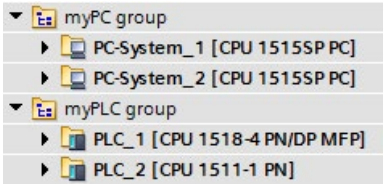
The S7-1517-3 PN/DP was used as CPU in the station. The CP 1543-1 is used as communication processor for the connection of an additional network.

SINETPLAN groups these modules and marks all four ports as external. The identification of the devices is based on the article numbers in the SINETPLAN catalog; in turn, the catalog is based on the corresponding device descriptions.

The SINETPLAN group is marked as AML group and cannot be canceled. The station is considered as complete station. The grouped AML data is taken into account for the AML export.

AML import from TIA groups

In TIA Portal you have the option of grouping devices in the project tree. These groups are not visible in the topology view, only in the project tree of TIA Portal.



If you export a project in TIA Portal as an AML file and then import it into SINETPLAN, this grouping is retained.

You do not have this option with the export as STEP 7 project and subsequent import into SINETPLAN.

A grouping in SINETPLAN, which was caused by a grouping in TIA Portal, remains if you export this project from SINETPLAN and import it again into TIA Portal. This function is only available for the AML import/export.

5.5 Importing SINETPLAN projects

5.5.1 Adding a SINETPLAN project to the current project

Introduction

With SINETPLAN you can not only plan and simulate the networking of individual machines or plant units. The higher-level network infrastructure in which these machines or plant units are embedded can also be easily mapped using SINETPLAN.

The import of SINETPLAN projects enables you to integrate the individual network components as individual projects in another project - such as a plant project.

Adding a SINETPLAN project

To adopt a SINETPLAN project and add it to the current project, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Import project" toolbar button.

   SINETPLAN displays the dialog for selecting a project.
3. Select the directory in which the project is saved.
4. Under "Project type", select the entry "SINETPLAN project".
5. Select a project under "Project name" or "Last used project name".
6. If you want to add the project as a group, select the box "Add project as grouped element".
7. Click "Import project".

   If you are adding the project as a grouped element, you will see a dialog in which you can change the group description. Click "OK".

   SINETPLAN shows the project in the topology view.

Difference between importing and opening SINETPLAN projects

- When you import a SINETPLAN project, the current project is extended to include the imported project.
- When you open a SINETPLAN project, you will be asked whether changes to the current project are to be saved. The current project is then closed and the new project opened.

See also

Opening a SINETPLAN project (Page 59)

Scanning networks

6

6.1 Network Scanner

Scanning networks

SINETPLAN enables you to scan in an installed Ethernet network.

After scanning, SINETPLAN displays the devices found.

In addition, SINETPLAN shows the physical connections (wiring) between the devices, if they could be found.

Scanning is important in the following cases, for example:

- You want to analyze an installed network (installed devices and dataflows determined with Pcap).
- You want to add devices to an existing network and simulate the effects on the network.

SINETPLAN scans a network to detect its current status.

Requirements

- No devices may be added to the network or removed from the network during the scan.
- Network topologies with IO devices that change during operation (e.g. tool changers) must not be scanned.
- If an S7-1500 "MFP" CPU (e.g. CPU 1518-4 PN/DP MFP) is present in the network, only the CPU runtime may be active at the time of the scan process, see description in the next section.

  As of TIA Portal V15, the Multifunctional Platform (MFP) can be used as a new device type.

Notes on specific device types

- Multifunctional Platform (MFP, CPU 1518-4 PN/DP MFP, CPU 1518F-4 PN/DP MFP)

  This device type allows you to execute programs written in the C or C++ programming languages on an S7-1500 CPU, in addition to the CPU program you create with STEP 7 (TIA Portal).

  C/C++ programs can be used either synchronously to the cycle of the CPU or in a separate unit.

  – **C/C++ programs synchronous to the CPU program (in the CPU Runtime)**:

    With this usage, the CPU user program calls program parts that are written in C/C++.

    The program parts are called and executed during the CPU cycle. The CPU then continues to execute the CPU user program.

    When you scan such a multifunctional platform (MFP) with SINETPLAN, SINETPLAN detects the MFP as an S7-1500 CPU in an S7-1500 station. SINETPLAN displays the MFP like any other S7-1500 CPU.

  – **C/C++ programs in a separate unit (in the C/C++ Runtime)**

    With this usage, program parts written in C/C++ are executed in a separate application under a Linux operating system.

    The Linux operating system and the C/C++ programs form a separate unit in addition to the S7 CPU.

    This separate unit is called "C/C++ runtime".

    The unit in which the CPU user program is executed is called the "CPU Runtime".

    The CPU Runtime and the C/C++ Runtime are independent from each other.

    The two units (runtime environments) share the PROFINET interface X3: This interface has an IP address for the CPU Runtime and an additional IP address for the C/C++ Runtime.

    For information on how to assign both runtime environments to IP addresses, refer to here (https://support.industry.siemens.com/cs/ww/en/view/109749061).

    Rule

    Before you scan multifunctional platform (with CPU and C/C++ Runtime), you must stop the C/C++ Runtime (Linux) to allow SINETPLAN to detect the CPU correctly.

    Then insert the C/C++ Runtime manually into SINETPLAN (as SIMATIC PC).

See also

Generating dataflows from capture files (Page 94)

6.2 Scanning and analyzing networks

Procedure

To scan and analyze an installed network, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Scan topology" icon in the toolbar.

   SINETPLAN scans the network and shows the devices found in the topology view of SINETPLAN.

   SINETPLAN shows connection lines between the devices if the cabling has been found using the Simple Network Management Protocol (SNMP).
3. Add missing dataflows between the devices to the project.

   You have the following options:

   – Start by drawing the real dataflows with a tool for analyzing your network, for example, with Wireshark.

     In SINETPLAN, you then analyze the obtained Pcap files, create Pcap dataflows from them and import the dataflows into the project. The procedure is described in the section "Generating dataflows from capture files (Page 94)".

     When connection lines between the devices are missing, error messages are displayed in the dataflow analysis. In this case, manually add connection lines between the devices.

     To do this, click on the output port, hold down the left mouse button and drag a line to the port of the target device.

   – You create the dataflows manually and add the missing connection lines between the devices in the editor.

     (see "Creating dataflows (Page 81)").
4. Define the generic device descriptions in more detail.

   If SINETPLAN finds devices during the scan for which there are no device descriptions, SINETPLAN then uses generic (general) device descriptions. Such devices are marked in the editor with an exclamation point.

   To increase the accuracy of the analysis, change the generic device descriptions so that the descriptions accurately match the devices used.

   Information on device replacement is available here (Page 50).
5. Click the "Analyze topology" icon in the toolbar.

   The results of the network analysis are displayed in the editor and in the "Results" tab.

Dataflows 7

Definition

When data are transferred from Device A to Device B, a dataflow arises from Device A to Device B.

A dataflow takes place in only one direction (just as a river dataflows in nature). A further dataflow is required if the opposite flow direction is to be included.

SINETPLAN uses dataflows to simulate the data traffic and the traffic load in the planned network.

The dataflows can be divided into three categories: Unicast, broadcast and multicast transmission.

Unicast transmission

The data packet is sent from the sender to a receiver in the network. The data propagation through the network takes place via the shortest path from the source device via the interface to the target device.

The dataflow is predefined by default as unicast transmission type.

Broadcast transmission

The data packet is transferred from the sender to all devices in the network.

To switch the default unicast transmission type to broadcast transmission type, proceed as follows:

- Click on the Edit dataflow map
- Select broadcast transmission type

You can also edit the dataflow template that you created earlier.

The selection of the broadcast transmission type deactivates all target fields (target group, target device and interface), because the data is transmitted to all connected devices.

Multicast transmission

A sender sends a data packet to several receivers in the network (not to all receivers as with broadcast).

SINETPLAN supports no multicast dataflows: The program triggers multicast dataflow in multiple unicast dataflows. The individual unicast dataflows then start from the sender and lead to the individual receivers in the network.

For example, SINETPLAN converts a multicast on two network devices into two unicast dataflows that flow simultaneously from the sender to the two receivers.

This makes it possible for SINETPLAN to calculate a higher network load than actually exists when simulating the network.

See also

Generating dataflows from capture files (Page 94)

Recording dataflows of a redundant system (Page 98)

7.1 Properties

Dataflow properties

The following data are required to simulate the planned network:

- Name of the dataflow
- Transmission type
  - Unicast
  - Broadcast

Source

The device that sends the data (source device).

Target

The device that receives the data (target device, only for unicast transmission type).

Dataflow parameters

- Dataflow template

  When creating (or changing) a dataflow, you can use templates that provide the values for the "Real-Time Class", "Protocol", "Transmission Type", "Maximum Packet Size", "Burst", and "Average Data Rate" parameters.

- Real-time class
  - NRT
  - PROFINET IO RT Class 1 (only for unicast transmission type)
  - PROFINET IO RT Class 2 (only for unicast transmission type)
  - PROFINET IO RT Class 3 (only for unicast transmission type)
- Protocol
  - Unknown
  - ARP
  - TCP
  - UDP
- Maximum packet size [B]

  The maximum size of the data packets (in bytes).

  Many PROFINET packets are very short (typically 60 bytes of payload). The entire packet including header has a payload of 108 bytes.

- Burst (B)

  The number of all bytes in data packets that are sent one right after the other (in one block). For PROFINET packets, burst is equal to the value of the maximum packet size.

- Average rate (B/s)

  The data volume per second.

7.2 Managing dataflows

7.2.1 Overview

You can use SINETPLAN for the following dataflow operations:

- Importing
- Creating
- Changing
- Exporting
- Deleting

The following sections explain the procedures.

7.2.2 Importing dataflows

Proceed as follows to import dataflows:

1. Select the "Network analysis" view.
2. Click the "Dataflows" tab under "Topology Details".
3. Click the "Import dataflows" icon:

   The "Import dataflows" dialog is displayed.
4. Use this to select the directory with the dataflows.
5. Click on the "Import" button.

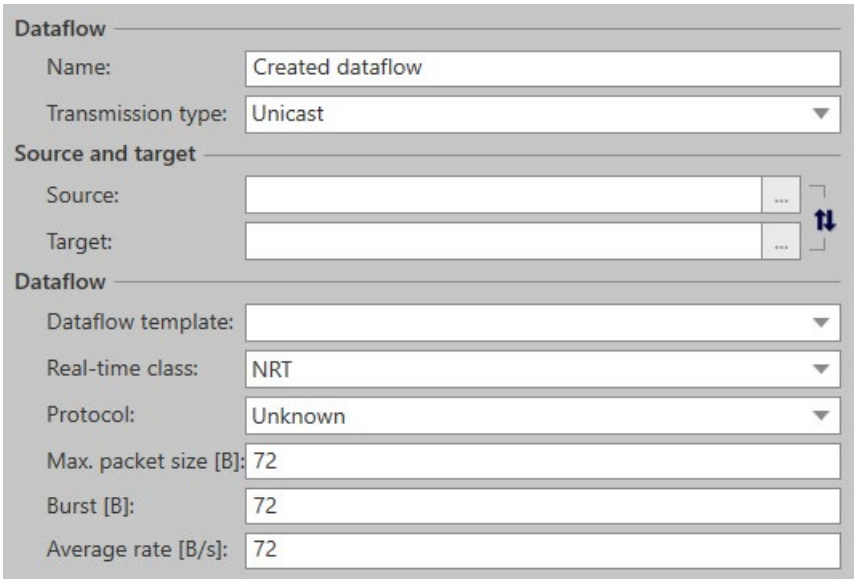
   SINETPLAN displays the imported dataflows in the "Dataflows" tab.

7.2.3 Creating dataflows

To create a dataflow, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Dataflows" tab under "Topology Details".
3. Click the "Create dataflow" icon.

The following dialog opens:



4. Fill in the text boxes of the dialog.

   Note the following explanations in this regard:

   – Name

     Enter a unique name for the dataflow.

     Use the source and the target of the dataflow in the name.

   – Transmission type

     Select unicast or broadcast transmission from the drop-down list.

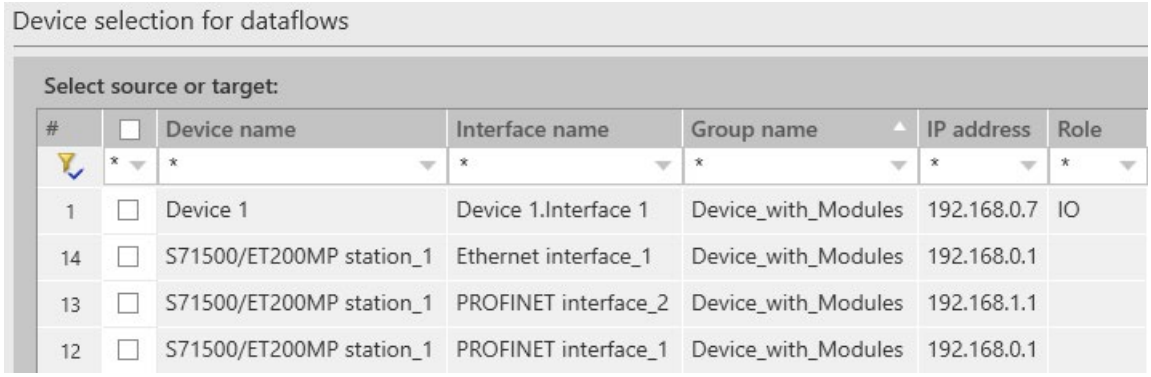
   – Source and target

     Source: The device that sends the data (source device).

     Target: The device that receives the data (target device, only for unicast transmission type).

     Select the name of the device from the "Device selection for dataflows" dialog box:

     All devices are listed in the list. You can select multiple sources or multiple targets.



   – Dataflow template

     Select a template for the dataflow from the drop-down list.

     A dataflow template is a template that you can use when creating (or editing) a dataflow.

     A dataflow template provides values for the parameters "Real-time class", "Maximum packet size", "Burst" and "Average data rate".

     You can import dataflow templates, generate them from Wireshark captures (Pcap and Pcapng files) or create them using your own data (see Managing dataflow templates (Page 88)).

- Real-time class

  Select one of the following classes:

  NRT (NonRealTime): Data that are sent in standard Ethernet data packets. Data packets are assigned the priority 0 to 7 according to IEEE 802.1Q.

  PROFINET IO RT Class 1: RT. Unsynchronized real-time communication between PROFINET IO controller and PROFINET IO devices (only for unicast transmission type).

  PROFINET IO RT Class 2: IRTflex. Synchronized or unsynchronized real-time communication between PROFINET IO controller and PROFINET IO devices (only for unicast transmission type).

  PROFINET IO RT Class 3: IRT (STEP 7 Classic: IRTtop). Synchronized real-time communication between PROFINET IO controller and PROFINET IO devices. These data are transferred first in each data transmission cycle; all other data must wait (only for unicast transmission type).

- Protocol
- Maximum packet size [B]

  Many IO data is rather small in PROFINET IO, often only 80 bytes. In this case, enter 80. If, for example, image data is transferred, the communication partners use the maximum size of an Ethernet packet: 1530 bytes.

- Burst (B)

  For PROFINET IO same as the Max Packet Size (80 in the example).

  One data packet is not sufficient, however, when image data are transferred. Several packets are sent one after the other. In this case, enter the size of the image file (for example 1 000 000, for 1 MB).

- Average rate (B/s)

  How much data on average is sent per second?

  For PROFINET IO, the I/O data is sent 1000 times per second (update time 1 ms) (80000 in the example).

  When image data with 1 MB each are transferred five times per second, you enter the value 5 000 000.

5. Click "Create".

   SINETPLAN displays the new dataflow in the "Dataflows" tab.

6. Perform the topology analysis.
   Click the "Analyze topology" icon.

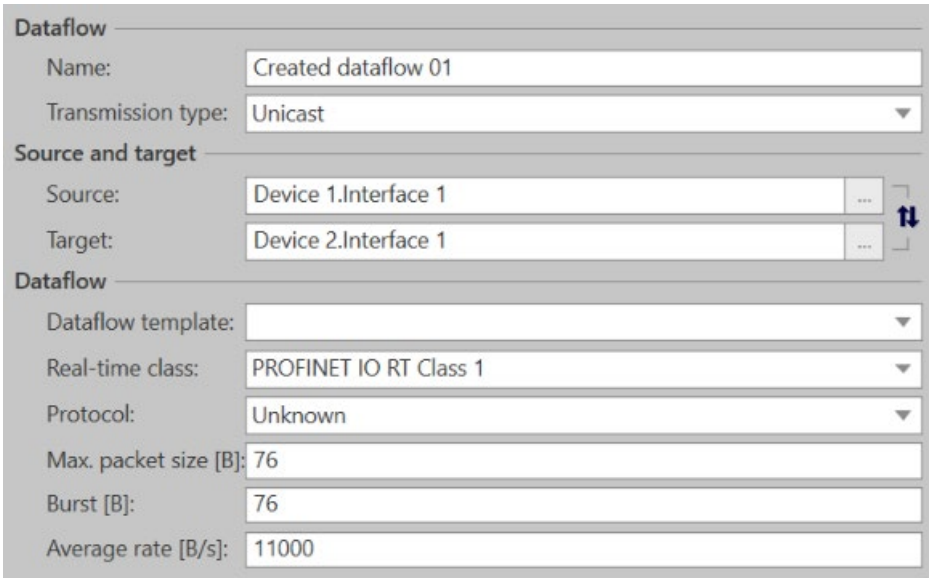
   and follow the steps in section Analyzing networks (Page 131).

7.2.4 Changing dataflows

To change the dataflow proceed as follows:

1. Select the "Network analysis" view.
2. Click the "Dataflows" tab under "Topology Details".
3. Double-click the dataflow that you want to change.

   The dialog for editing a dataflow is displayed with the current data:



   Otherwise:

   Right-click the dataflow that you want to change in the "Dataflow" tab.

   Then select the menu command "Edit dataflow".

4. Edit the dataflow.

   Take into account the explanations under Creating dataflows (Page 81) to this purpose.

5. Click "Save" to accept your changes.

7.2.5 Copying dataflows

Procedure

You can easily copy dataflows and edit them as part of a project:

1. Select the "Network analysis" view.
2. Click the "Dataflows" tab under "Topology Details".
3. Select the rows with the dataflows you wish to copy.
4. Right-click the selected rows.
5. Select the "Copy dataflows" shortcut menu.
6. The copies of the selected dataflows are displayed immediately in the following table rows.

7.2.6 Exporting dataflows

Exporting dataflows to a CSV file

To export dataflows, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Dataflows" tab under "Topology Details".
3. To export additional details on the dataflows, right-click in the table.

   Then select additional columns in the shortcut menu.

   If you deactivate table columns, these details are not exported to the dataflows.
4. Click the "Export dataflows" icon:

   The "Export dataflows" dialog is displayed.
5. There, select the file path for the CSV file to which SINETPLAN should export the dataflows.
6. Enter the name of the CSV file.
7. If you do not want to export a dataflow, click the check mark in the appropriate row: The check mark is no longer displayed and the dataflow is not included in the CSV file.
8. Click "Export".

See also

Exporting a device list (Page 57)

7.2.7 Deleting dataflows

Removing a dataflow

To delete a dataflow, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Dataflows" tab under "Topology Details".
3. Right-click the dataflow that you want to delete.
4. In the shortcut menu click "Remove dataflow".

Dataflow templates

8

8.1 Information about dataflow templates

Definition

A dataflow template makes values available for the following parameters of a dataflow:

- Real-time class
- Protocol
- Transmission type
- Maximum packet size
- Burst
- Average data rate

If you select a dataflow template when creating or editing a dataflow, then SINETPLAN uses the values of this dataflow template for the dataflow.

Supplied dataflow templates

A number of dataflow templates are supplied with SINETPLAN that can be used as samples for creating your own dataflows. These templates are commented and contain typical values for the parameters listed above as far as different communication procedures are concerned.

8.2 Properties

Dataflow templates have the following properties:

- Name

  Assign a unique name to the dataflow template. The name must not be in use anywhere else in the project.

- Version
- Description
- Category

  The category under which the dataflow template is displayed in the "Dataflow templates" catalog.

  When you enter a new category, the new template is listed under this new category in the catalog.

  When you enter a category that already exists, the new template is listed under this category.

- Real-time class, protocol, transmission type, maximum packet size, burst, average data rate (see "Create dataflows (Page 81)").
- Author
- Company
- Product
- Product version
- Product manufacturer

8.3 Managing dataflow templates

In SINETPLAN, you can do the following with dataflow templates:

- Import and export
- Generate from Wireshark files (pcap and pcapng)
- Create
- Change
- Save as global so that the templates are available for all projects.
- Delete

8.3.1 Importing and exporting dataflow templates

SINETPLAN stores dataflow templates in a separate directory, see Creating and exporting dataflow templates (Page 90).

You can export these dataflow templates and pass them on to other users. These users must then import the dataflow templates into SINETPLAN.

Import

To import dataflow templates, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Dataflow templates" tab under "Catalogs".
3. Click the "Import dataflow templates" icon:

   The "Import dataflow templates" dialog is displayed.
4. Use this to select the directory with the dataflow templates.

   If you have selected a directory with dataflow templates, SINETPLAN displays the dataflow templates dialog.
5. Select the desired template.
6. Click on the "Import" button.

   SINETPLAN inserts the dataflow template into the "Dataflow templates" catalog.

   You can use this template when you create or edit dataflows.

Export

To export dataflow templates, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Dataflow templates" tab under "Catalogs".
3. Click the "Export dataflow templates" icon:

   The "Export dataflow templates" dialog is displayed.
4. Select the desired templates.
5. Select the directory for saving the dataflow templates.
6. Click "Export".

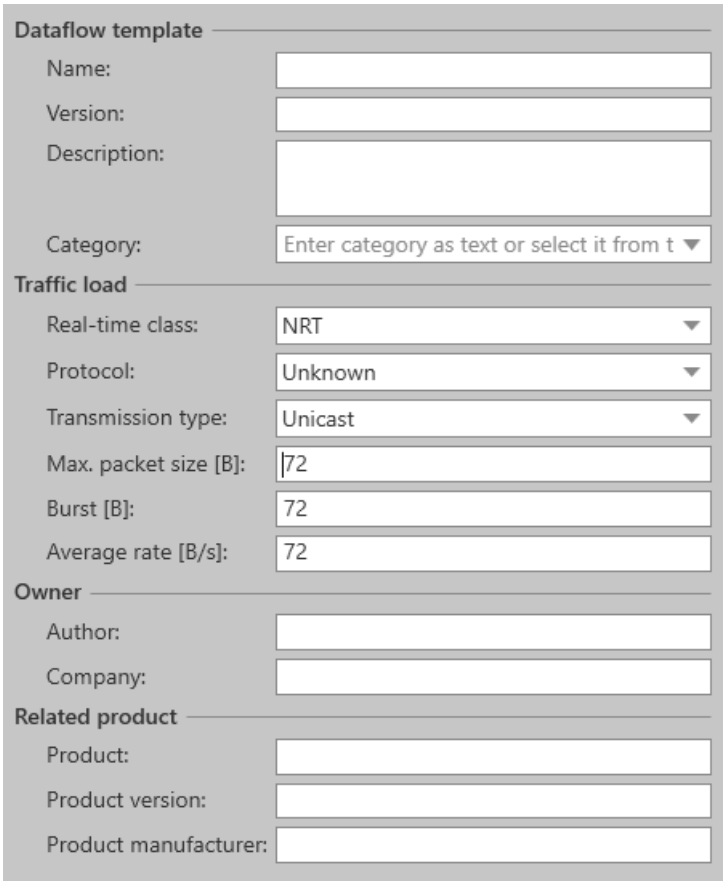
8.3.2 Creating and exporting dataflow templates

Creating dataflow templates

To create a dataflow template with your own data, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Dataflow templates" tab under "Catalogs".
3. Click the "Create new dataflow template" icon:

The following dialog opens:



4. Fill in the text boxes of the dialog.

   Note the following explanations in this regard:

   – Name

     Assign a unique name to the dataflow template.

     The name must only be used once in the project.

   – Version

   – Description

   – Category

     The category under which the new dataflow template is displayed in the "Dataflow templates" catalog.

     When you enter a new category, the new dataflow template is listed under this new category in the catalog.

     When you enter a category that already exists, the new dataflow template is listed under this category.

   – Real-time class, protocol, transmission type, maximum packet size, burst, average data rate (see "Create dataflows (Page 81)").

   – Author

   – Company

   – Product

   – Product version

   – Product manufacturer

5. Click "Save".

   SINETPLAN displays the new dataflow template in the "Dataflow templates" catalog.

   You can use the dataflow template when you create or edit dataflows.

Exporting dataflow templates

When you create a dataflow template, SINETPLAN saves the description of the dataflow template in a single XML file.

To pass on dataflow templates to other SINETPLAN users, export the XML files (see Importing and exporting dataflow templates (Page 89)).

Pass on the files to other users, for example, by e-mail.

8.3.3 Changing dataflow templates

To change a dataflow template follow these steps:

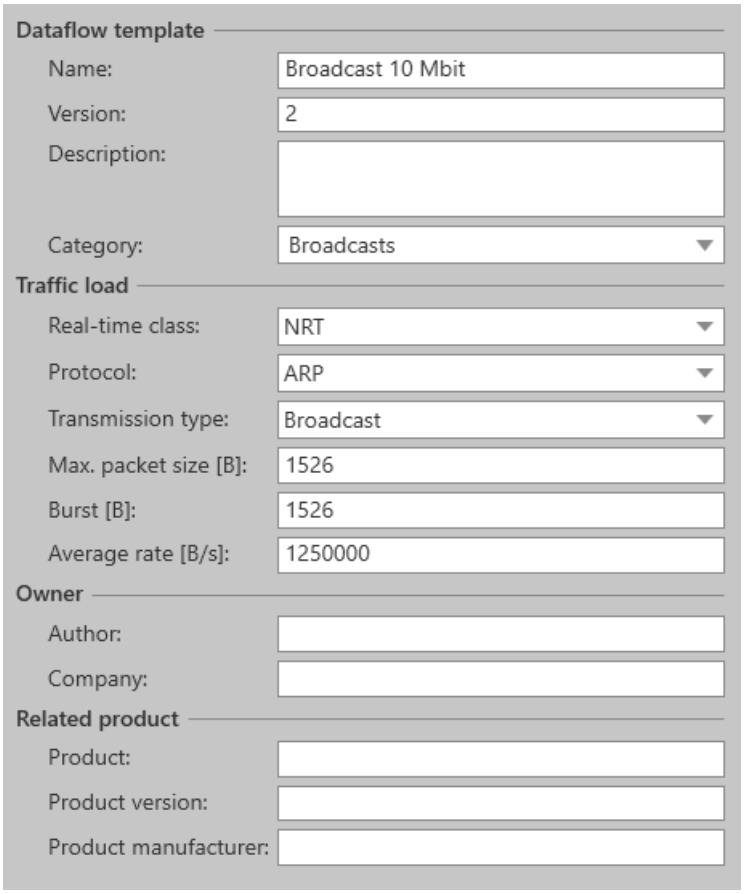
1. Select the "Network analysis" view.
2. Click the "Dataflow templates" tab under "Catalogs".
3. In the "Dataflow templates" catalog, either click the icon below to display the global dataflow templates:

   Or click the following icon to display the dataflow templates of this project:

   
4. Select the dataflow template that you want to change in the catalog.
5. Right-click the template.
6. Click "edit" in the shortcut menu.

   The dialog for changing the template is displayed:



7. Change the dataflow template.

   Take into account the explanations under Creating a dataflow template (Page 90) to this purpose.
8. Click "Save" to accept your changes.

8.3.4 Saving dataflow templates globally

Saving the dataflow template for all projects

Proceed as follows to save a dataflow template globally:

1. Select the "Network analysis" view.
2. Click the "Dataflow templates" tab under "Catalogs".
3. Click the dataflow template that you want to save so that it is available for all projects.
4. Click the following icon in the lower part of the catalog window:

   The dataflow template is now available for all projects (not only for the current project).

8.3.5 Deleting dataflow templates

To delete a dataflow template follow these steps:

1. Select the "Network analysis" view.
2. Click the "Dataflow templates" tab under "Catalogs".
3. Select the dataflow template that you want to delete in the catalog.
4. Right-click the template.
5. Click "Delete" in the shortcut menu.

Consequences of deleting:

- When you delete a global dataflow template that is used in the project, this dataflow template is considered to be project-specific and is displayed in the catalog under the project-specific dataflow templates.
- When you delete a global dataflow template that is neither used in the project nor in a device group template, SINETPLAN deletes the dataflow template and no longer displays it in the catalog.
- When you delete a project-specific dataflow template that is used in the project, SINETPLAN ignores this delete instruction and continues to display the template in the catalog.
- When you delete a project-specific dataflow template that is **no longer** used in the project, SINETPLAN deletes the template and no longer displays it in the catalog.

Analyzing captured data

9

9.1 Generating dataflows from capture files

Requirements

To add dataflows from capture files to a project, the following requirements must be met:

- The project must exist in SINETPLAN.

  To do so, you either scan the project or create it in the editor (topology view).

  The procedure of how to scan an attachment is described here (Page 75).
- The PROFINET/Ethernet connections between the devices must exist in this project.

  If the PROFINET/Ethernet connections are not determined automatically during the scan, you must add them manually.
- The capture files (recording files) of the individual dataflows must exist for this project.

Generating dataflows and dataflow templates

Tools for network analysis (for example Wireshark) record the data traffic in a network and save the data traffic in capture files (recording files).

Recording files with the PCAP (packet capture) format have the ending ".pcap" or ".pcapng".

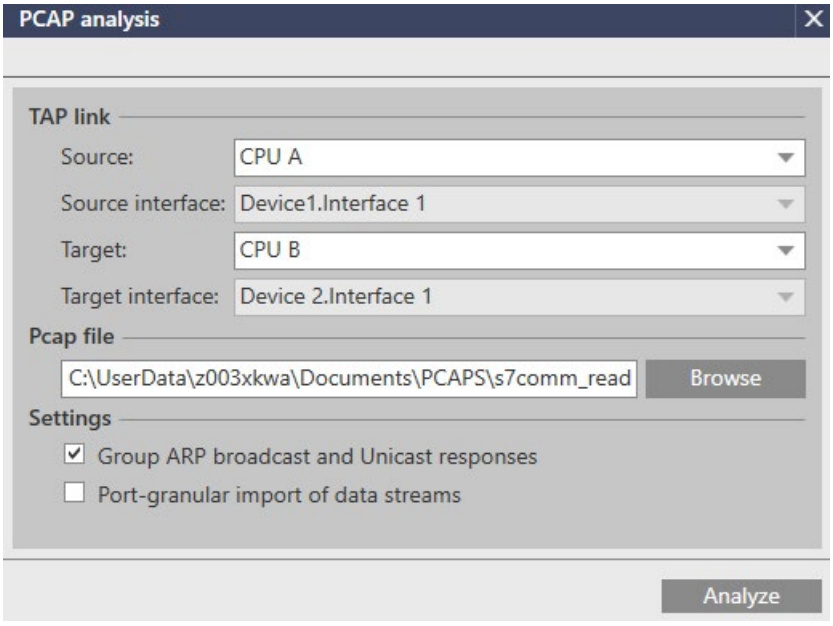
You can analyze PCAP files with SINETPLAN, generate a dataflow or a dataflow template from them and add them to your project

To do so, follow these steps:

1. Select the "Network analysis" view.
2. Click the tab of the project to which you want to add a dataflow or a dataflow template.
3. Click the "Add dataflows and dataflow templates from PCAP file" icon in the toolbar:

   The "PCAP analysis" dialog is displayed:

4. In the "Pcap analysis" dialog, enter the devices between which the TAP device (TAP link) was connected for the Pcap recording:

   To do so, click on the connection between these devices to apply the settings for source, source interface as well as target and target interface automatically to the fields or click on the respective drop-down lists to select the corresponding information.

5. Click the "Browse" button to select a recording file that contains the dataflow from the source to the target device.

6. Select the settings.
   - Grouping ARP broadcast and unicast replies

     The "Address Resolution Protocol" (ARP) is used to request the MAC address of a network device if only the IP address of this network device is known (ARP broadcast).

     For this purpose, the requesting network device sends an "ARP Request" to all network devices: The device with the known IP address should send its MAC address via "ARP Reply" to the requesting network device (unicast reply).

     If you activate the option "ARP broadcast and unicast replies", then SINETPLAN adds the unicast reply to the respective ARP broadcast dataflow. SINETPLAN thus calculates higher values for burst and data rate when simulating the traffic load. The actual values are lower.

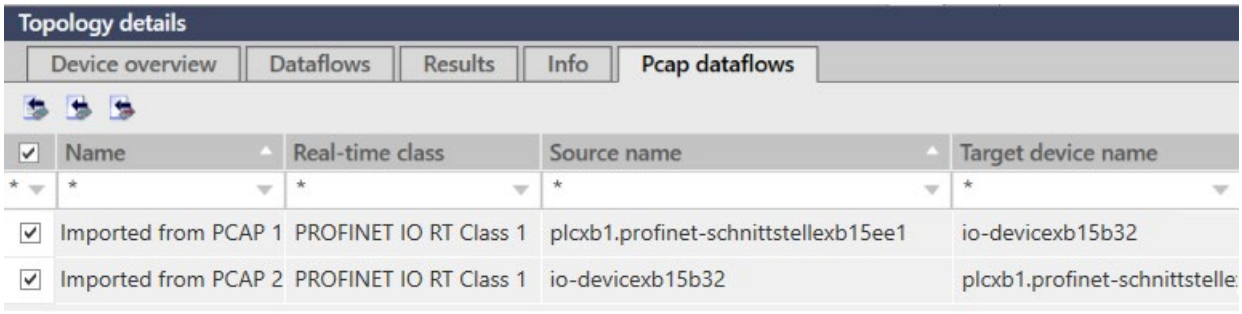
     If you do not activate the "ARP broadcast and unicast replies" option, SINETPLAN considers the unicast reply and the ARP broadcast dataflow separately. If the capture file contains only one ARP reply to a specific ARP request, then SINETPLAN discards this unicast reply. SINETPLAN thus calculates lower values for burst and data rate when simulating the traffic load. The actual values are higher. Therefore, you should keep the default setting (activated option).

   - Port-granular import of dataflows

     A new data stream is created by activating the "Port-granular import of data streams" box whenever an IPv4 frame with an unknown combination of source device, source port, target device and target port appears.
     If the box is not activated, the ports of IPv4 frames are compared with existing data streams between the same source and target devices. If the ports are different, the corresponding source or target port property is set to multiple ports.

7. Click the "Analyze" button.

   SINETPLAN now evaluates the PCAP file and displays the dataflows found in the "Pcap dataflows" tab:



Optimum position for TAPs to measure dataflows

The arrangement of the Test Access Points (TAP) in the network affects the accuracy of the dataflow measurement.

Recommendation: If you want to measure and record dataflows between source and target devices, place the Test Access Point (TAP) as close as possible to the source device. The measuring accuracy is increased by this placement.

Reason: If there are additional devices between the source device and TAP, these devices can influence the dataflow from the source device to the target device.

Using Pcap dataflows

You can perform the following actions in the "Pcap dataflows" tab:

- Import Pcap dataflows into the project.

  Click the "Import dataflows" icon for this:

  The dataflows are now available in the "Dataflows" tab.

- Save Pcap dataflows as global dataflow templates.

  To do this, select the Pcap dataflows and click on the "Import dataflow template to global library" icon:

  The dataflows are now globally available in the "Dataflow templates" catalog.

  You can use the templates for all projects.

- Import Pcap dataflows into the project as a dataflow templates.

  Click the "Import dataflow template to project library" icon for this.

  The dataflows are now available in the "Dataflow templates" catalog in the project area.

  You can use the templates for the current project.

9.2 Recording dataflows of a redundant system

This section describes how to record dataflows without errors in a redundant system with two S7-1500R central processing units.

Use a Test Access Point (TAP) and Wireshark for the recording.

In a second step, you then insert the recorded dataflows into your SINETPLAN project.

S7-1500R/H redundant system

For an S7-1500R/H redundant system, the central processing units (CPUs) are duplicated, i.e. redundant.

The two CPUs process the same project data and the same user program in parallel.

If one CPU fails, the other CPU maintains control of the process.

Redundant automation systems are used to reach higher availability of the controlled plant through parallel operation of two central processing units.

Synchronization of the two central processing units

The "H-Sync" protocol is used to synchronize the two CPUs. The protocol transmits the contents of the work memory of the active system to the backup system (update). In addition, H-Sync synchronizes the user program running on the backup CPU with the user program running on the active central processing unit: Both systems must run the same command of the user program at the same time.

S7-1500H system

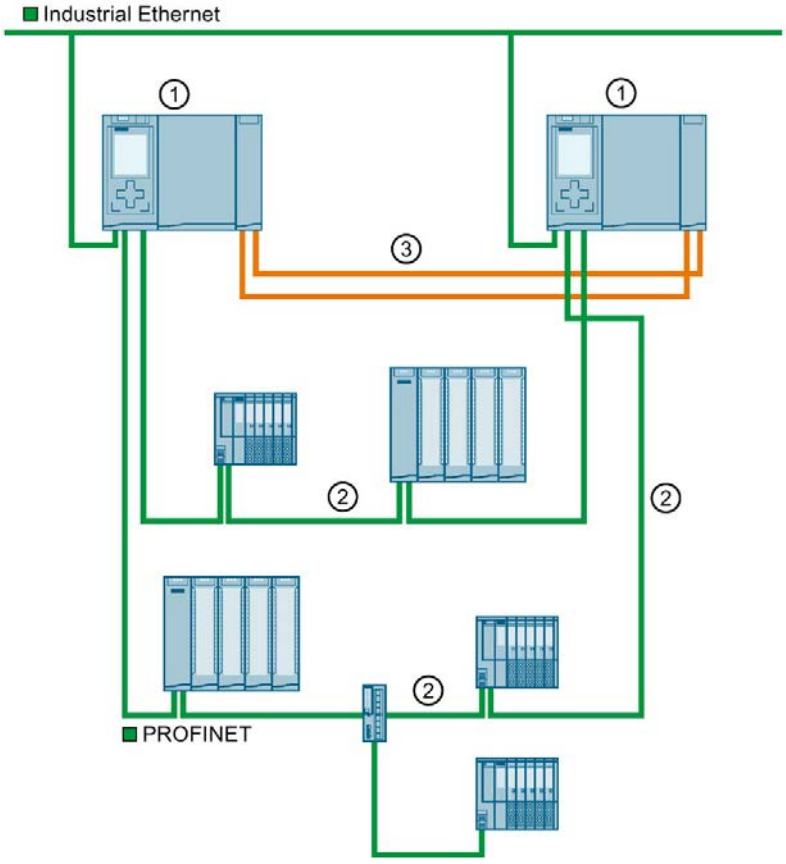
S7-1500H systems use additional synchronization modules and additional lines ③ for the physical transfer of synchronization data between two central processing units (number ① in the following graphic).

H-Sync data packets are only transmitted via these additional lines.

Therefore, the data traffic for synchronization does not affect the PROFINET network ② .

These dataflows therefore do not have to be recorded for SINETPLAN for SINETPLAN to be able to calculate the traffic load of the PROFINET network ②.

The graphic below shows an S7-1500H system:



S7-1500R system

S7-1500R systems use no additional lines for the physical transfer of synchronization data.

The PROFINET network ② is used to synchronize the two S7-1500 central modules ① of the redundant system.

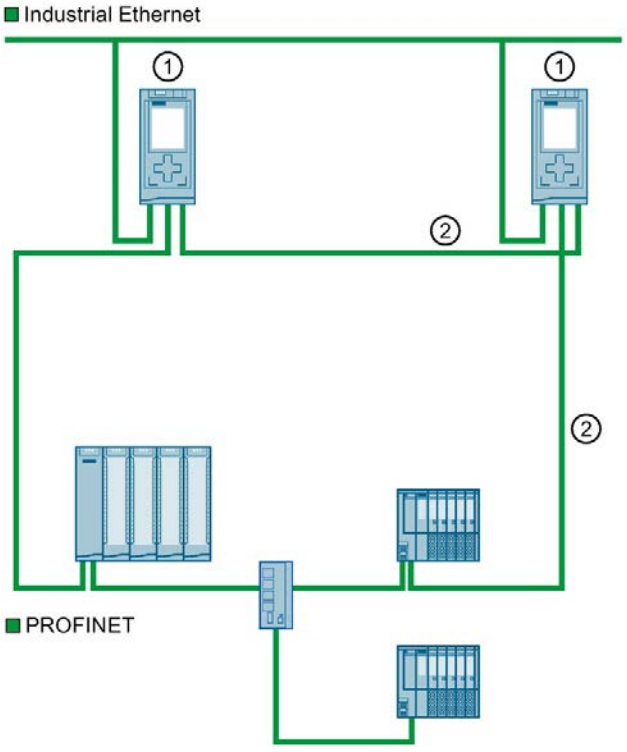
This increases the traffic load in the PROFINET network by the data transferred according to the H-Sync protocol.

Therefore, you must record the entire data traffic in the PROFINET network (including the H-Sync data packets) so that SINETPLAN can calculate the traffic load of the PROFINET network (including the load through H-Sync).

The next section shows you how to measure dataflows in a redundant S7-1500R system (including the H-Sync dataflows) using a Test Access Point (TAP). For example, you can use a SCALANCE TAP104 as TAP.

Redundant S7-1500 systems are described in the SIMATIC S7-1500 S7-1500R/H Redundant System System Manual (Page 68).

The graphic below shows an S7-1500R system:



Measuring dataflows in a redundant S7-1500R system

To record the data traffic in a redundant S7-1500R system without errors, carry out the following steps.

1. Connect a TAP device at position ① (near CPU 1, see the figure below).

   You can also measure at position ②. To simplify the following description, however, it should be assumed that you connect a TAP device at position ①, for example, a SCALANCE TAP104.

2. Start the recording of dataflows in the network with Wireshark.
3. Switch off CPU 2 of the redundant system.

   In our example, CPU 1 is to actively manage the process. This is achieved by switching off CPU 2.

   In the example, CPU 1 is the primary CPU.

4. Switch CPU 2 on again.

   CPU 2 now works as backup CPU.

   The primary CPU (CPU 1) now sends synchronization data according to the "H-Sync" protocol to transfer the current state of its work memory to CPU 2.

   For example, the work memory of the primary CPU contains the current process image of the inputs and the process image of the outputs.

   In addition, CPU 1 cyclically sends output data to the IO devices in the ring and receives input data from the IO devices (PROFINET IO data traffic).

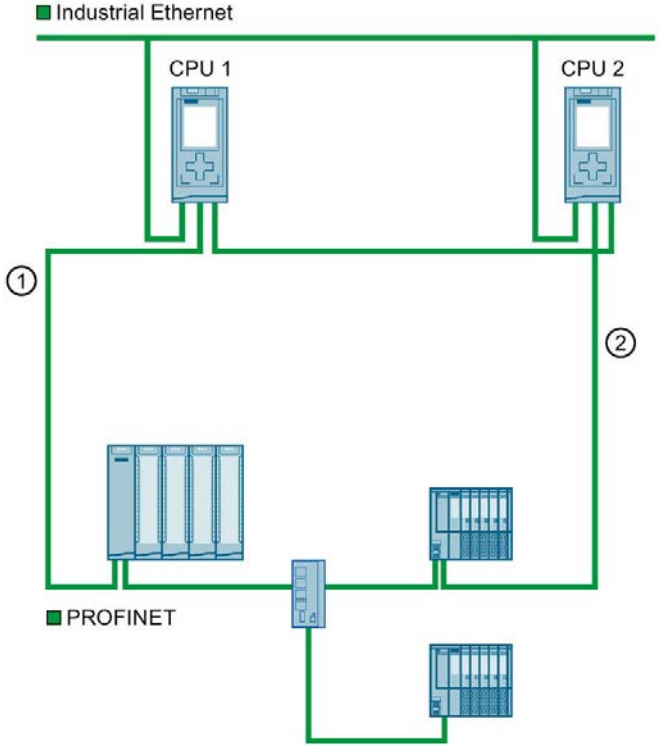
5. Now remove from CPU 1 the plug of the PROFINET cable that connects the two central processing units (CPU 1 and 2). After a brief pause, reconnect the plug of the PROFINET cable.

   With this interruption you force the primary CPU (CPU 1) to first transfer PROFINET IO data and H-SYNC data to the measuring point ①, then to the IO devices and finally to CPU 2 (counterclockwise, in the figure below).

   If you capture dataflows with a TAP, you must connect the TAP device as close as possible to the data source. This minimizes measurement errors.

   In addition, you must not measure between the two central processing units in a redundant system.

6. Perform the measurement for a certain time (one to two minutes), then remove the TAP device from the plant.



Measurement result:

You have written the data packets for synchronization of a redundant S7-1500R system.

The individual data packets that were transferred between the two central processing units of the redundant system according to the H-Sync protocol are stored in a capture file (Pcap file).

You can now analyze this Pcap file in SINETPLAN: During the analysis, SINETPLAN reads the recorded data packets of the dataflows from the capture file and adds them to the project.

The following section, "Transferring dataflows from a Pcap file to SINETPLAN", describes how to proceed for the Pcap analysis.

Rules for measurement in redundant S7-1500R systems

Observe the following rules when recording data streams in a redundant S7-1500R system.

- Use a TAP device that is able to read the dataflows in a PROFINET line in real-time without disrupting the dataflows.
- Measure as closely as possible to the data source.
- Do not measure between the two central processing units of an S7-1500R system.

Transferring dataflows from a Pcap file to SINETPLAN

Initial situation:

- You measured the dataflows in an S7-1500R system using a TAP device and recorded them using Wireshark.
- The recorded dataflows are stored in a Pcap file.
- You have scanned the network topology of your system and thus transferred it to your SINETPLAN project.

  Or you have created the project manually in SINETPLAN.

Applying H-Sync dataflows from a PCAP file

To apply dataflows from a Pcap file to your SINETPLAN project, proceed as described here (https://support.industry.siemens.com/cs/ww/en/view/109754833).

SINETPLAN analyzes the Pcap file correctly if exactly two central processing units (with R function) are used in an S7-1500R system.

If SINETPLAN detects an error when accepting the dataflows, a message informs you of the cause.

Example:

- "Topology is not supported in the PCAP analysis: TAP device must not be between two devices with R-functionality".

  Cause: You have measured the dataflows between the two central operating units of an S7-1500R system.

Device descriptions 10

Properties

A device description is an XML file which is saved encrypted or unencrypted in a SINETPLAN directory.

This file contains the relevant parameters and settings of a device which describe the behavior of how Ethernet packets are received, sent and forwarded.

This means a device description mainly includes the properties and parameters of the interfaces and ports of the device (details under Creating device descriptions (Page 105)).

If a device description (XML file) is available for a device in SINETPLAN, it is displayed in the "Devices" catalog of SINETPLAN with name, article number and version.

Device descriptions are required for all devices of a project so that SINETPLAN can simulate the planned network and identify critical segments.

SIEMENS device descriptions

Device descriptions for Siemens devices are already included in the SINETPLAN "Devices" catalog and are arranged according to the predefined categories (device type, device family, etc.).

The categories correspond to the hardware catalog of TIA Portal.

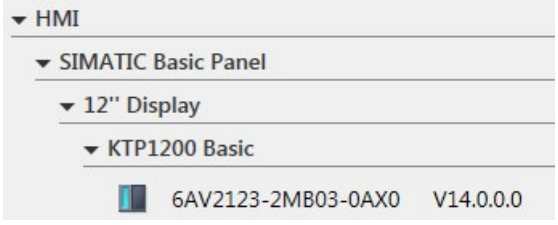
Available versions of devices in SINETPLAN

For Siemens devices, a new version of the device description is only available in SINETPLAN if parameters relevant for the simulation have been modified. Therefore, the correct or most current version in the SINETPLAN device catalog is not always available for a specific device.

Therefore, a device from a TIA Portal import may be assigned an older version in SINETPLAN.

Example: An HMI device has version V15 in TIA Portal. The parameters relevant for the simulation have not changed compared to version V14. Therefore, only version V14 is available in SINETPLAN.

As a rule, there are no differences with regard to the network behavior.



Device descriptions of other manufacturers

Device descriptions for devices from other manufacturers can be obtained from this manufacturer and imported so that the devices are visible and can be selected in the catalog (see Importing device descriptions (Page 104)).

Or you create your own device description based on the technical documentation of this manufacturer (see Creating device descriptions (Page 105)).

When you create a device description yourself, you can save it the file either encrypted or unencrypted.

You cannot view the configuration or change it with encrypted device descriptions.

10.1 Managing device descriptions

You can execute the following actions in SINETPLAN:

- Importing and exporting device descriptions
- Create device descriptions
- Edit device descriptions
- Saving device descriptions globally
- Searching for device descriptions
- Delete device descriptions

10.1.1 Importing device descriptions

To import a device description, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Devices" tab under "Catalogs".
3. Click the "Import devices into catalog" icon:

   The dialog box for importing the device description opens.
4. Select the directory that includes the device description.
5. Click "Import".

   SINETPLAN adds the imported device description to the device catalog.

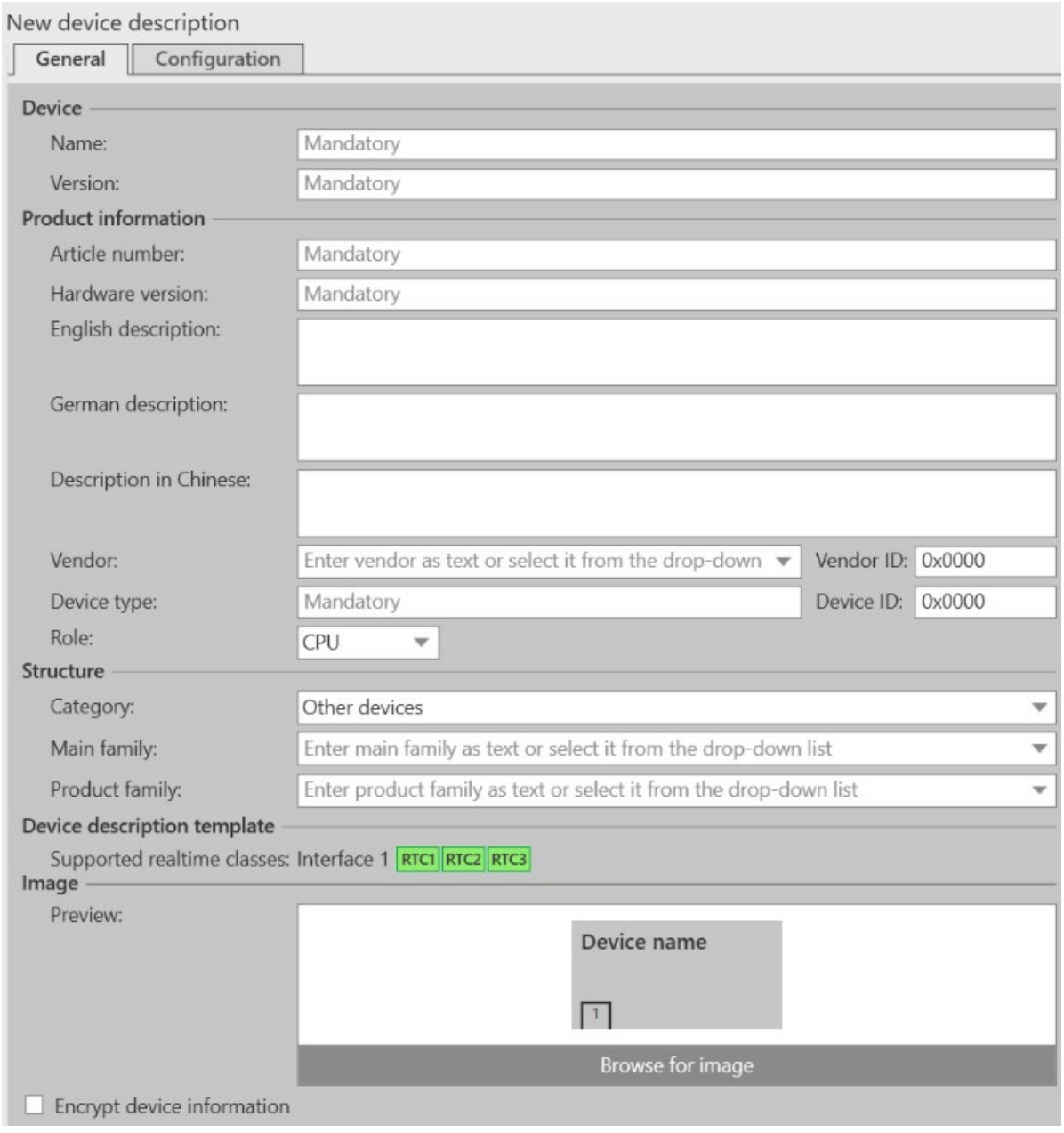
10.1.2 Creating device descriptions

To create a new device, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Devices" tab under "Catalogs".
3. Click the "Create new device" icon:

   The "New device description" dialog is displayed:



Creating a new device

"General" tab

1. Fill in the general text boxes of the dialog.
   - Name

     Enter a name for the device.
   - Version

     Device version: The combination of name and device version must be unique.
   - Article number
   - Hardware Version
   - Description in different languages (if required)
   - Vendor
   - Vendor ID
   - Device type
   - Device ID

     The device ID is used to identify devices for PROFINET IO.

     The 0 is assigned as device ID (0x0000) to the Siemens panels in the Basic series.
   - Role
   - Category
   - Main family

     The entry is used for sorting the device in the device catalog, for example. "CPU", "I/O" or "Industrial PC".

     The entry can be freely selected.
   - Product family

     The entry serves as subcategory when sorting in the device catalog.
   - Supported real-time class

     The PROFINET I/O real-time classes supported by the device.
   - Preview

     SINETPLAN uses this image in the editor.
   - Encrypting device information

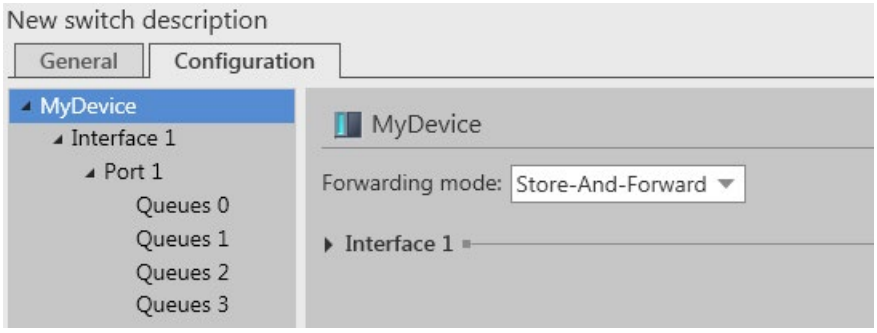
     Select this option to encrypt the device description.

     Attention: When you select this option, you can no longer view or edit the device configuration.

"Configuration" tab

2. Click the "Configuration" tab.
3. Click on the device, here "MyDevice", in the left pane of the tab.

   The following tab is displayed:



4. From the "Forwarding mode" drop-down list select the technology that the internal device switch uses to forward the received data packets.

   The following settings are available:

   – Store-And-Forward (default):

     The device receives and stores a data packet completely.

     The device then analyzes the data packet and forwards the data packet to the target address.

   – Cut-Through:

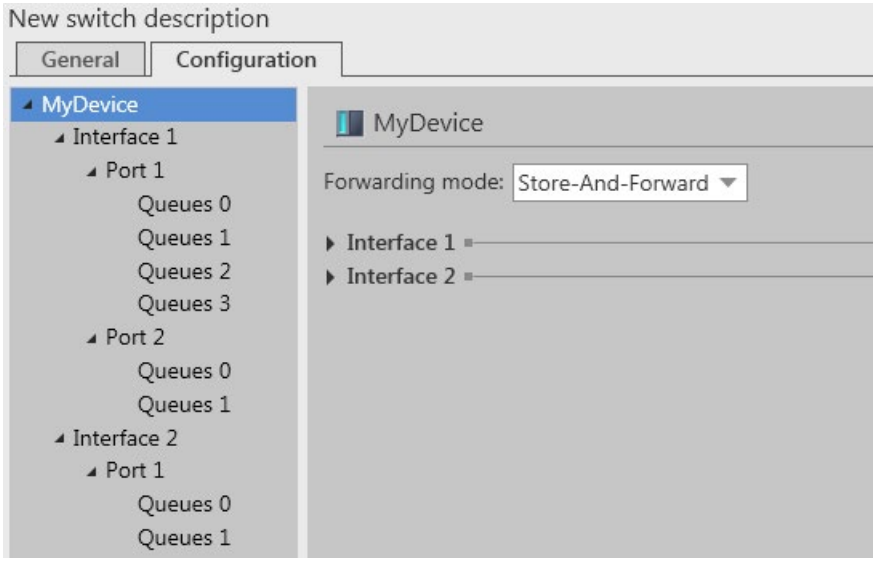
     The device sends data packets to the target address as soon as it has evaluated the header.

Interfaces

5. Check the number of interfaces.

   If the device has two PROFINET interfaces, click "Menu" (on the top-right in the dialog), and then click "Add interface".

   The following tab is displayed:

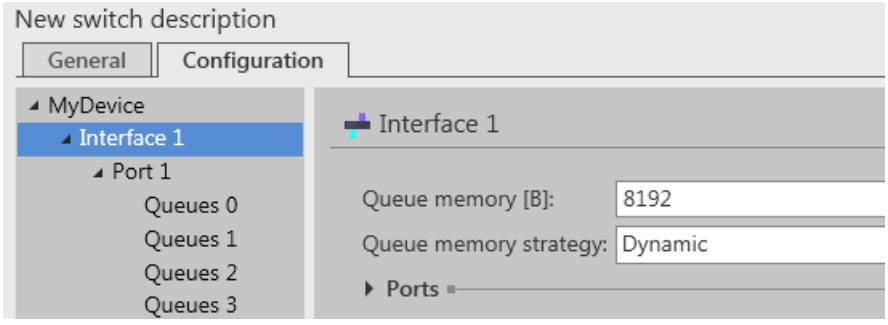


   If you want to remove an interface, click the minus character sign that is assigned to the interface.

   In the description below, we assume that the device has only one PROFINET interface.

6. Click "Interface 1" either in the tree on the left in the dialog or in the main part of the dialog.

   The following tab is displayed:



7. In the "Queue memory [B]" text field, enter the size of the memory area in bytes that is reserved for the queues (buffers) of the interface.

   In this memory area the interface saves the received data packets in one or multiple queues.

   You can find the value in the device documentation. Or ask the device manufacturer.

   8192 bytes is used as the value in the description below.

8. From the "Queue memory strategy" drop-down list, select how the device distributes the available memory area (for example, 8192 bytes) across multiple ports.

   The following settings are available:

   – Static

     The distribution of the available memory area is permanently specified.

     Each port receives the same amount of memory.

   – Dynamic

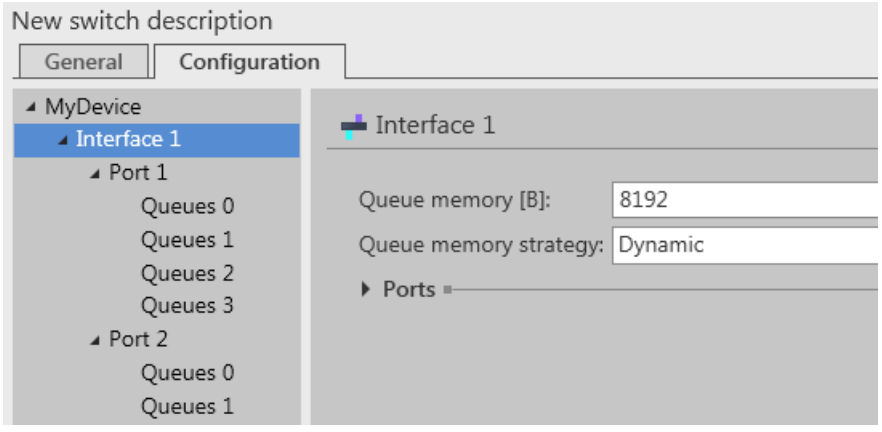
     The distribution of the available memory area is variable: If more data arrives at a port, this port receives more memory.

9. Check the number of ports.

   If the device has two or more ports, add one or more ports.

   To do so, click "Menu" (top right in the dialog), then "Add port".

   The tab below shows a configuration with two ports:



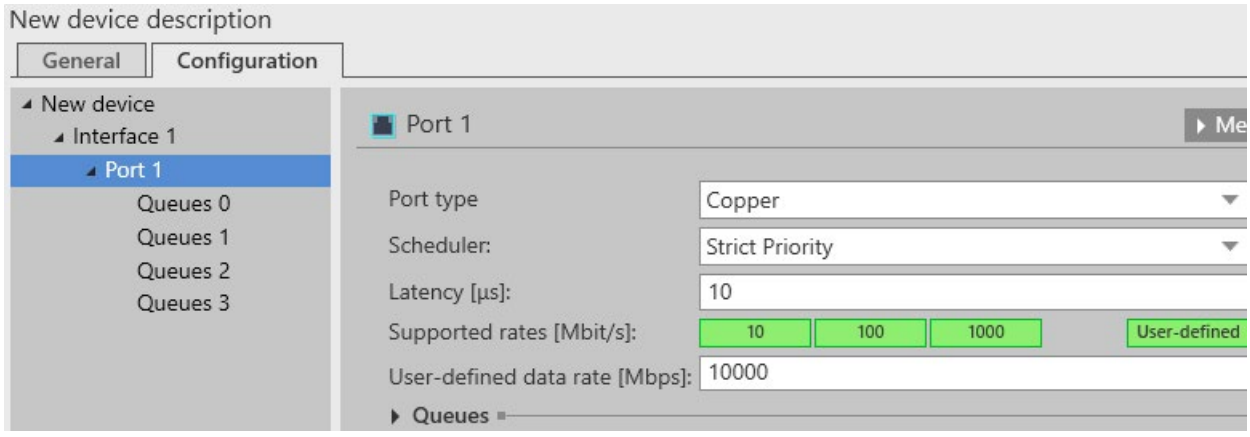
   Otherwise: To add an additional port, click the plus (+) sign at "Ports".

   If you want to remove (delete) a port, click the minus character (-) sign that is assigned to the port.

In the description below, we assume that the device has only one port.

10. Click "Port 1" in the tree on the left in the dialog.

    The following tab is displayed (section):



11. Select the transmission medium from the "Port type" drop-down list.

    The following settings are available:

    – Copper

      Is the port designed for copper cables? If so, keep the default "Copper".

    – FO

      If the port is designed for a polymer optical fiber, select the setting "FO".

Scheduler

12. From the "Scheduler" drop-down list, select the principle according to which the scheduler of the device forwards the data packets.

    If there is only one data packet pending, then the scheduler forwards this data packet immediately.

    If there are several data packets pending in the device queues, the device scheduler determines which data packet it forwards immediately. The other data packets have to wait.

    This principle is, for example, applied to voice data to enable phone calls over Ethernet (Quality of Service).

    For PROFINET devices, the scheduler forwards real-time data packets according to priority.

    Standard Ethernet data must wait until the real-time data has been sent.

    This setup is implemented with the help of multiple queues which have been assigned different data classes (e.g. the real-time classes RTC1, RTC2 and RTC3). The queues have different priorities (see Settings for the queues below).

    You can select one of the following settings in the "Scheduler" drop-down list:

    – Strict Priority

      With this setting, the scheduler first forwards all data packets that are located in the queue with the highest priority to their target address.

      Data packets located in the queue with the lowest priority must wait until all data packets in the queues with higher priority have been sent.

      When a lot of high-priority data is received, there is a risk that the data packets in the queue with the lowest priority are never forwarded or that they are only forwarded very late.

    – FIFO

      With this setting, the scheduler forwards the received data packets in the order in which they are received.

      There is only one queue.

    – Weighted Round Robin

      With this setting, the scheduler forwards a specific number of data packets from each queue in each round. The number of sent data packets is determined by the weight that has been assigned to this queue.

      With this procedure, even data packets located in the queue with the lowest priority have a chance of being sent.

13. In the "Latency [µs]" text field, enter the time by which a data packet is delayed when passing through the device (from receive port to send port). The delay time is, among other things, dependent on the utilized switching method (cut-through or store-and-forward).

The value 10 microseconds is used in the description below.

14. Select the transmission rates of the device.

    To do this, click the "10", "100" or "1000" button for "Supported rates [Mbit/s]".

    In the example above, the device supports the rates 10, 100 and 1000 Mbit/s.

    In addition, the value 10000 was entered under "User-defined data rate", which means the device supports the data rate of 1 Gbps. You can also enter a floating-point number here, such as "5.5", to specify that the device has a data transmission rate of 5.5 Mbit/s.

15. Check the number of queues.

    To create an additional queue, click "Menu" (top right in the dialog), then click "Add queue". Or click on the plus (+) sign that is assigned to the label "Queue".

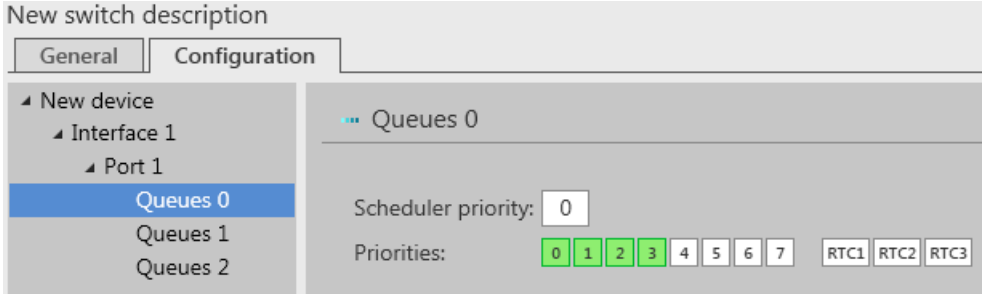
    To delete a queue, click "Menu", then "Remove queue". Or click on the minus (-) sign that is assigned to the label "Queue".

    In the description below, we assume that the device has three queues.

    For example, delete "queue 3".

    Click "Queue 0" to select this queue.

    The following tab is displayed:



16. Under "Priorities" select the data traffic classes that you want to assign to Queue 0.

    Possible values are the priorities 0 to 7 according to IEEE 802.1Q as well as the PROFINET real-time classes RTC1, RTC2 and RTC3.

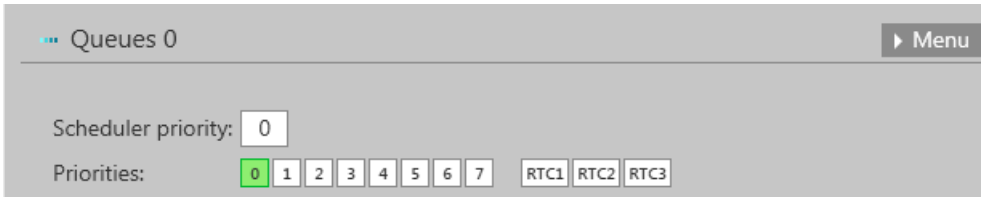
802.1Q VLAN priority	Traffic types
0	Best Effort
1	Background
2	Excellent Effort
3	Critical Applications
4	Video, delay time and jitter less than 100 ms
5	Voice, delay time and jitter less than 10 ms
6	Internetwork Control
7	Network Control

    In the description below, we assume that standard Ethernet data packets are assigned to Queue 0.

    According to IEEE 802.1Q, standard Ethernet data packets have the priority 0 (Best Effort).

    You assign a priority to a queue by clicking the appropriate check box.

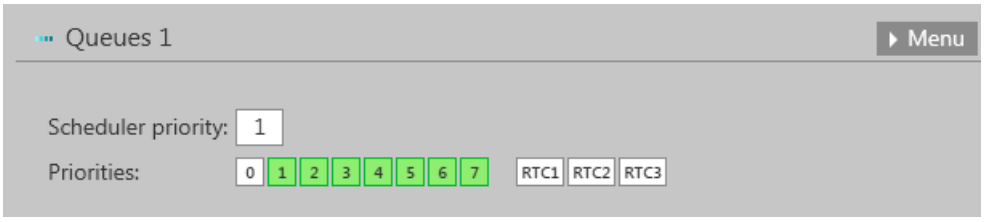
    The following figure shows this configuration:



17. Now click "Queue 1" in the dialog tree to select this queue.

    In the description below, we assume that VLAN priorities 1 to 7 are assigned to Queue 1.

    The following figure shows this configuration:

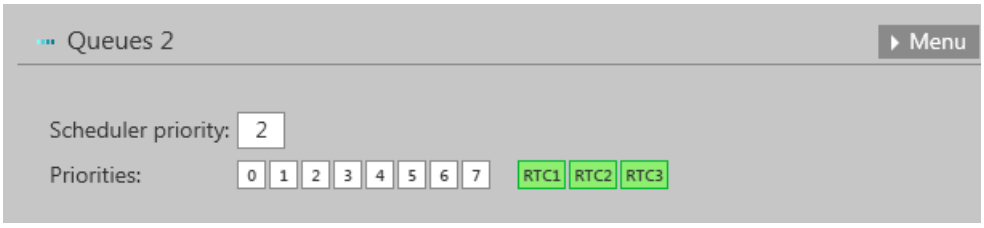


18. Now click "Queue 2" in the dialog tree to select this queue.

    In the description below, we assume that PROFINET real-time classes RTC1, RTC2 and RTC3 are assigned to Queue 2.

    The scheduler priority is set to "2". Data packets of the PROFINET real-time classes of all other data packets are therefore forwarded (highest Scheduler priority). The higher the number for "Scheduler priority, the higher the priority.

    The following figure shows this configuration:



19. Click "Save" to save the device description.

File directory for device descriptions

When you create a device description, SINETPLAN saves the description in an XML file.

The XML file is located in the following directory:

"C:\User\<USER>\AppData\Local\Sinetplan\DeviceDescriptions".

<USER> is a placeholder for your user name here.

To pass on device descriptions to other SINETPLAN users, copy the XML files and forward the files to other users, e.g. by e-mail.

10.1.3

10.1.4 Creating device descriptions with an XML editor

Device descriptions are XML files.

The schema of these XML files as well as information on the elements and attributes is available here (https://support.industry.siemens.com/cs/ww/en/view/109483229).

You can use it to create device descriptions (outside of SINETPLAN) with an XML editor.

The created XML files are then imported into SINETPLAN (see Importing device descriptions (Page 104)).

10.1.5 Editing device descriptions

You can only edit a device description if it was created with SINETPLAN and saved unencrypted.

To edit a device description, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Devices" tab under "Catalogs".
3. Select the device in the device catalog.

   If the device catalog is not open, click on the icon below to display the devices of the current project.

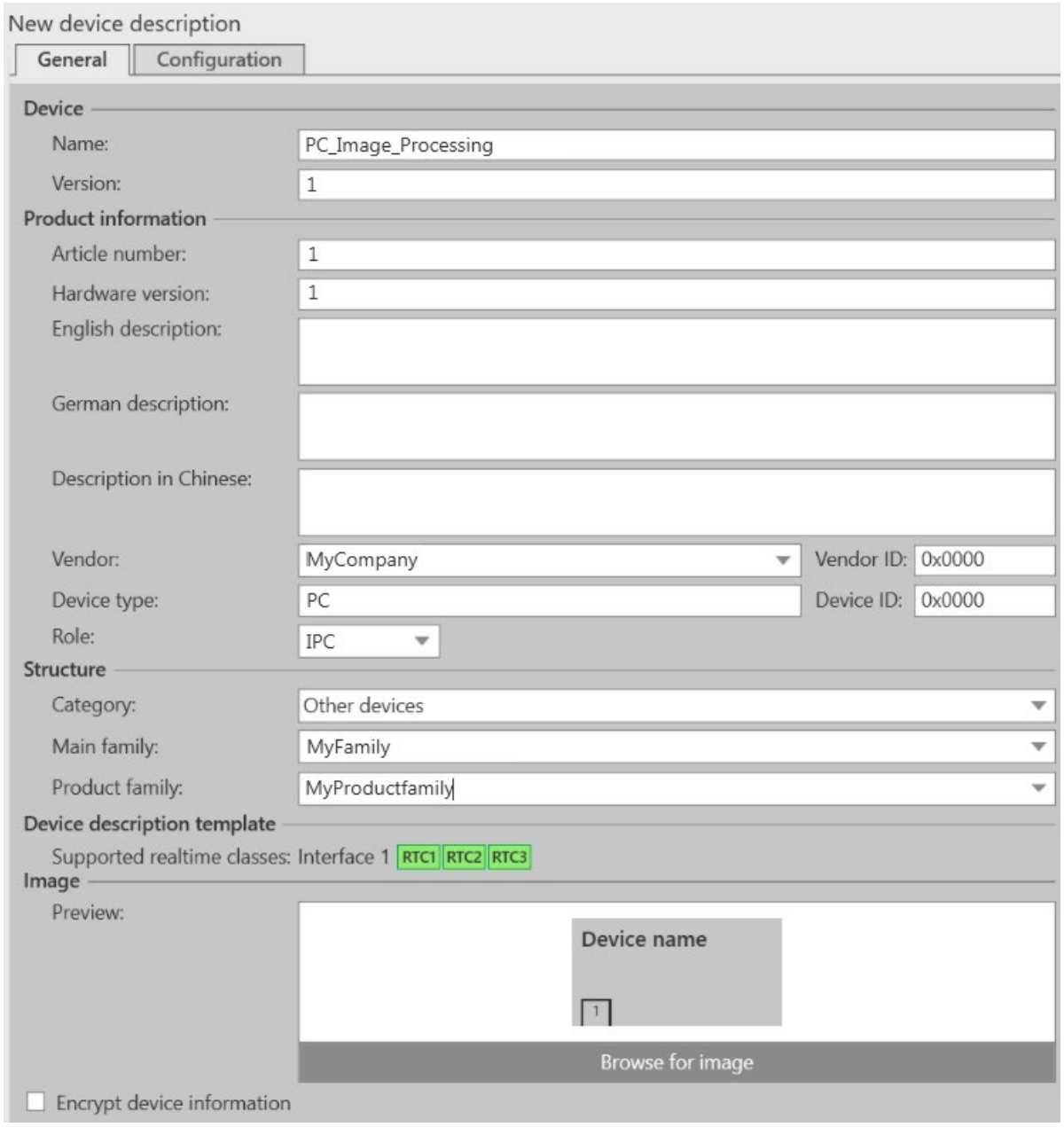
   Or click the icon below to display the devices that are available in all projects.

   
4. Right-click on the device.

   A menu is displayed.

5. In the menu, click "Edit".

   The following dialog is displayed:



6. Edit the device description.

   Also see the explanations under Creating device descriptions (Page 105) in this regard.

7. Click "Save" to accept the changes for this device.

   To also use the device description for another version of the device, enter a different version number in the "Version" field (for example, 1.1) and click "Save as". The combination of name and device version must be unique.

   To also use the device description for another device, enter the name of the other device in the "Name" field and click "Save as". The combination of name and device version must be unique.

Saving the device descriptions for all projects

Proceed as follows to save a device description globally:

1. Select the "Network analysis" view.
2. Click the "Devices" tab under "Catalogs".
3. Select the device in the device catalog.

   If the device catalog is not open, click on the icon below to display the devices of the current project.

4. Under "Details" in the device catalog, click "Save as global".

   The device description is now available for all projects.

   The device is given the following icon in the device catalog:

10.1.6 Searching for devices

Search function for the device catalog

You can search the device catalog for specific devices.

To do this, follow these steps:

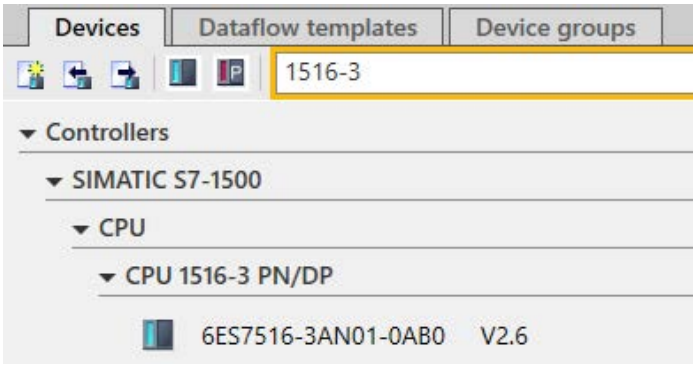
1. Select the "Network analysis" view.
2. Click the "Devices" tab under "Catalogs".

   You will see the following search box in the toolbar of the device catalog:

3. In it, enter a term or a type designation, for example, "1516-3":

   All devices that were found in the device catalog are now displayed, in the example:

10.1.7 Deleting device descriptions

Deleting a device

To delete a device, follow these steps:

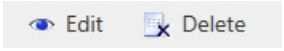
1. Select the "Network analysis" view.
2. Click the "Devices" tab under "Catalogs".
3. Select the device in the device catalog.

   If the device catalog is not open, click on the icon below to display project-specific devices.

   Or click the icon below to display the devices that are available in all projects (global devices).

   
4. Under "Details" in the device catalog, click "Delete".

   Otherwise: Right-click the device in the device catalog and then select "Delete" in the menu.

Consequences of deleting:

- When you delete a globally available device (global device) that is used in the project in the device catalog, this device is considered to be project-specific and is displayed in the device catalog under the project-specific devices.
- When you delete a globally available device that is **not** used in the project in the device catalog, SINETPLAN deletes the device and no longer displays it in the device catalog.
- When you delete a project-specific device that is used in the project in the device catalog, SINETPLAN ignores this delete instruction and continues to display the device in the device catalog.
- When you delete a project-specific device that is **no longer** used in the project in the device catalog, SINETPLAN deletes the device and no longer displays it in the device catalog.

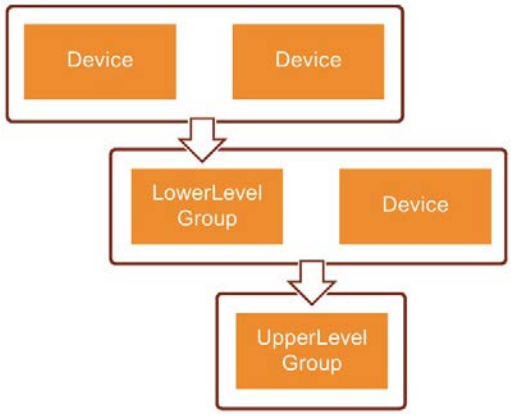
Device groups

11

With SINETPLAN, devices can be combined into a group.

Devices and groups can be combined to form a higher-level group.

The figure below shows this principle: The framed objects each form a group. The displayed nesting of groupings can be continued so that deeply nested groupings are possible (group-in-group configurations).



Group tasks

You can use groups to organize large projects into smaller units.

In addition, it is possible to first configure plant sections (e.g. production cells), to combine the devices of the plant section into a group, and then use this group several times in the project.

Examples of groups

- A robot with multiple lower-level devices (e.g. valve terminal, milling cutter, glue controller) is used in a production cell.

  In SINETPLAN you can now combine the production cell into a group and use it multiple times in the project.

- A plant with multiple units. The devices of the units are combined into a group.

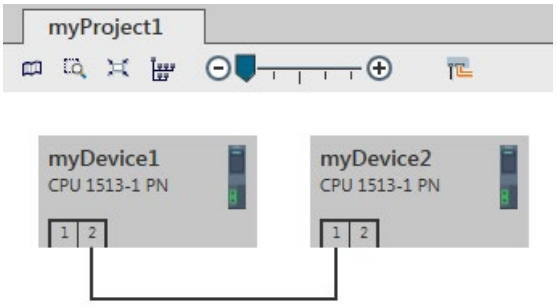
Combining devices into groups

You usually start by creating a group in the topology view of the project tab.

Example

You have created a project with two new networked devices and named the project "myProject1".

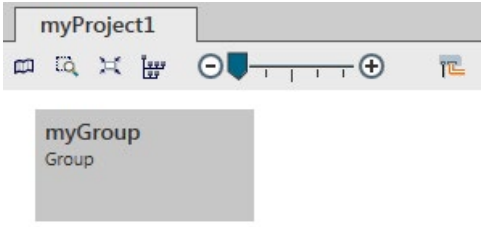
SINETPLAN then shows the following project window:



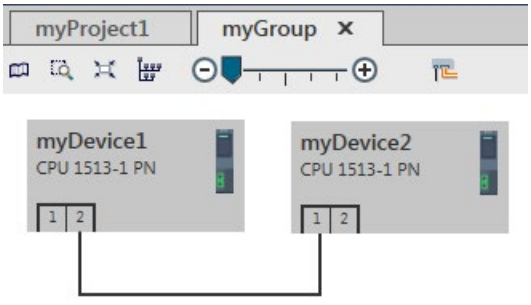
You can find a description of how to create a group in SINETPLAN here (Page 124).

If you combine the two devices in the example above into one group named "myGroup", SINETPLAN shows the following result:

- The "myGroup" group is displayed in the "myProject1" project tab.



- When you double-click on the "myGroup" group, SINETPLAN opens the group in its own tab with the name of the group and displays the structure of the group in this tab, i.e. the two devices that make up the group.



- You can now add more devices in the project window, merge these devices with the newly created group to form a new group, or import a project as group and group it with other groups or devices. The newly created group is displayed again in the project tab and you can open the group. The structure of the group is again displayed in a separate tab of the topology view.
- As only one tab can be displayed at a time, you only see one hierarchy level of the group structure in the project at a time. Therefore, reduce the number of hierarchy levels in the topology view to keep the project clearly structured.

Configuring the port of a device as the port of the group

In the above example, the newly created group cannot be networked because it has no port.

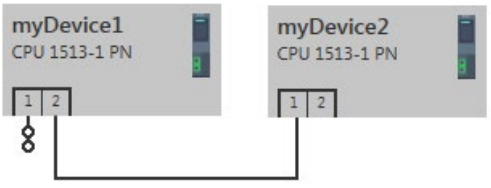
To assign a port to a group, proceed as follows:

1. Open the group.
2. Right-click on a non-networked port of a device in the group and select the shortcut menu "Create external port".

   Result: SINETPLAN creates an external port.

   The symbol with the unfilled circles means that the port, if it is not connected with other devices or groups, is displayed in each hierarchy level of possible other groupings and can therefore be networked in each hierarchy level.

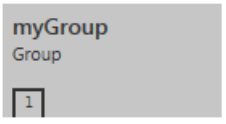
   Once you network the port in one of these nested groups, the port is no longer available in the higher-level groups - a port can only have one connection.



3. Optional: You have the option of setting up the port so that it is passed on only one hierarchy level, which means only the group of the next level shows an external port. To do so, remove the check mark in the "Show external ports in all groups" shortcut menu of the port.

   Result: The symbol changes and has only one unfilled circle.

   Only the next higher-level group shows the external port and can be connected to other devices or groups on this level.

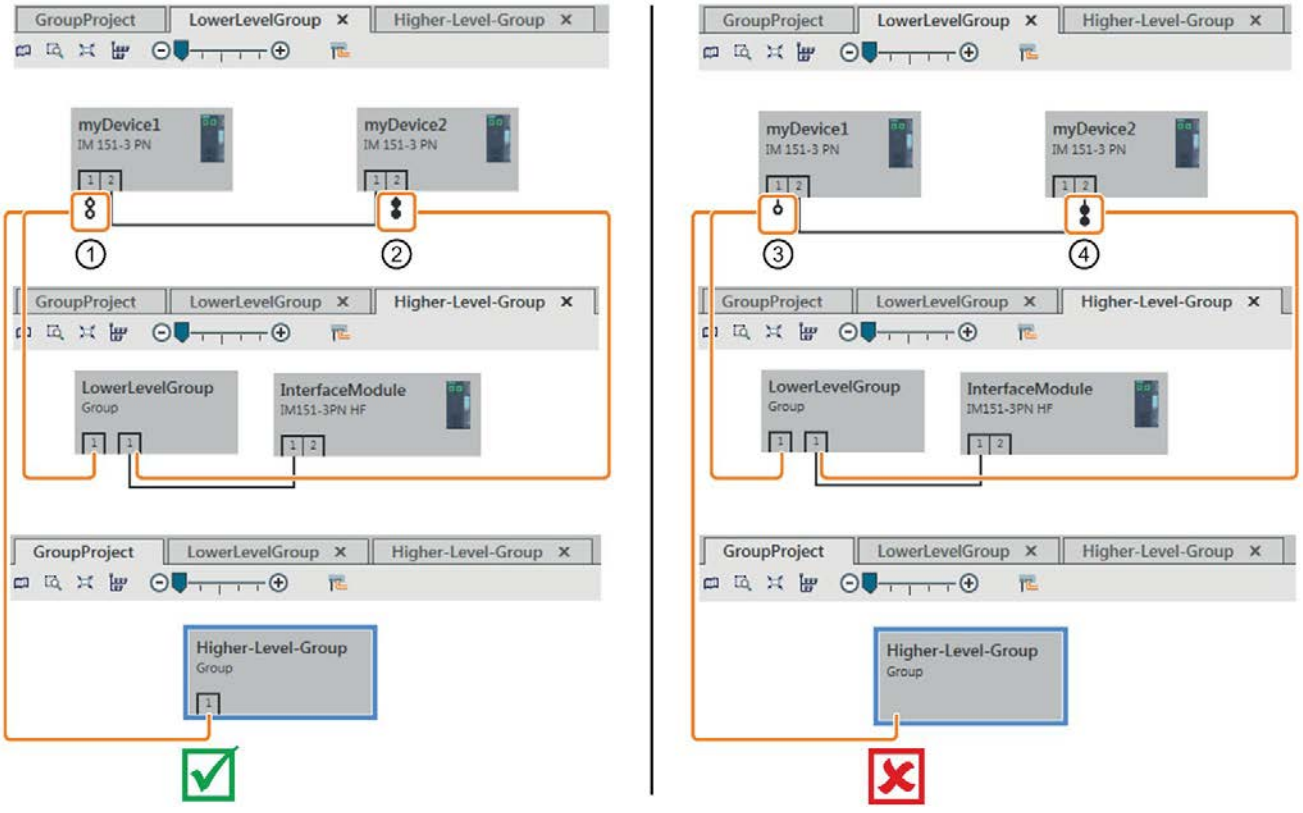


Tip: If you move the cursor over the port of a group, the tooltip displays information about the port (device, interface and port number).

Summary

The figure below shows the different options for configuring groups:

The orange lines show the assignment of the ports of the devices marked as external ports to the respective groups, in particular the effects of the setting "Show external ports in all groups".



① Symbol for "Show external ports in all groups".
② Symbol for "External port is connected"
③ Symbol for "Do not show external port in all groups" (show only in higher-level group)
④ same as ②

11.1 Managing groups

You can execute the following actions with SINETPLAN:

- Creating groups

  When creating a group, you can simultaneously include this group as a template in the catalog ("Device groups" tab).
- Edit group descriptions
- Changing groups
- Undo grouping
- Deleting groups
- Importing groups

Procedure

To create a group, follow these steps:

1. Select the "Network analysis" view.
2. Click the tab of the project in the editor.
3. Select the devices you want to group together in the editor.

   Use one of the following methods to select the devices:

   – Press the Ctrl key and keep it pressed.

     Click the devices you want to group.

   – Press the Ctrl key and keep it pressed.

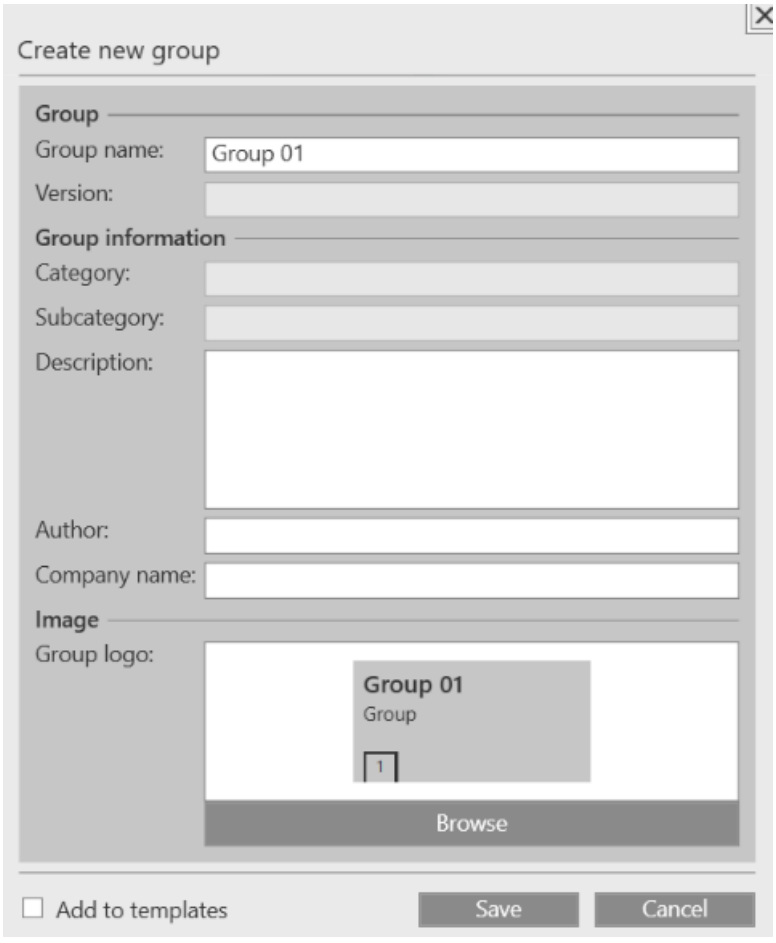
     In the editor, click in front of a device that you want to add to a group.

     Hold down the left mouse button and draw a rectangle that includes all devices of the group.

   SINETPLAN shows the selected devices with a blue border.
4. Right-click one of the selected devices.

5. Select the "Create group" entry in the shortcut menu.

   The following dialog is displayed:



6. Fill in the text boxes of the group parameters.
   - Group name (required)

     Apply the entered name or assign a different, unique name for the group.
   - Version (grayed out)

     If you activate the "Add to templates" option, you have to enter the version of the user group here.
   - Category (grayed out)

     If you activate the "Add to templates" option, you have to enter the category here under which the group is categorized in the group catalog.
   - Subcategory (grayed out)

     If you activate the "Add to templates" option, you have to enter the subcategory under which the group is categorized in the group catalog.
   - Description
   - Author
   - Company name
   - Group logo

     SINETPLAN uses this image in the editor for the group.
7. "Add to templates" option

   When you select this option (set check mark), the new group is added to the group catalog ("Catalogs > Device groups" tab).

Group templates

When you create a group and add it to the templates, SINETPLAN saves the description of the group in an XML file.

Exporting groups

To forward group templates from the catalog to other SINETPLAN users, click on the "Export groups" icon in the "Catalogs > Device groups" tab.

In the subsequent dialog, select the groups to be exported.

You can forward the exported file, for example, by email.

Procedure

To edit the parameters of a group, follow these steps:

1. Select the "Network analysis" view.
2. Click the tab of the project in the editor.
3. Right-click the group whose parameters you want to edit.
4. Click the "Edit group parameters" entry in the shortcut menu.

   The dialog for changing the current description is displayed.
5. Change the group. See the explanations on the parameters (see Creating groups (Page 124)) in this regard.
6. Click "Save" to apply the changes.

Procedure

To edit a group, follow these steps:

1. Select the "Network analysis" view.
2. Click the tab of the project in the editor.
3. Double-click the group you want to edit.

   Otherwise: Select "Show group" from the shortcut menu of the group.

   SINETPLAN now shows an additional tab in the editor which displays the individual devices of the group.

   The group tab is the view of a partial area of the project, the grouped devices.
4. Edit the group:
   - You can, for example, add additional devices to the group:

     To do so, drag the devices from the device catalog to the group in the editor.
   - You can also add a group:

     To do so, drag&drop the group from the "Device groups" catalog into the group in the editor.
   - You can delete devices or groups in the group.

   The changes only have an effect on the current group in the editor, not on the template for the group in the "Device groups" catalog.
5. Save the project to apply the changes.

Procedure

You can undo the grouping of devices (and groups). SINETPLAN then shows all grouped elements in the Project tab once again.

To undo a grouping, follow these steps:

1. Select the "Network analysis" view.
2. Click the tab of the project in the editor.
3. Right-click the group you want to ungroup.
4. Select the "Expand group" entry in the shortcut menu.

Procedure

To delete a group, follow these steps:

1. Select the "Network analysis" view.
2. Click the tab of the project in the editor.
3. Right-click the group you want to delete in the project.
4. Click "Remove" in the shortcut menu.

   If dataflows lead into this group from outside or if dataflows lead out of this group, SINETPLAN shows the "Remove dataflows" query. You are asked whether the dataflows that are connected to the selected devices should also be deleted:

   – "Yes" button: The dataflows are also deleted.
   – "No" button: The dataflows to the group and from the group are retained. The source or target devices of these dataflows which are missing after the group is deleted are highlighted in red in the "Dataflows" tab.

   Dataflows within the group to be deleted are deleted together with the group without a prompt for confirmation.

To import a group, follow these steps:

1. Select the "Network analysis" view.
2. Select the group catalog. Click the "Device groups" tab in "Catalogs".
3. Click the "Import groups" icon.

   The dialog for importing groups is displayed.
4. Select the directory and the file with the group description.
5. Click "Import".

   SINETPLAN adds the imported group to the group catalog.

Analyzing networks 12

12.1 Requirements

Required information

SINETPLAN can analyze a network when it has the following information:

- Device descriptions

  A device description must be available in the device catalog for each device in the configuration.

  The description includes the ability of the device to send, receive and forward data packets (details under Creating device descriptions (Page 105)).

  Descriptions for Siemens switches are already saved in the device catalog.

  If there is no device description, SINETPLAN uses a general description for this device based on the device type.

  The general description is based on assumptions and is therefore inaccurate. General device descriptions are therefore highlighted in yellow in the list of utilized devices.

  You should replace the general device description with a description of the actual device.

  – Request a device description from the manufacturer of the device.

    Then import this description into the SINETPLAN device catalog (see Importing device descriptions (Page 104)).

  – Or create your own device descriptions using the data sheet or other device documents

    (see Creating device descriptions (Page 105)).

- Dataflows

  The dataflows between the devices must be available.

  When you import a STEP 7 project, SINETPLAN applies the dataflows from the directory of the STEP 7 project.

  When you add a device to the project in SINETPLAN, you must create the dataflows that exist between this new device and the other devices of the project (see Creating dataflows (Page 81)).

  Create a separate dataflow for each direction.

- Topological connection

  When you add a device to the project, you must interconnect the ports of the device in SINETPLAN in accordance with the planned system.

- Restrictions for a ring topology

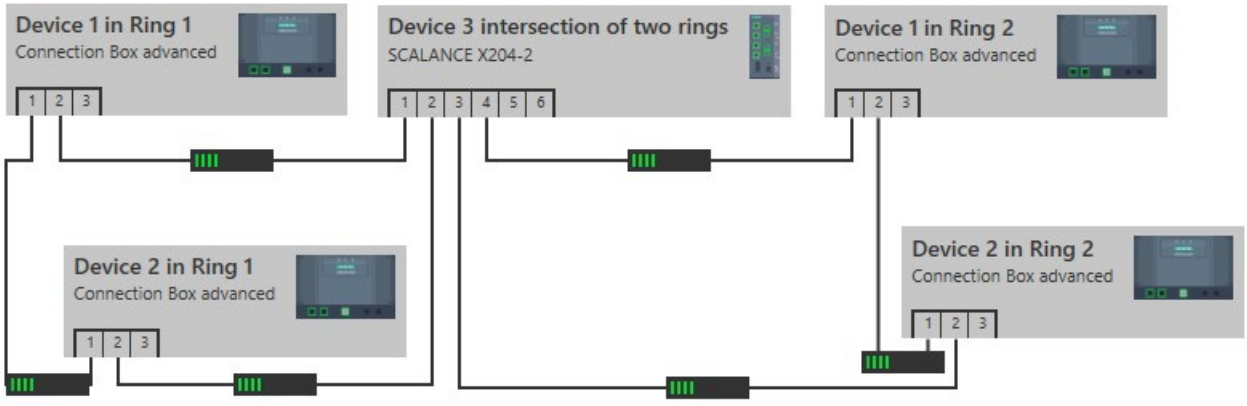
  If your configuration contains rings, then two rings may have a maximum of one shared device.

  The figure below shows a valid topology with one common device.

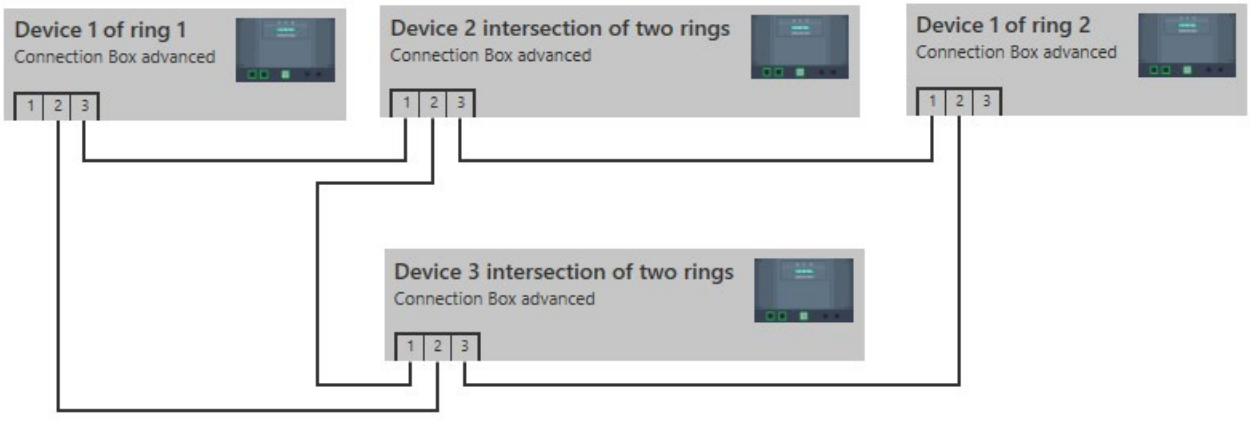
Restrictions for a ring topology

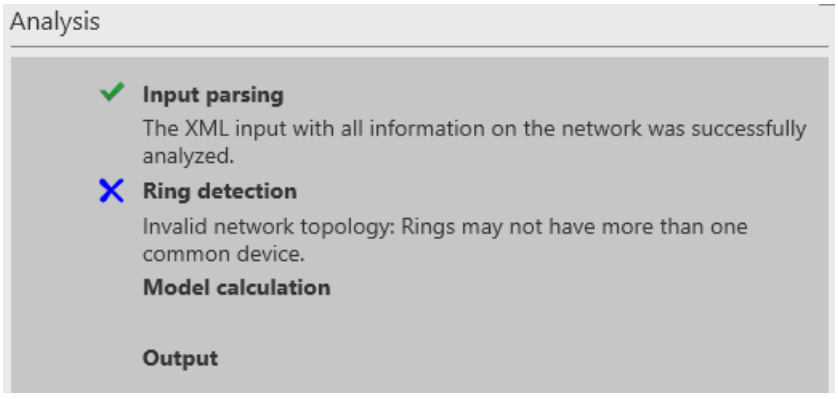
If your configuration contains rings, then two rings may have a maximum of one shared device.

The figure below shows a valid topology with one common device.



The following images show an invalid topology with two common devices and the error message during topology analysis.





In this case, you can perform an indicative analysis. Delete one of the unsupported connections, e.g. between port 2 of device 2 and port 1 of device 3.

12.2 Analyzing networks

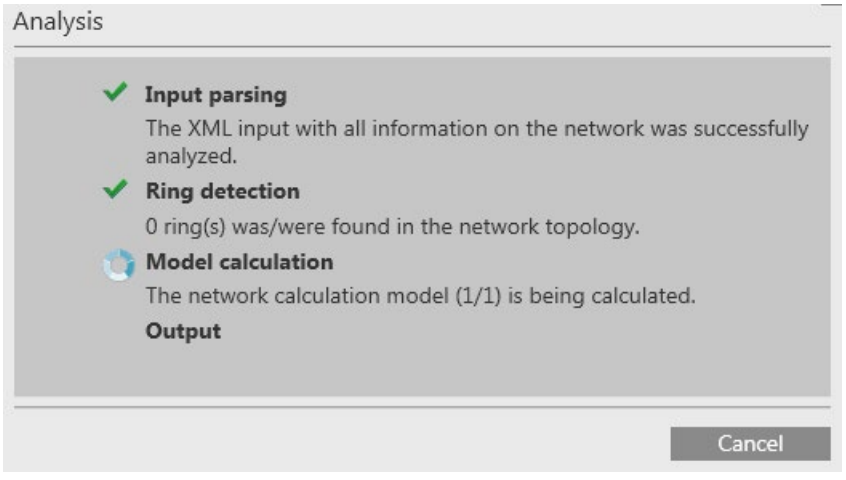
Analyzing a PROFINET network

To analyze a network, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Analyze topology" icon in the toolbar.

The SINETPLAN starts the analysis.

The following dialog opens. It shows the current status of the analysis:

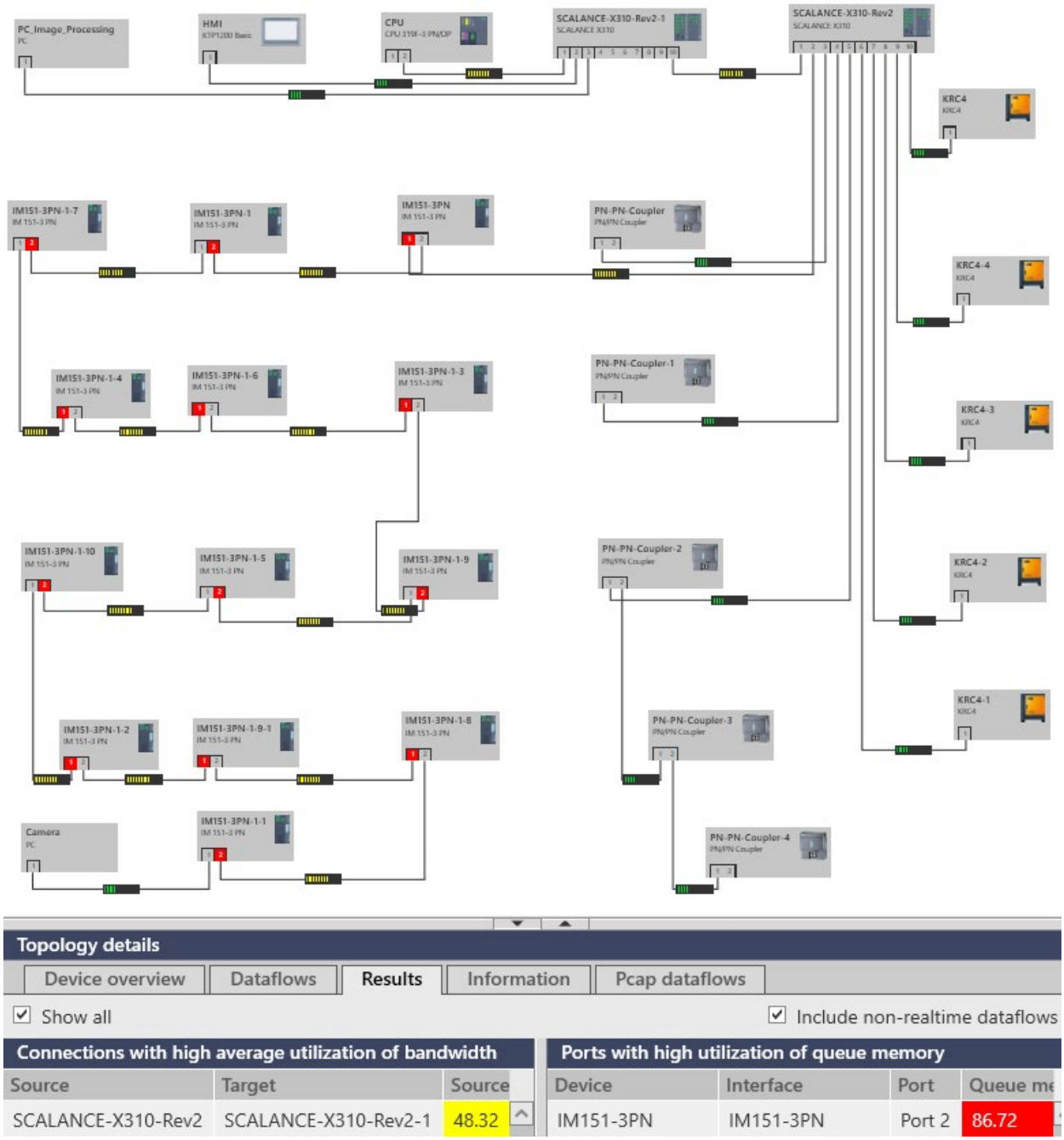


Results of the analysis

SINETPLAN shows the results of the analysis in the editor and in the "Results" tab.

Critical values for the average utilization of the bandwidth and the queues are listed individually in the "Results" tab. If you select the "Show all" option, then all results are listed (not only the critical values).

In the example below the analysis shows some critical network segments.



Color scheme for the results of the network analysis

The colors green, yellow and red are used to visualize the results of the analysis.

The meaning of the colors:

- Green: The values lie below the average threshold (see "Settings > Thresholds").

  The planned network is okay. No changes are necessary.

  The color green is used only in the editor, not in the 'Results' tab.

- Yellow: The average threshold has been exceeded.

  We recommend that you check the planned network.

- Red: The high threshold has been exceeded.

  The planned network should not be installed and operated.

  There is the risk of a plant standstill.

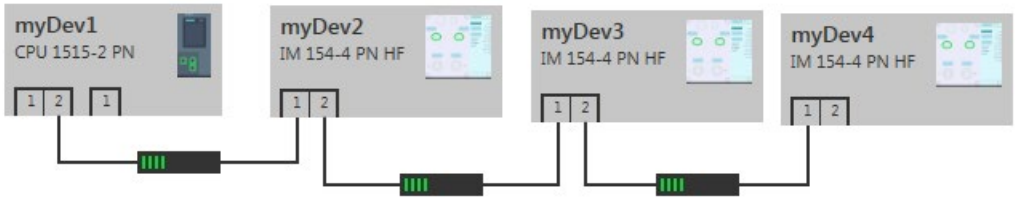
  Changes are necessary.

Information determined from the topology details

As a result of the successful network analysis, new parameters appear in the lists of dataflows and Pcap dataflows:

- Line depth of the dataflows

  Line depth is the shortest number of visible connections between the source and target interfaces. The value is displayed as "Line depth" column as natural number in the flow list.
  In the following example, the target myDev4 has the line depth 3 in the dataflow of the source myDev1.



- Update time (cycle time) of the dataflow

  You create or import the RTC1/2/3 PNIO dataflow using the UNKNOWN protocol or PNIO protocol. The update time is calculated and displayed as "Update time [ms]" column in the dataflow and Pcap dataflow table. The values can also be found in device, port and connection details.

- Jitter of PNIO dataflows

  In topology analysis, the jitter values correspond to the difference between the calculated values for the configured minimum cycle time and the actual cycle time. The displayed jitter value is the jitter value obtainable in the worst-case scenario (*worst-case value). Jitter is displayed as an absolute number in ms and as a percentage value in the dataflow list.

Topology analysis with broadcast dataflows

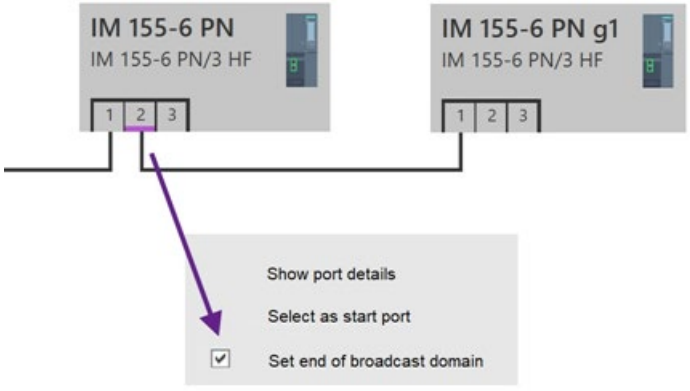
Click on the icon for the topology analysis. After successful analysis, you can click on any device, port or connection to see if the broadcast flow was propagated there. During topology analysis, the broadcast domain of each broadcast dataflow is calculated with respect to its propagation through the network. The broadcast dataflow is then only visible in connected areas in which the source device is contained.

Stopping the propagation of broadcast dataflows

You can define a property for the device port that is to prevent the propagation of broadcast dataflows.

Right-click on the port of the device. A dialog box opens. This item contains a check box that represents the current status of the broadcast blocking property of the selected port:

.



Click the "Set end of broadcast domain" element and the broadcast blocking property of the port is changed.

Click the "Analyze topology" button. After successful analysis, the broadcast flows are not transmitted via the selected port (egress filter).

Reducing the traffic load

13

The following options, among others, are available to reduce the traffic load:

- Change the network structure:
  - Reduce the line depth (number of devices in a row).
  - Form subnets through additional network adapter (CP).
- Change the device parameters if this is possible in the respective plant.
  - Increase the send clock of the PROFINET IO controller. The controller thus sends and receives data at shorter intervals

    (see Send clock (Page 135)).
  - Increase the update time of the PROFINET IO devices. The PROFINET IO devices thus receive data at greater intervals

    (see Update time (Page 135)).

Observe the PROFINET installation guideline of the PROFIBUS User Organization.

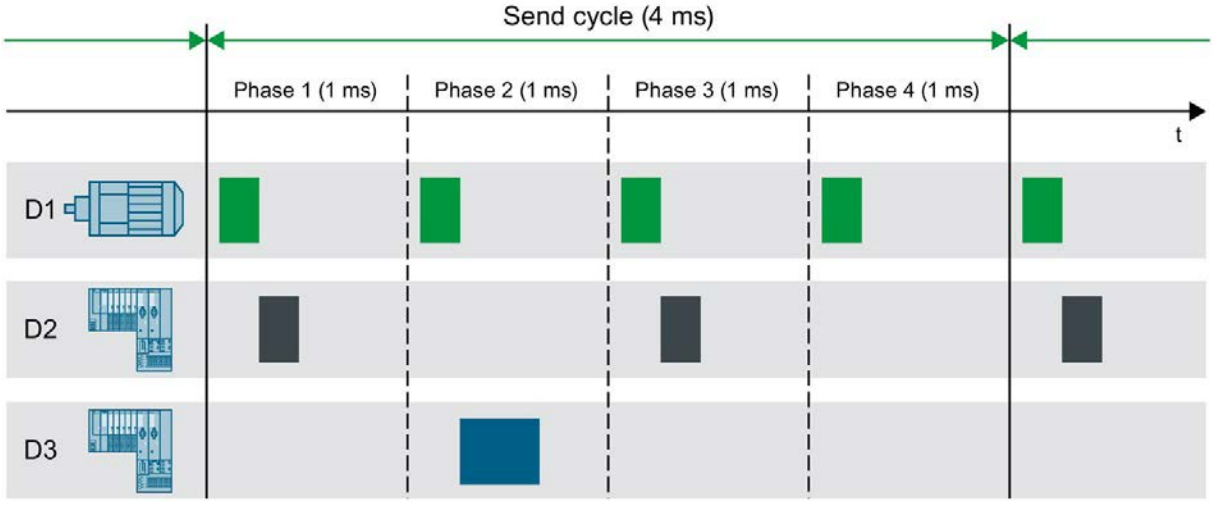
The update time is the time interval in which a PROFINET IO device sends current incoming data to the PROFINET IO controller and receives current output data from it.

You can set the update time at the individual PROFINET IO devices differently depending on the requirements of the process and the hardware used.

The example below assumes a system with three PROFINET IO devices.

At device D1 the update time is set to 1 ms, at D2 to 2 ms and at D3 to 4 ms.

The device with the longest update time (D3) determines the sending cycle.



The send cycle is 4 ms in the example: Within this interval the PROFINET IO controller sends current data at least once to the three devices.

The data are not transferred individually, but in data packets (data sequences that belong together).

The data packets of the example have different properties:

- The green data packets are 108 bytes long each. The data packets are sent at intervals of 1 ms and together form the dataflow from the PROFINET IO controller to device D1.
- The gray data packets are 108 bytes long each. The data packets are sent at intervals of 2 ms and together form the dataflow from the PROFINET IO controller to device D2.
- The blue data packets are 300 bytes long each. The data packets are sent at intervals of 4 ms and together form the dataflow from the PROFINET IO controller to device D3.

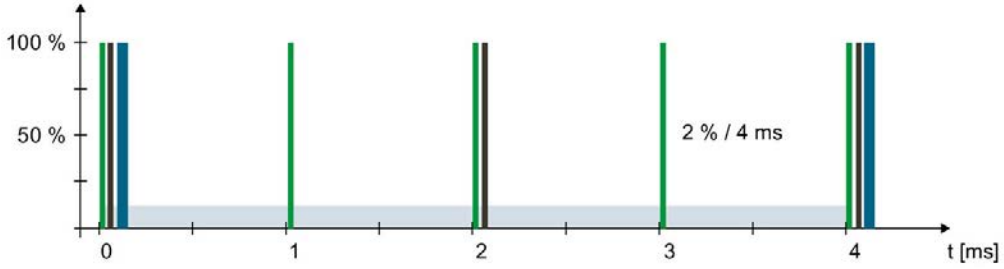
Definition of the traffic load

The ratio of utilized bandwidth to maximum available bandwidth is referred to as traffic load.

The observation period is important for the definition of the traffic load.

When the individual data packets are sent, they occupy 100% of the network bandwidth for the duration of the transmission: A second data packet cannot be sent during this brief time period.

When you look at an entire data cycle, however, the traffic load in the example is 2%.



Longer update times reduce the traffic load

If the process does not require rapid update times, you should increase (extend) the update time.

Example:

You determine that an update time of 2 ms is acceptable for device D1.

In this case you should increase (lengthen) the update time to 2 ms to reduce the traffic load.

Rule

- Set a longer update time at the PROFINET IO devices if the process does not require faster updating.

How does the send clock of the PROFINET IO controller affect the distribution of the traffic load?

The figure below shows the data packets that are sent from an IO controller to 4 IO devices in the following example.

The four devices have an update time of 4 ms: The devices receive new data at intervals of every 4 ms.

But it has not been specified yet when exactly the IO controller sends the individual data packets within the send cycle of 4 ms.

The following options are shown in the example below:

1. The IO controller has a send clock of 1 ms.

   It sends the individual data packets to the four devices at an interval of 1 ms.

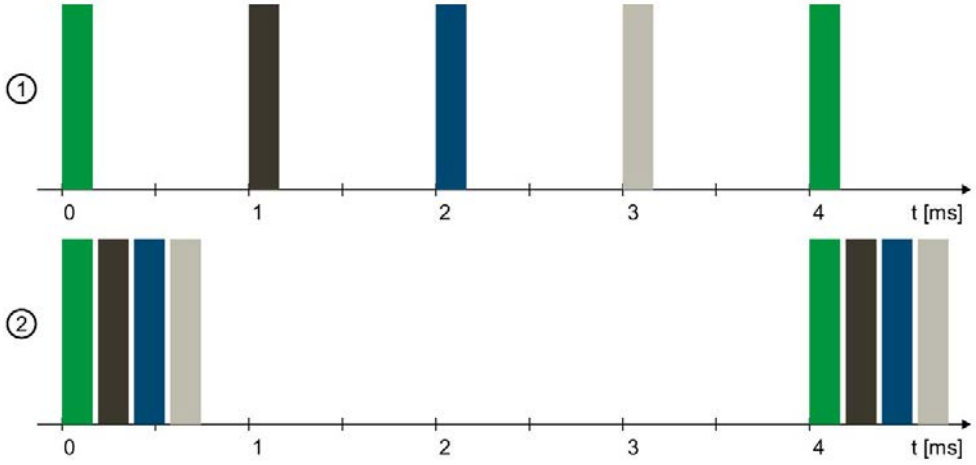
   This distributes the load. There is no accumulation of packets (short bursts).

2. The IO controller has a send clock of 4 ms.

   It sends the individual data packets one immediately after the other to the four devices at an interval of 4 ms.

   This does not distribute the load. There is an accumulation of packets (a long burst in each send cycle).

In both cases, the traffic load is the same. However, the distribution of the traffic load differs:



The example shows that a higher send clock cycle results in a more even distribution of the traffic load.

Rule

Set a high send clock at the PROFINET IO controller.

Settings

14

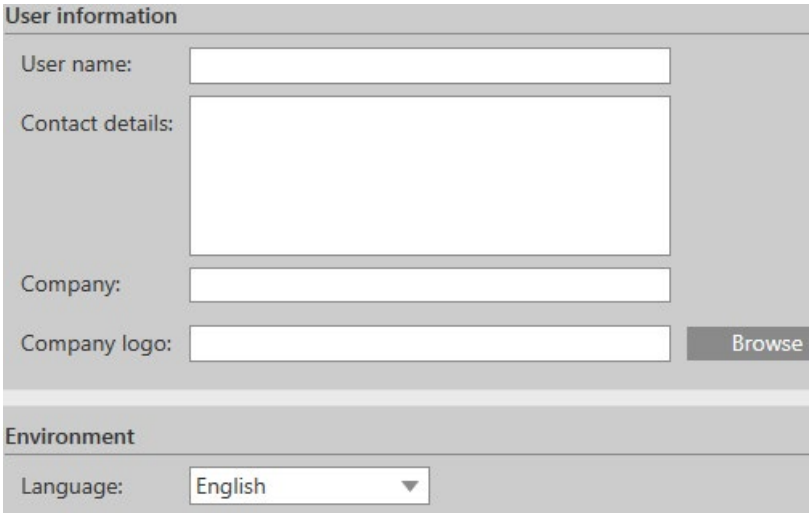
The "Settings" view has the following tabs:

- General
- Thresholds
- Network Scanner
- Validation

To insert or change information about the user follow these steps:

1. Select the "Settings" view.
2. Select the "General" tab.

   SINETPLAN displays the following settings:



3. Fill in the text boxes of the tab.

   Note the following explanations in this regard:

   – User name

     Enter the name of the user here.

   – Contact details

     Enter the contact data of the user here (for example the address, e-mail or phone number)

   – Company

   – Company logo

   – Language

     Here you set the language that the SINETPLAN uses for the texts of the graphical interface.

     The following languages are available:

     - German

     - English

     - Chinese

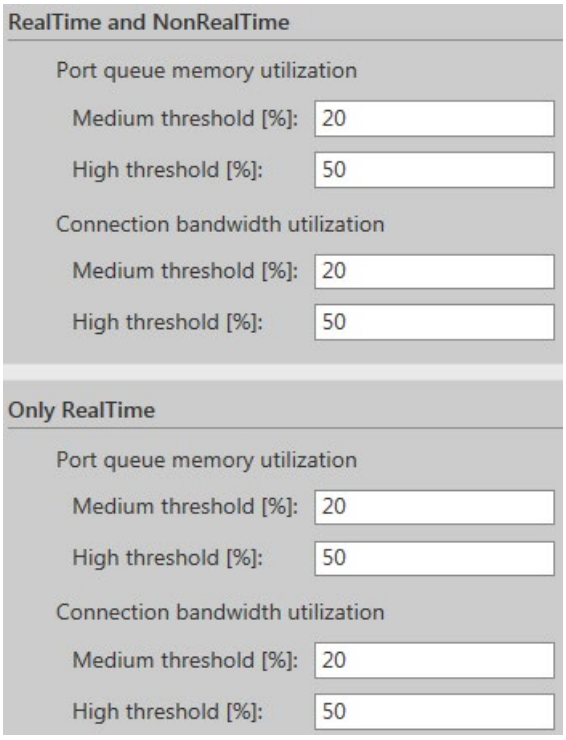
14.1 Setting thresholds

Procedure

To change the limits for the usage of the bandwidth and port utilization, follow these steps:

1. Change to the "Settings" view.
2. Select the "Thresholds" tab.

   SINETPLAN displays the following settings:



3. Make the changes. Please note the following:
   - SINETPLAN supports the analysis of real-time data and the shared analysis of real-time and non-real time data. You can set different limits for two modes.
   - Port queue memory utilization

     You can set the medium and high threshold for use of the queues (buffers) of the ports.

     In order to avoid the data loss, the ports dispose of queues to the buffers of data packets. If the processing speed of the devices is lower than the network data rate, received data packets and data packs to be set are stored temporarily there.

     Buffers are especially important when a lot of data is received in quick succession at the device ports (burst).
   - Average connection bandwidth utilization

     You can set the medium and high threshold for use of the available bandwidth (network capacity) of the connection between the devices.

     The ratio of utilized bandwidth to maximum bandwidth is referred to as traffic load.

Recommended thresholds

If the analysis only takes into consideration real-time data, the PROFINET installation guideline recommends the following thresholds:

- Medium threshold: 20 percent

  If the medium threshold is exceed, we recommend that you check the planned network.

- High threshold: 50 percent

  If the high threshold is exceeded, the traffic load is too high: You must take measures to reduce the traffic load.

  The following measures can reduce the traffic load (see Reducing the traffic load (Page 135)):

  – Shorter lines of IO devices connected in series
  – Additional lines through additional switches
  – Higher update time of the IO data
  – Shorter CPU send clock

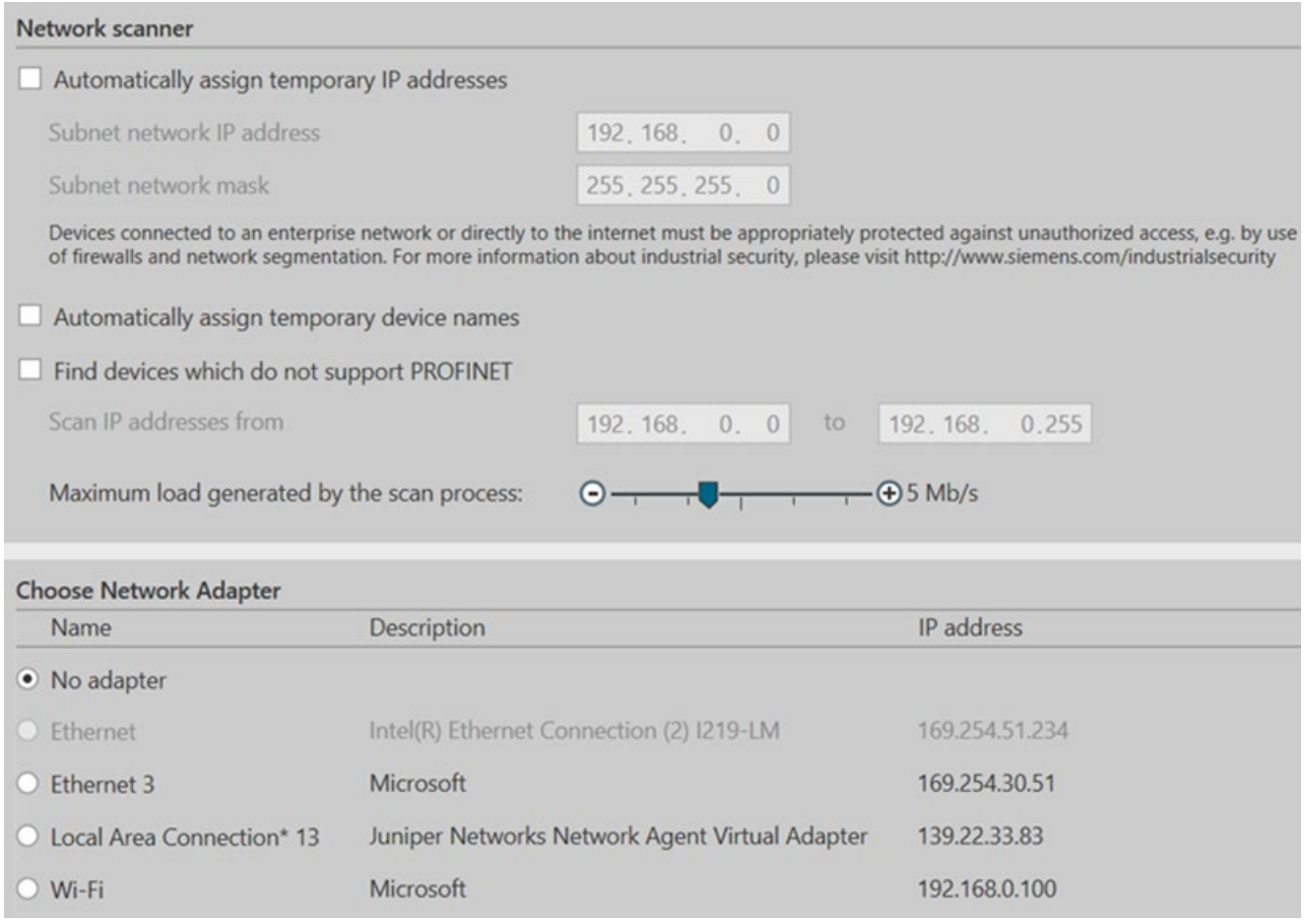
14.2 Settings for Network Scanner

Procedure

To carry out settings for the Network Scanner follow these steps:

1. Select the "Settings" view.
2. Click the "Network Scanner" tab.

   SINETPLAN displays the following settings:



3. Change the settings.

- Observe the following notes in this regard:
  - Automatically assign temporary IP addresses

    If you activate this option, SINETPLAN assigns valid IP addresses to all the devices that were found during the network scan if they do not yet have one.

    The assigned IP addresses are based on the subnet address that is entered in the "Subnet network IP address" field.

    The subnet mask is taken from the setting in the "Subnet network mask".

    When you switch off devices, the assigned IP addresses and/or device names are deleted
  - Automatically assign temporary device names

    If you activate this option, SINETPLAN assigns valid names to all the devices that were found during the network scan if they do not yet have one.
  - Find devices which do not support PROFINET

    Select this check box if SINETPLAN is also to find devices that do not support the PROFINET standard (such as standard Ethernet devices).

    In the process SINETPLAN searches for devices whose IP addresses lie in the range that you enter under "Scan IP addresses from ... to".
  - Maximum load generated by the scan process

    If you scan a network, then SINETPLAN generates an additional traffic load in this Ethernet/PROFINET network.

    The additional traffic load can disturb networks if the traffic load in these networks is already high (low reserves).

    With the slider "Maximum traffic generated by scanner" you have the option to limit the traffic load caused by SINETPLAN when scanning a network.

    Limit the traffic load especially if you scan a network while it is running.

    To limit the traffic load, left-click on the arrow in the slider and move the arrow to the left. Keep the mouse button pressed.

    For very lightly loaded networks, you can increase the speed of the scan by increasing the set value of the slider.

    To increase the scanning speed, left-click on the arrow in the slider and move the arrow to the right.

    SINETPLAN uses the protocol "Discovery and basic Configuration Protocol" (DCP) to scan an Ethernet network.

    During scanning, SINETPLAN sends identify requests to the network participants via DCP. The replies of the network devices can cause high network traffic.
  - Select Network Adapter

    SINETPLAN displays the network adapters that it finds on your computer in this area.

    Click the option button of the network adapter that SINETPLAN is to use during the network scan.

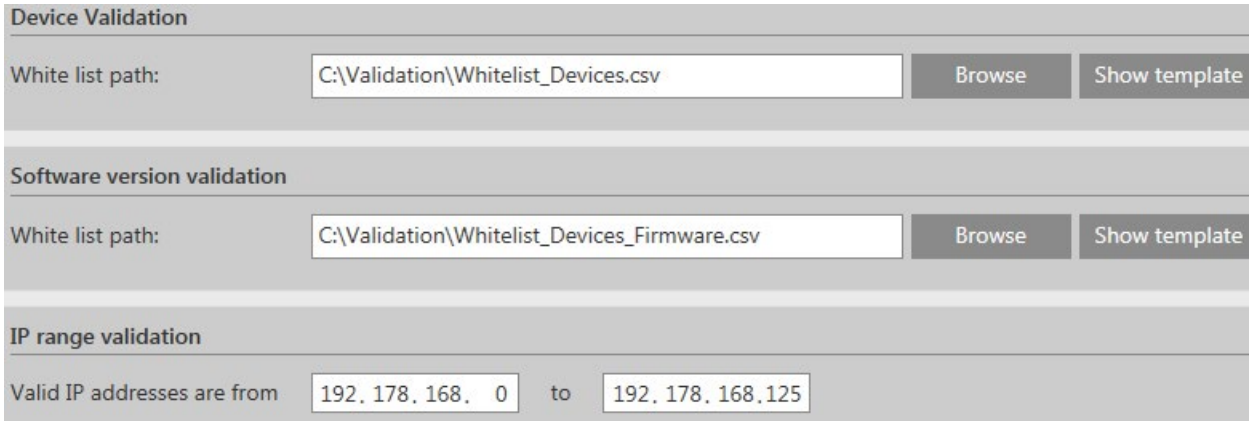
14.3 Settings for validating networks

Procedure

To carry out settings for validation follow these steps:

1. Select the "Settings" view.
2. Click on the "Validation" tab.

   SINETPLAN displays the following settings:



3. Change the settings.

   Please note the following:

   – Device Validation

     Click the "Browse" button to select a CSV file that contains the permitted devices.

     You get a sample for such a file by clicking the "Show template" button.

   – Software version validation

     Click the "Browse" button to select a CSV file that contains the permitted devices with the allowable software versions (firmware versions).

     You get a sample for such a file by clicking the "Show template" button.

   – IP range validation

     Set the permissible range within which the IP addresses of the devices may lie.

     Enter the lowest and highest IP address that may be used in the network.

Validating networks 15

15.1 Checking networks

Are specifications observed?

With SINETPLAN you can check whether the following specifications are observed at a network.

- Device Validation

  A check is made here as to whether only devices permitted in the project are used.

  The permitted devices are contained in a CSV file.

  You set the path to this file under "Settings > Validation > Device Validation".

  A sample for such a file is contained in the installation directory of the Siemens Network Planner, in the "Resources" subdirectory.

  You also obtain this sample by clicking on the "Show template" button in the "Validation" tab (see Settings for validating networks (Page 144)).

- Software version validation

  A check is made here as to whether only permitted software versions (firmware versions) of the permitted devices are used.

  The permitted devices with the valid versions are contained in a CSV file.

  You set the path to this file under "Settings > Validation > Software Version Validation".

  A sample for such a file is contained in the installation directory of the Siemens Network Planner, in the "Resources" subdirectory.

  You also obtain this sample by clicking on the "Show template" button in the "Validation" tab (see Settings for validating networks (Page 144)).

- IP range validation

  Here a check is made as to whether the IP addresses of the devices used are in the range which is set under "Settings > Validation > IP range validation" (see Settings for validating networks (Page 144)).

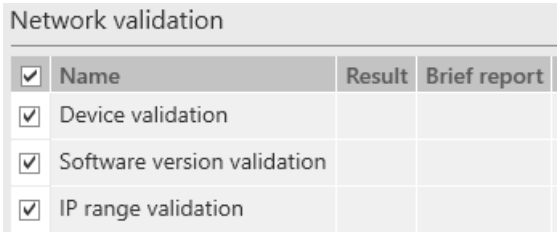
Validating a network

To check a network, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Network constraints validation" icon in the toolbar.

   SINETPLAN shows a list of specifications and rules:

   
   Network validation

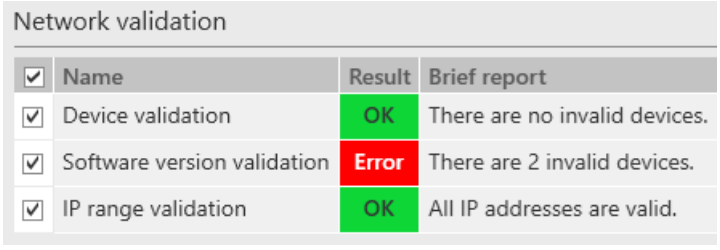
	Name	Result	Brief report
☑	Device validation		
☑	Software version validation		
☑	IP range validation		

3. Select the specifications or rules that SINETPLAN is to use when validating the network.

   To do so, activate the respective check box.

4. Click the "Start" button.

   SINETPLAN now checks the network and displays the result.

   
   Network validation

	Name	Result	Brief report
☑	Device validation	OK	There are no invalid devices.
☑	Software version validation	Error	There are 2 invalid devices.
☑	IP range validation	OK	All IP addresses are valid.

   Result in the example above:

   Errors have occurred in a network validation: Two devices with an invalid firmware version are used. The devices themselves are allowed, however.

Topology details 16

16.1 Overviews and tables

Overviews

SINETPLAN provides the following overviews under "Topology details":

- Device overview

  All the devices and device groups that you use in the current project or in the current group are listed in the "Device overview" tab.

  When you mark devices and device groups in the editor, the devices and device groups have a blue background in the device overview.

- Dataflows

  All the dataflows that you use in the current project or in the current group are listed in the "Dataflows" tab.

- Results

  SINETPLAN lists the results of the network analysis here.

- Information

  SINETPLAN enters log entries about the actions that are currently being carried out, for example "STEP 7 import".

- Pcap dataflows

  If you generate dataflows from capture files, these dataflows are listed in the "Pcap dataflows" tab.

Topology details are arranged in tables. Each row of the table belongs to a device or a device group.

The columns show the individual device parameters. The entries in the columns can be sorted alphanumerically upwards or downwards.

You can also use filters for the tables of the devices, dataflows, and Pcap dataflows.

Sorting entries

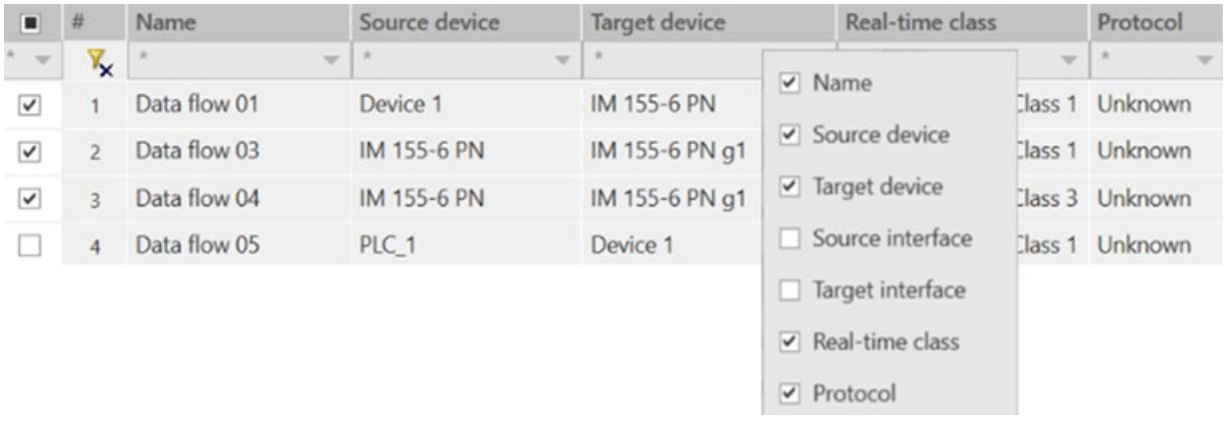
Click in the header of a table column. A white arrow appears. All entries in the list (table) are sorted alphanumerically in ascending order after this column.

When you click in the header of the table column again, the sort order of the entries is reversed.

Adding or removing table columns

Right-click in the header of a table.

A option button with available table columns appears:



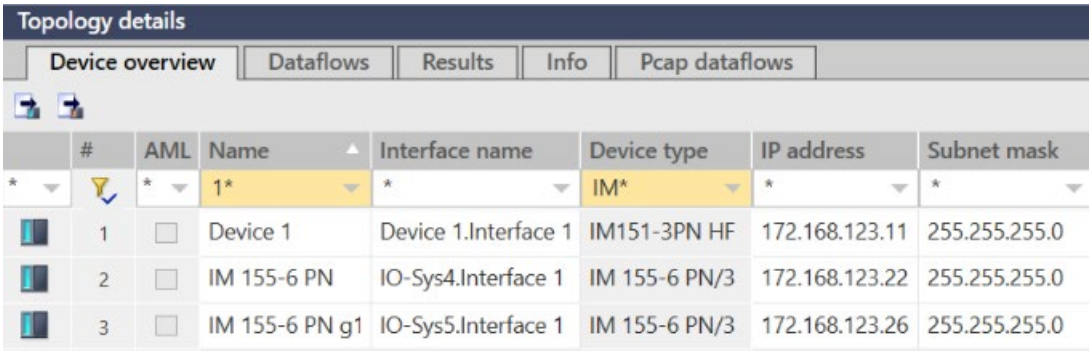
To add the desired column to the table, activate the selection (set the check mark).

To remove the column, deactivate the selection (clear the check mark).

Sorting entries

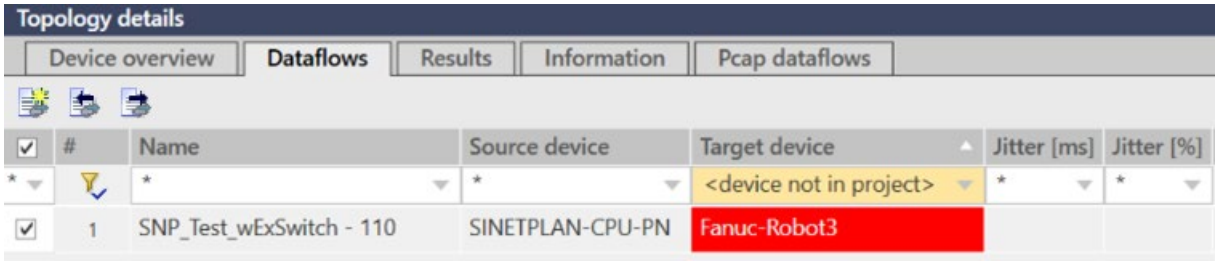
A combination of text filter and count filter is available for the tables of devices, dataflows and Pcap dataflows.

1. In the table of devices, dataflows or Pcap dataflows, click the selection box in the second row of the # column. This activates the filter function in all columns.
2. Filter the entries by column.
   - Select one of the available values.
     If you select <empty> from the drop-down list, the filter finds the rows with an empty field in the selected column.
     This means, for example, that it very quickly finds all dataflows without source or target.
   - Write your search term in the second line of the table instead of the placeholder "*".
3. SINETPLAN shows only the rows where your search term appears in the selected column.
   The field with the search term turns yellow.
4. Use a combination of wildcard and search term as needed (1* in the "Name" column and IO in the "Interface name" column in the example in the figure below):



5. Click in the header of a table column if you want to sort the selected entries. A white arrow appears. All entries of the filtered list are sorted alphanumerically in ascending order after this column.

In the table of dataflows you can also select the search term <device not in project> in the source and target device columns to find the dataflows to devices that do not exist.



16.2 Device overview

Overview of all devices of a project

"Device overview" lists all devices that are contained in the project or in the group currently shown in the topology view.

SINETPLAN adds a line for each device in this list.

Each line contains the following items:

- Number of the line in the device list

  This number is assigned by SINETPLAN and cannot be changed.

- Icons

  SINETPLAN uses the following icons:

  – For groups of devices:

  – For devices that are available in all projects (global devices):

  – For devices that are only available in the current project (project-specific devices):

  – For devices for which no device descriptions exist in SINETPLAN.

  SINETPLAN uses general, generic device descriptions for such devices:

- Name

  The device name.

  You can change the name in the "Edit device" dialog (see "Changing the properties of a device").

- Interface name

  This is the name of the PROFINET/Ethernet interface.

  For devices with more than one PROFINET/Ethernet interface, SINETPLAN uses the device name and the interface name separated by a period, for example, "Device1. Interface1".

  You can change the interface name in the "Edit device" dialog (see "Changing the properties of a device").

- Converted name

  The "Converted name" column displays the converted name for the relevant interface of the PROFINET device. This converted name complies with the DNS conventions for PROFINET devices - just as the name is stored in the PROFINET device and goes "via the line".

  SINETPLAN automatically creates the converted name from the configured name of the PROFINET device interface.

  The converted name only differs from the configured name of the device if the name of the device does not comply with the rules of IEC 61158-6-10.

  Example: The name "device-1.machine-1.plant-1.vendor" is not converted. This procedure facilitates the correct assignment of PROFINET device names.
- Device type
- IP address
- Subnet mask

Selecting a device

You select a device in the device list by clicking the line in which the device is entered.

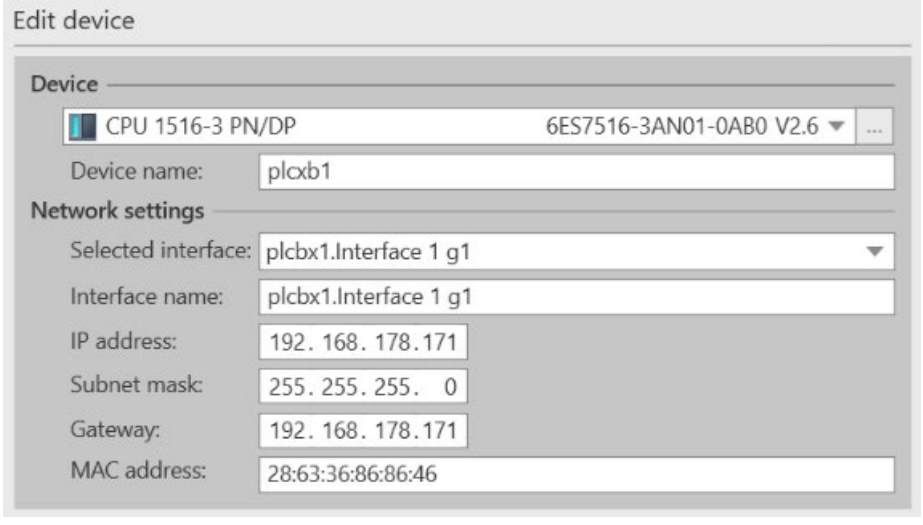
SINETPLAN then shows the topology of the current project or the current group so that the selected device is in the center of the editor. In addition, the selected device is shown with a blue border.

For devices with more than one PROFINET/Ethernet interface, SINETPLAN now shows two (or more) additional lines in which the interface names of this device are entered.

Changing the properties of a device

To change the properties of a device, double-click the line in the device list which the device is entered.

The following dialog is displayed:



The same content is shown in the fields "Selected interface" and "Interface name".

To change the name of the interface, enter the changed name in the "Interface name" field.

For devices with more than one PROFINET/Ethernet interface, follow these steps to change the name of an interface:

1. For "Selected interface" select the interface whose name you want to change.
2. Enter the changed name in the "Interface name" field.

16.3 Exporting a device list

Exporting a device overview to a CSV file

SINETPLAN lists all devices used in the project in the "Device overview" tab.

This overview can be exported as a CSV file.

To do this, follow these steps:

1. Select the "Network analysis" view.
2. Click the "Device overview" tab under "Topology details".
3. To export additional details about the devices, right-click in the table.

   Then select additional columns in the shortcut menu.

   If you deactivate table columns, these details are not exported to the devices.
4. Click the "Export device list" icon:

   The "Export devices" dialog is displayed.
5. There, select the file path for the CSV file to which SINETPLAN should export the device lists.
6. Enter the name of the CSV file.
7. If you do not want to export a device, click the check mark in the appropriate row: The check mark is no longer displayed and the device is not included in the CSV file.
8. Click "Export".

See also

Exporting dataflows (Page 85)

Information about the project 17

17.1 Inserting information about the project

You have the option to enter information for the current project, which is displayed on the cover page of the network project report using the "Create Project Report" function.

Procedure

To insert information about the project follow these steps:

1. Select the "Network analysis" view.
2. Click the "Project information settings" icon in the toolbar.

   The following dialog opens:

3. Fill in the text boxes of the dialog.
   - Project name

     Enter a unique name for the project.
   - Description:

     Add additional information about the project, e.g. project source (STEP 7, TIA Portal or AML).
   - System supplier:

     Enter the organization and contact of the system supplier, if relevant.
   - Plant designation, plant:

     Enter the designation and additional information for the plant that represents the project.
   - Hall, plant, station:

     Enter information about the location and positioning of the plant.
   - Comments:

     Add additional information and notes about the project.
   - Author, company name, company logo, contact details:

     Add your data as author and contact person for the project.
4. Close the dialog box with "OK".

Project reports

18

18.1 Generating reports

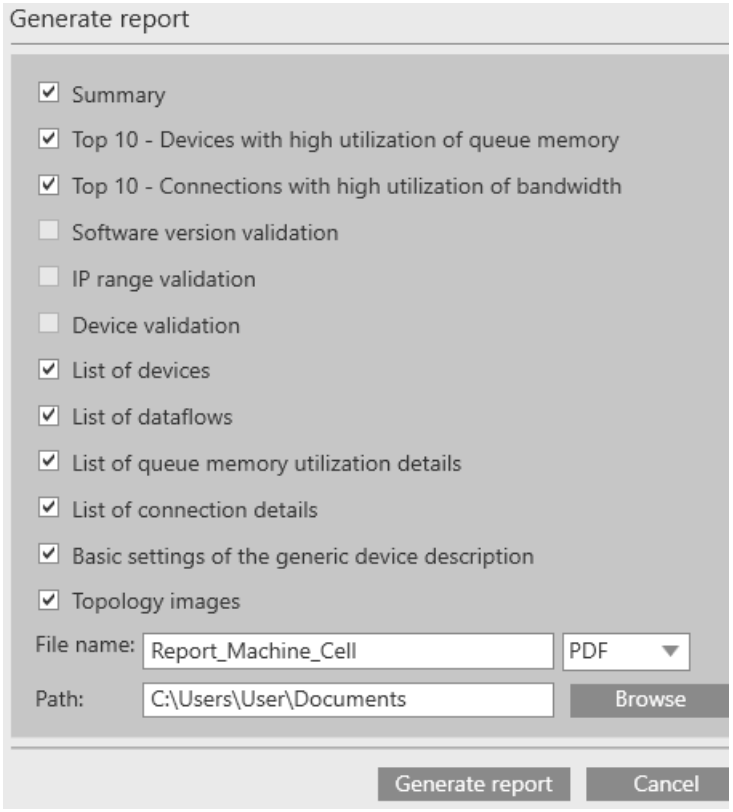
Generating reports

You can have a wide range of information about the current project output with SINETPLAN.

To generate a project report follow these steps:

1. Select the "Network analysis" view.
2. Click the "Generate report" icon in the toolbar.

The following dialog is displayed:



3. You can select or clear the available options for the report.

   The options available for the report are already selected.

   Options with grayed-out check boxes are not available in the current project.

   In the example above the option "IP range validation" is not available because this validation has not yet been carried out in the project. Therefore, there are no results that can be output.
4. You can accept the suggested directory name or enter a different name.
5. Select the format of the report (PDF or XML).
6. Click the "Browse" button to select the directory in which the project report is to be stored.
7. Click the "Generate report" button to generate a report.

19 Project image

19.1 Generating a project image

Creating network images

You can generate an image of the topology of a project or of a device group.

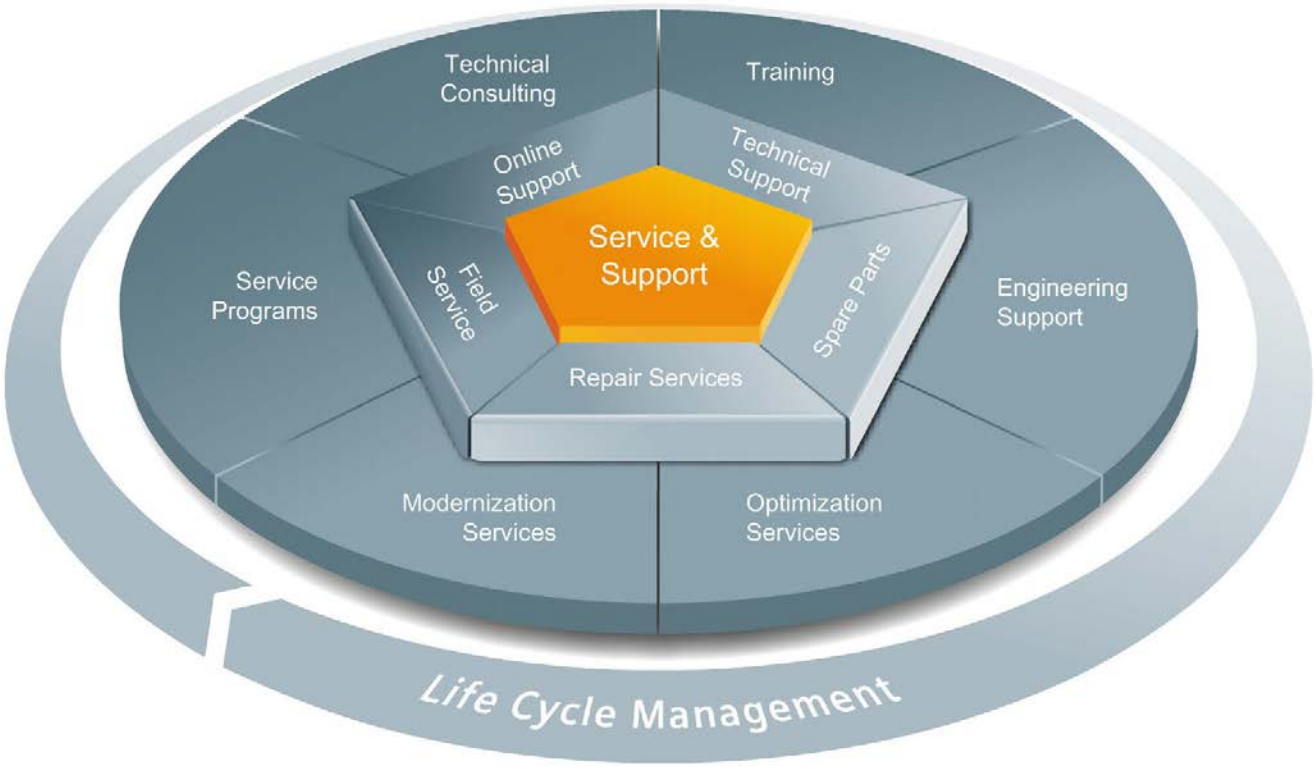
Follow these steps:

1. Select the "Network analysis" view.
2. Select the project or the device group of which you want to create an image.
   To this purpose click the tab of the project or of the device group.
3. Click the "Save topology as picture" icon in the toolbar.

   SINETPLAN now displays a dialog for saving the image file.
4. Select the directory.
5. Enter a name for the file.
6. Select the file type. The following file formats are possible:
   - PNG (*.png)
   - Bitmap (*.bmp)
   - XML Paper Specification (*.xps)
7. Click the "Save" button.

Service & Support



The unmatched complete service for the entire life cycle

For machine constructors, solution providers and plant operators: The service offering from Siemens Industry Automation and Drive Technologies includes comprehensive services for a wide range of different users in all sectors of the manufacturing and process industry.

To accompany our products and systems, we offer integrated and structured services that provide valuable support in every phase of the life cycle of your machine or plant – from planning and implementation through commissioning as far as maintenance and modernization.

Our Service & Support accompanies you worldwide in all matters concerning automation and drive technology from Siemens. We provide direct on-site support in more than 100 countries through all phases of the life cycle of your machines and plants.

You have an experienced team of specialists at your side to provide active support and bundled know-how. Regular training courses and intensive contact among our employees – even across continents – ensure reliable service in the most diverse areas

Online Support

The comprehensive online information platform supports you in all aspects of our Service & Support at any time and from any location in the world.

You can find Online Support on the Internet at the following address: Internet (http://www.siemens.com/automation/service&support).

Technical Consulting

Support in planning and designing your project: From detailed actual-state analysis, definition of the goal and consultation on product and system questions right through to the creation of the automation solution.

Technical Support

Expert advice on technical questions with a wide range of demand-optimized services for all our products and systems.

You can find Technical Support on the Internet at the following address: Internet (http://www.siemens.com/automation/support-request).

Training

Extend your competitive edge – through practical know-how directly from the manufacturer.

You can find the training courses we offer on the Internet at the following address: Internet (http://www.siemens.com/sitrain).

Engineering Support

Support during project engineering and development with services fine-tuned to your requirements, from configuration through to implementation of an automation project.

Field Service

Our Field Service offers you services for commissioning and maintenance – to ensure that your machines and plants are always available.

Spare parts

In every sector worldwide, plants and systems are required to operate with constantly increasing reliability. We will provide you with the support you need to prevent a standstill from occurring in the first place: with a worldwide network and optimum logistics chains.

Repairs

Downtimes cause problems in the plant as well as unnecessary costs. We can help you to reduce both to a minimum – with our worldwide repair facilities.

Optimization

During the service life of machines and plants, there is often a great potential for increasing productivity or reducing costs.

To help you achieve this potential, we are offering a complete range of optimization services.

Modernization

You can also rely on our support when it comes to modernization – with comprehensive services from the planning phase all the way to commissioning.

Service programs

Our service programs are selected service packages for an automation and drives system or product group. The individual services are coordinated with each other to ensure smooth coverage of the entire life cycle and support optimum use of your products and systems.

The services of a Service Program can be flexibly adapted at any time and used separately.

Examples of service programs:

- Service contracts
- Plant IT Security Services
- Life Cycle Services for Drive Engineering
- SIMATIC PCS 7 Life Cycle Services
- SINUMERIK Manufacturing Excellence
- SIMATIC Remote Support Services

Advantages at a glance:

- Reduced downtimes for increased productivity
- Optimized maintenance costs due to a tailored scope of services
- Costs that can be calculated and therefore planned
- Service reliability due to guaranteed response times and spare part delivery times
- Customer service personnel will be supported and relieved of additional tasks
- Comprehensive service from a single source, fewer interfaces and greater expertise

Contact

At your service locally, around the globe: your partner for consultation, sales, training, service, support, spare parts... for the entire range of products supplied by Industry Automation and Drive Technologies.

You will find your personal contact in our contacts database at: Internet (http://www.siemens.com/automation/partner).

Appendix

B

B.1 Manually configuring the export from STEP 7

Setting Classic registry keys for STEP 7

During the installation of SINETPLAN STEP 7 is configured automatically so that STEP 7 stores important data for SINETPLAN (devices of a configuration, dataflows, topology) into the STEP 7 project directory.

If STEP 7 Classic is installed on a different computer, you must set the export of important project data from STEP 7 manually on the other computer.

Several options are available.

The following description shows how you can enter specific values for STEP 7 in the Windows registry.

Attention: Only set the registry keys yourself if you dispose of expert knowledge.

Configuring STEP 7 with the registry editor

To configure STEP 7 with the registry editor follow these steps:

1. Determine whether you use a 32- or 64-bit operating system on the computer on which STEP 7 is run (example for Windows 7):
   - Click "Start".
   - Right-click "Computer".
   - Click "Properties".
   - The "System type" is then displayed under "System".
2. Call the registry editor.
   - Click "Start".
   - Enter "regedit" in the search box.
   - Click "regedit.exe" in the list of results.

3. Add the following entries to the Windows registry database:
   - EXPORT_SLC_OUTPUT
   - EXPORT_SLC_OUTPUT_V2

   Use the "REG_DWORD" data type for the entries and set the value to 0x00000001 (1) each time.

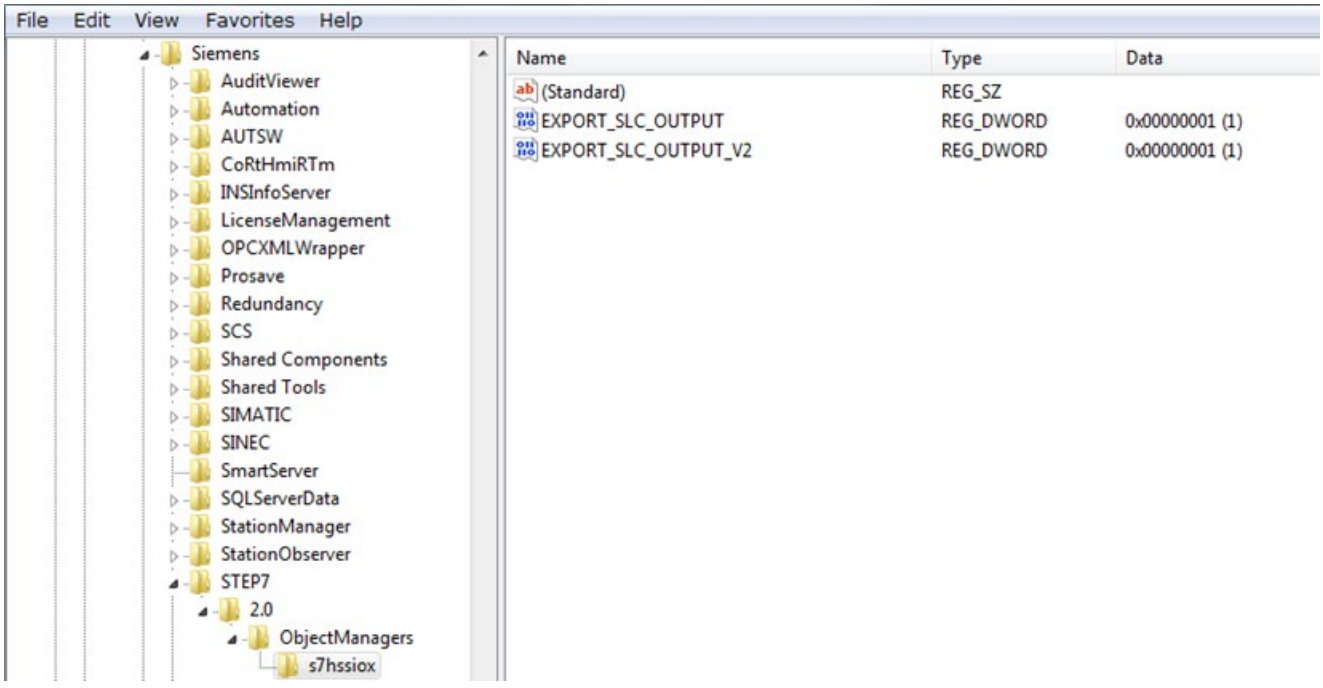
   For a **32-bit operating system** add the entries under

   HKEY_LOCAL_MACHINE\SOFTWARE\Siemens\STEP7\2.0\ObjectManagers\s7hssiox

   For a **64-bit operating system** add the entries under

   HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Siemens\STEP7\2.0\ObjectManagers\s7hssiox

   The figure below shows the entries:



4. Restart STEP 7.

   The registry keys do not come into force until STEP 7 has been restarted.

   STEP 7 only evaluates the registry keys during a program start.

   Therefore you have to restart STEP 7 after the entries have been set.

B.2 Exporting dataflows and topology from STEP 7

Exporting data for SINETPLAN from STEP 7

Proceed as follows to export information for SINETPLAN (devices in a configuration, topology and dataflows) from STEP 7:

1. Check to make sure that the export of this information is enabled.

   The export of information from STEP 7 has to be configured (see Manually configuring the export from STEP 7 (Page 162)).

2. Open the project in STEP 7 Classic.
3. Open the hardware configuration of the project in HW Config.
4. Open the topology editor (right-click the PROFINET line, then click "PROFINET IO Topology").
5. Close the topology editor once again (click "OK").

   A dialog is displayed.

6. In the dialog, click "Yes" to apply the changed data.

   The topology editor now saves the project topology in the "topology.xml" file in the "Global" directory in the main directory of the project.

7. Save and compile the project in HW Config.

   HW Config now adds several XML files to the main directory of the project which include information on the dataflows.

8. Close HW Config.

Index

A

Adding devices to a project, 14
Analysis, 131
Analyzing a PROFINET network, 131
Analyzing topology, 131
Average data rate, 79

B

Bandwidth, 140
Broadcast transmission, 78
Burst, 79, 83

C

Color scheme, 19
Color scheme of the data packet, 12
Copying device, 48
Creating a dataflow, 49
Creating a device description, 106
Creating dataflow templates, 90
Creating network images, 158

D

Data packets, 19
Dataflow, 49, 78, 79, 85
Dataflow source, 49
Dataflow target, 49
Dataflow template, 82, 89, 90
Dataflow template, 82, 89, 90
Dataflows, 78
Dataflows overview, 52, 147
Device catalog, 14, 118
Device description, 106, 114
Device group, 126
Device ID, 106, (See device ID)
Device overview, 52, 147
Direct import, 63

E

Environment, 138
Export, 57, 85, 152
Export from STEP 7, 10
Exporting a device overview to a CSV file, 57, 152
Exporting dataflows to a CSV file, 85

F

File directory for dataflow templates, 90
File directory for device descriptions, 106
File directory for groups, 126

G

Generating a project image, 158
Generating reports, 156
Group, (See Device group)

H

Home page
    User interface, 33

I

Import, 63, 63, 64
Importing dataflow templates, 89
Indirect import, 64
Information, 52, 147

J

Jitter, 133

L

Language, 138
License types, 31
Line depth, 133

M

Main entry, 90
Maximum packet size, 79, 83
Maximum packet size, 79, 83
Microsoft-Framework .NET 4.5, 30
Move, 48

Multicast transmission, 78

N

Network adapter, 142
Network analysis, 16, 19
    User interface, 33
Network rules, 145
Network Scanner, 36, 142

O

Operating systems, 30

P

Pcap dataflows, 52, 147
Port, 46
Port utilization, 140
PROFIBUS, 71
Project information, 154

R

Reading in a network, 77
Real-time class, 83
Reg file, 61
Rules, 145

S

Saving dataflow template globally, 93
Scanning, 75
Scanning a network, 77
Scanning networks, 75
Scheme, 114
Search, 50, 118
Search function, 50, 118
Setting the bandwidth, 18
Setting the port buffer, 18
Setting thresholds, 18
Settings, 36, 138, 142
    User interface, 33
Simulation, 8
Specifications, 145
Start port, 46
STEP 7, 59, 60, 61

T

Target port, 46
Temporary device names, 142
Temporary IP addresses, 142
Threshold, 19
Thresholds, 36, 140
TIA Portal, 63, 63, 64
Topology image, 158
Transmission type, 82

U

Unicast transmission, 78
Update time, 133
User, 138
User information, 154

V

Validating, 145
Validating networks, 145

W

Windows 10
    Subentry, 30
Windows 7
    Subentry, 30
WinPcap, 30
Wiring, 46
Worst case, 8
Worst-case scenarios, 8

X

XML, 114
XML file, 64