SIEMENS

SIMATIC

Component based Automation Configuring Plants with SIMATIC iMap

Manual

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Safety Guidelines

This manual contains notices intended to ensure personal safety, as well as to protect the products and connected equipment against damage. These notices are highlighted by the symbols shown below and graded according to severity by the following texts:

Danger
indicates that death, severe personal injury or substantial property damage will result if proper precautions are not taken.

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We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

Preface

Purpose of the manual

This manual provides support for the configuration and commissioning of plants using SIMATIC iMap.

It is directed towards project engineers working in the field of configuration, commissioning and servicing automation systems with component based automation..

We recommend you read the documentation, "Getting Started with SIMATIC iMap". It will help to introduce you to working with SIMATIC iMap.

Required knowledge

To understand the manual, you require general experience in the field of automation engineering.

In addition, you are required to have a good working knowledge of computers or other equipment similar to PCs (e.g. programming devices) under the operating systems Windows 2000 or Windows XP. Since SIMATIC iMap is based on the basic STEP 7 software when SIMATIC devices are used, you should have knowledge about operating this basis software as described in the manual, "Programming with STEP 7 V5.2".

Validity of the Manual

This manual is valid for the software package SIMATIC iMap V2.0.

What is new in SIMATIC iMap V2.0?

- Structures as a data type for connectors – Chap. 1.3
- Optimized display of the Industrial Ethernet in the network view – Chap. 3.4.3
- Display of additional information in the project view – Chap. 3.4.4
- Specialized display of message in several tabs of the information window – Chap. 3.4.10
- Improved data storage with the project library – Chap. 4.3.1
- Cyclic data transmission between PROFInet communication participants – Chap. 4.4.3.4
- Project-wide setting of interconnection properties – Chap. 4.4.3.4
- Checking the load on devices – Chap. 4.5.6
- Creating cross-project interconnections – Chap. 4.6.3
- Improved editing options for PROFInet components in the libraries. – Chap. 4.7.1
- Replacing instances – Chap. 4.7.2
- Querying runtime information using online device analysis – Chap. 5.10
- Unique OPC path over several projects – Chap. 5.11.1
- Singleton components – Chap. 6.2
- PROFInet components with HMI sections – Chap. 6.3

Your guide through the manual

The following manual is divided into the following topic areas:

- Chapter 1 provides an overview of the overall concept and the product range of component based automation.
- Chapter 2 describes the installation of the software
- Chapters 3 to 6 describe working with SIMATIC iMap
- The appendix contains a summary of the control elements for your reference.
- The glossary contains explanations of important terms.
- The index helps you to quickly find textual information on important keywords.

Its place in the information environment

This manual is part of the SIMATIC iMap documentation package. The documentation is supplied with the software and includes the electronic manuals in PDF format:

- Getting started with SIMATIC iMap
  Brief introduction to working with component based automation and SIMATIC iMap.
- Configuring Plants with SIMATIC iMap – this manual
  Contains detailed information and instructions about configuration and commissioning of plants using SIMATIC iMap.
- Creating PROFInet Components
  Contains detailed information and instructions about creating PROFInet components with STEP 7 and the use of SIMATIC devices in component based automation.
- Commissioning the System, Tutorial
  Contains detailed information and step-by-step instructions using examples, from the creation of PROFInet components to commissioning of the complete plant.

In addition, the entire documentation is available as an HTML basic help in SIMATIC iMap.

References

The following section provides references to information for carrying out the following tasks:

- Creating PROFInet components with STEP 7
- Configuring plants with SIMATIC iMap
- Commissioning plants with SIMATIC iMap

The following table provides a "thread" through all manuals about component based automation and SIMATIC iMap. The chapters are listed in the order required for performing the task.

References for Creating PROFInet Components with STEP 7

Target group: Plant and machine engineers

Manual	Chapter		Title
	Required	Optional	
Getting Started with SIMATIC iMap		1	Getting Started - Introduction
		2	Step 1: Defining PROFInet components
		3	Step 2: Creating PROFInet components with STEP 7
Creating PROFInet Components	1.1		Basic procedure
	1.3		Creating the project with STEP 7
	1.4.1		Properties of PROFInet interfaces
		1.4.2	Using the PROFInet interface editor
	1.4.3		Creating PROFInet interface
		1.4.4	Changing PROFInet interfaces
	1.6.1		Creating PROFInet components in SIMATIC Manager
		1.7	Importing PROFInet components to a library
		1.8	Modifying PROFInet components
		2	SIMATIC devices as PROFInet components
Commissioning Systems, Tutorial		2	Part 1: Creating PROFInet components

References for Configuring Plants Using SIMATIC iMap

Target group: Plant designers

Manual	Chapter		Title
	Required	**Optional**	
Getting Started with SIMATIC iMap		1	Getting Started - Introduction
		4	Steps 3 to 6: Configuring a plant with SIMATIC iMap
Configuring plants with SIMATIC iMap		1	Component based Automation - Overview
	2		Installing SIMATIC iMap
	3.1		Starting SIMATIC iMap
		3.3	Operating philosophy
	4.1		Basic procedure for configuring the plant
	4.2.1		Creating a new project
	4.2.2		Opening and closing projects
	4.3.2		Creating a new library
	4.3.3		Opening and closing libraries
	4.3.4		Importing PROFInet components
	4.4.1		Inserting PROFInet components into a SIMATIC iMap project
	4.4.2		Coupling devices in the net view
	4.5.3		Assigning addresses
	4.4.3		Interconnecting technological functions
		4.5.1	Looking up and modifying properties
	4.5.6		Checking the utilization
		4.6.1	Creating subordinate charts
		4.7	Working with modified PROFInet components
		4.7.2	Replacing instances
	4.2.4		Generating the project
		4.2.5	Documenting and printing a project
	4.2.3		Saving and archiving projects
		4.3.6	Archiving and retrieving libraries
		5.11.1	Creating OPC symbol files
Commissioning Systems, Tutorial		3.3.2	Step 3: Configuring Machine 1 with SIMATIC iMap
		3.4.2	Step 3: Configuring Machine 2 with SIMATIC iMap
		3.5.2	Step 3: Configuring Machine 3 with SIMATIC iMap

References for Commissioning Plants Using SIMATIC iMap

Target group: Plant operators

Manual	Chapter		Title
	Required	Optional	
Getting Started with SIMATIC iMap		1	Getting Started - Introduction
		5	Step 7: Generating and Download
		6	Step 8: Diagnostics
		7	Step 9: Visualizing Process Data
Anlagen projektieren mit SIMATIC iMap	2		Installing SIMATIC iMap
	3.1		Starting SIMATIC iMap
		3	Working with SIMATIC iMap
		4	Configuring plants
	5.1		Basic procedure for commissioning
		5.2	Overview of the online functions
	5.3		Downloading Programs and Interconnections
	5.4		Diagnostic information in the online view t
	5.5		Diagnosing PROFInet components
	5.6		Checking the accessiblity of the devices
	5.7		Comparing online and offline data
	5.8		Displaying and setting online values in the plant view
	5.9		Online testing with the variable table
		5.10	Online device analysis
	5.12.1		Special features of plants with SIMATIC devices
	5.12.2		Using SIMATIC devices in online mode
		5.12.3	Editing instances with STEP 7
Commissioning Systems, Tutorial		3	Part 2: Commissioning the system

Conventions

Menu commands are written in bold letters, for example: **Project> Save**.

Placeholders are set in angle brackets, for example <File name>.

Further support

Please contact your local SIEMENS partner if you have any further queries on the products described in this manual.

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http://www.ad.siemens.de/cba/

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- your appropriate documentation via our Service & Support search engine
- a forum for the exchange of information between users and specialists worldwide
- your local Automation & Drives partner via our partner database.
- information on repairs, replacement parts and on-site service. You will find more information under "Services“.

Contents

Figures

Tables

Component based Automation - Overview

1

1.1 New automation concept with Component based Automation

What is Component based Automation?

As part of Totally Integrated Automation (TIA), Component based Automation is an automation concept for implementing modular, distributed applications based on the open PROFInet standard. It allows a distributed automation package to be created using off-the-shelf components and partial solutions. This concept meets the demand for increased modularization in the field of plant and machine construction by extensively distributing the intelligent processing required.

The following diagrams show how automation packages are transformed by Component based Automation.

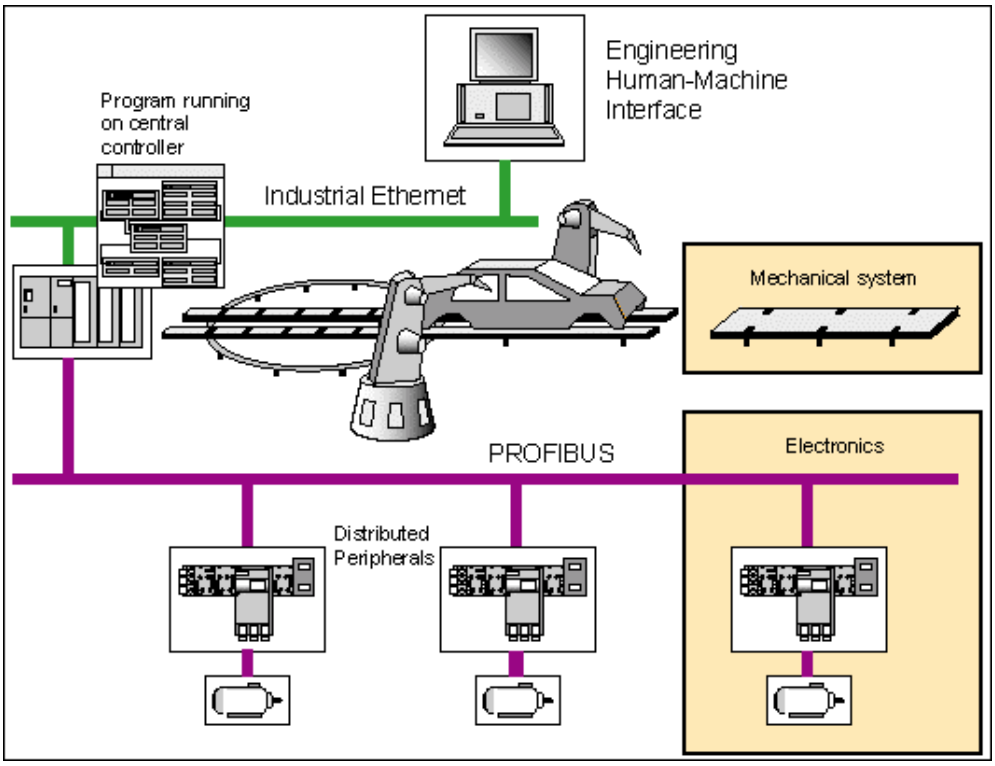


Figure 1-1 The old automation concept with a modular plant structure

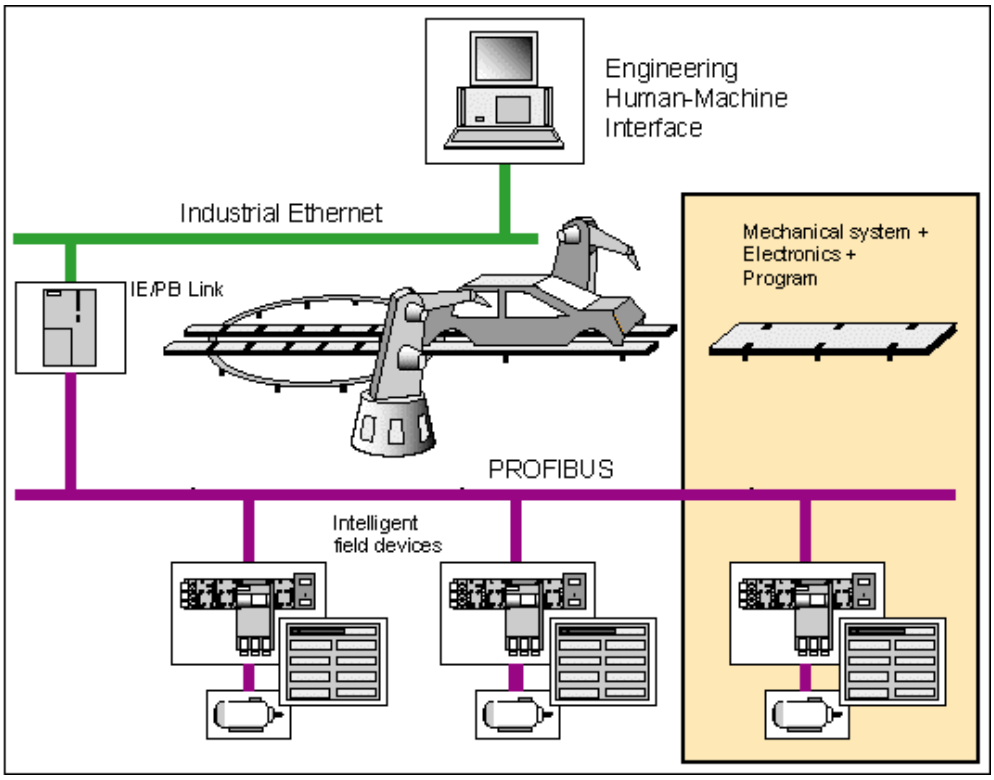


Figure 1-2 New: A modular concept with distributed intelligence

Component based Automation allows complete technological modules to be used as standardized automation components **- known as PROFInet components** - in large-scale plants.

Component based Automation is implemented by using the PROFInet standard for programmable controllers and through the use of suitable engineering tools, such as SIMATIC iMap.

What is PROFInet ?

PROFInet is the Ethernet-based automation standard issued by the PROFIBUS Nutzerorganisation e.V. (PNO). The PROFInet standard defines a cross-vendor communication, automation and engineering model.

PROFINet has the following objectives:

- Open, distributed automation
- Standardized communication via field bus and Ethernet
- Use of open IT standards.

PROFInet specifies the functions for implementing an integrated automation package, from installation of the network right through to web-based diagnostics. The modular structure means the PROFInet can be very easily upgraded with additional functions in the future.

Use of PROFInet with Industrial Ethernet and PROFIBUS

The following diagram illustrates the types of network that are supported for Component based Automation with PROFInet: Industrial Ethernet and PROFIBUS.

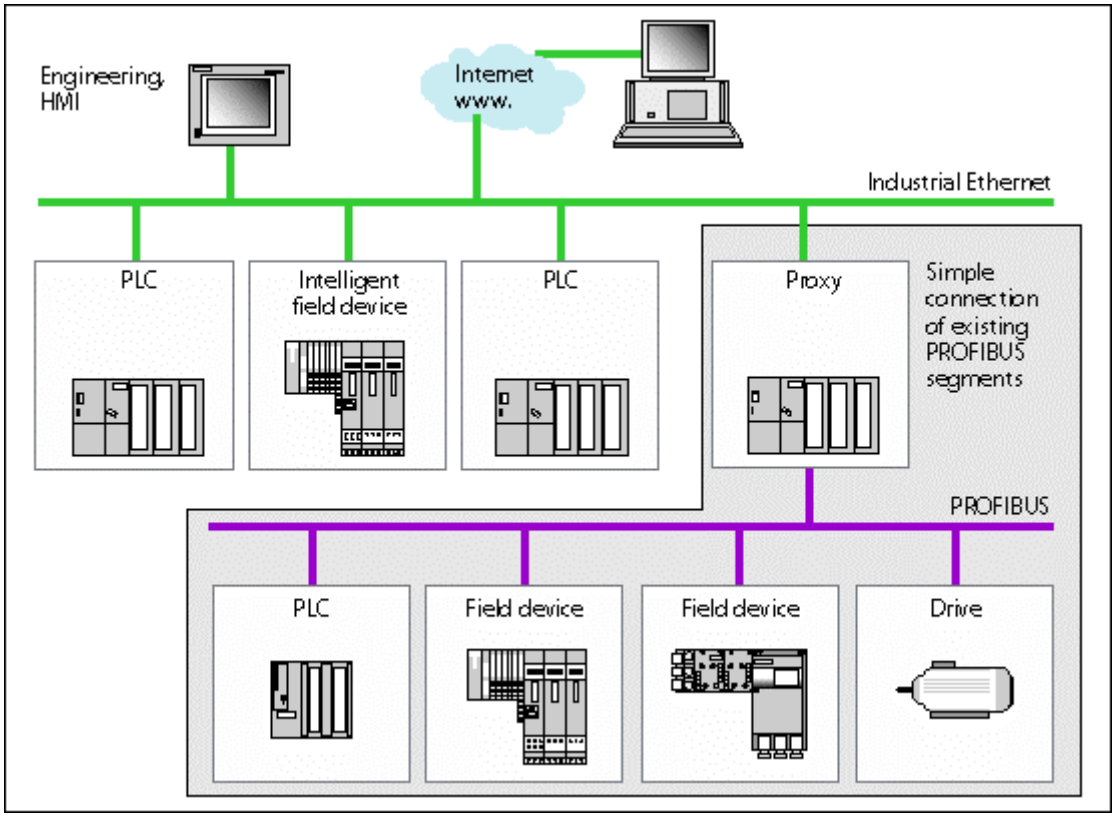


Figure 1-3 Supported network types: Industrial Ethernet and PROFIBUS

The PROFInet communication takes place via Industrial Ethernet. The following transmission modes are supported:

- Acyclical transmission of engineering data and non time-critical data
- Cyclical transmission of time-critical process data.

Existing PROFIBUS systems can easily be incorporated into PROFInet communication using the proxy concept, whereby the proxy represents the PROFIBUS devices on the Ethernet.

What is SIMATIC iMap?

PROFInet provides a standardized, vendor-independent engineering interface. It allows devices and components from different vendors to be easily integrated into a plant.

SIMATIC iMap is such a cross-vendor engineering tool for configuring PROFInet applications. It brings together distributed automation applications in a graphical format so that they can be displayed for the entire plant. All the PROFInet components needed are provided in a standardized format in the form of library elements. The communication links between devices are not programmed. Instead they are configured in graphical format as interconnection lines.

SIMATIC iMap can download the contents of PROFInet components and the associated interconnections to the devices in the plant. During commissioning and while the plant is in operation, you can use SIMATIC iMap to look up process data and diagnostic data concerning the devices as well as modify parameters and project data for testing purposes.

Vendor-specific programming and configuration tools may be integrated into SIMATIC iMap.

Product range

The product range for Component based Automation based on the PROFInet standard comprises:

- PROFInet devices that conform to the PROFInet specification, e.g. the SIMATIC devices CPU 317-2 PN/DP and IE/PB Link.
- SIMATIC iMap, the engineering tool for Component based Automation for configuring plants and linking to vendor-specific programming, configuration and diagnostic tools.

In addition, many existing automation and field devices from different vendors can also be used as PROFInet components.

As part of the PNO's work, a specification was drawn up for the communication mechanisms and the engineering model. This allows further devices to be made PROFInet-compliant and the associated configuration and programming tools to be linked into SIMATIC iMap.

1.2 PROFInet components

What are PROFInet components?

The mechanical, electrical and electronic parts of a programmable controller that perform a specific technological function within the automation system or production process, combined with the associated control program, form an independent technological submodule. If this technological submodule meets the communication requirements of the PROFInet standard, then it can be used to create a PROFInet component.

The concept is based on the Microsoft component model, which is the commonly-used data and communication model for the Windows PC world. It defines the protocol for exchanging data between software components from different vendors.

In Component based Automation, all the functionality of a technological module is encapsulated in a single component. A PROFInet component is the mapping of a technological module - i.e. an automation unit with defined functionality - in the PROFInet specification. PROFInet components are modular and thus can be easily assembled and reused, greatly simplifying the process of configuring an automation system.

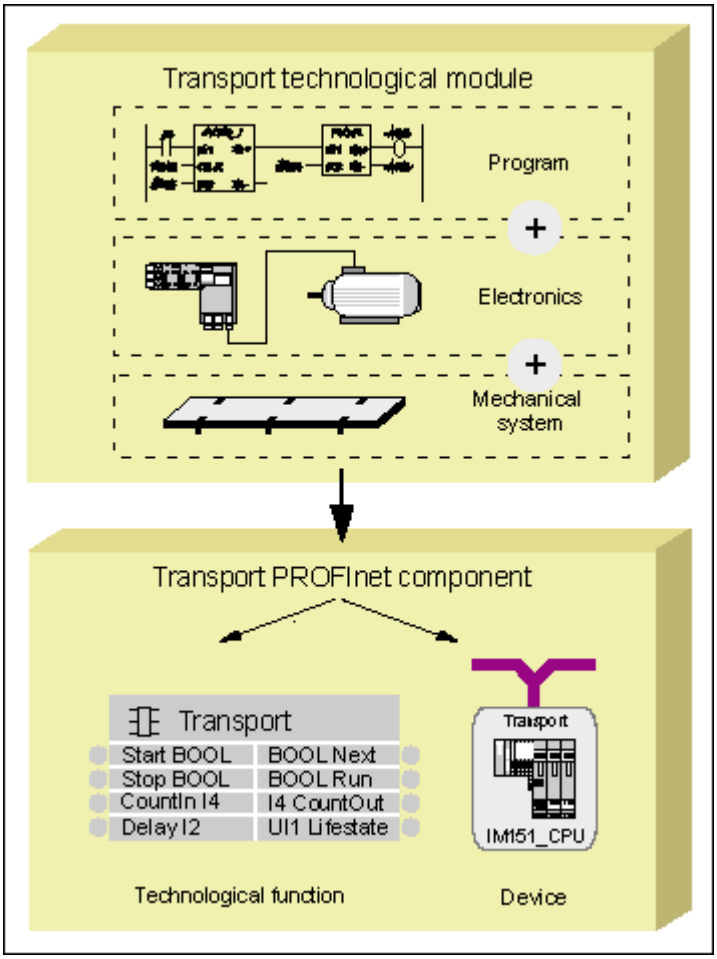


Figure 1-4 Creating a PROFInet component from a technological submodule

A PROFInet component incorporates all the hardware configuration data, the module parameters and the associated user program. The PROFInet component is made up of:

- an (optional) technological (software) function and
- the associated device.

The technological function of the component comprises the interface to other PROFInet components in the form of interconnectable inputs and outputs.

The device is the representation of the physical programmable controller or field device, including any peripheral devices, sensors and actuators, the mechanical system and the device's firmware.

How are PROFInet components created?

The programmable controller or field device of the PROFInet component is configured and programmed using the configuration and programming tool supplied by the device manufacturer. A PROFInet component is then created from the configuration of the programmable controller and its user program, e.g. using a menu command. The device's functionality is also encapsulated with the application-specific programs. From the outside, only the component interfaces that are needed for interaction across a machine or plant or for diagnostics, visualization and vertical integration are accessible.

The component interface of the PROFInet component is written in XML (Extended Markup Language) and is stored in a PCD (PROFInet Component Description) file. XML allows you to display information in a platform and vendor-independent format. A specification of the PCD file structure is given in the PROFInet engineering model.

The PROFInet component can incorporate information on the hardware configuration and on the user program, if necessary, in a device specific form.

Properties of PROFInet components

- Modularization and reusability

  The concept of the PROFInet component allows extensive modularization of automation systems. PROFInet components can be reused as often as necessary in different automation systems.

- Constant communication by support for the PROFInet specification

  Each PROFInet component provides a standardized interface for communicating with other components on the Ethernet or PROFIBUS, regardless of its internal functionality. The PROFInet specification describes the open communication interface for PROFInet-compliant devices.

- Cross-vendor engineering

  The technological functions of individual devices are programmed in the vendor-specific engineering tools. However, cross-vendor engineering tools such as SIMATIC iMap are used for the plant-wide interconnection of technological functions, since they allow products from different vendors to be incorporated into PROFInet communication. Thus, all field device and programmable controller vendors have to do is extend their programming and configuration tools to allow them to be linked to the device-neutral engineering tool (e.g. SIMATIC iMap).

Programmable and Fixed functionality

In an intelligent device, the application-specific functionality is defined by the user program that is downloaded to the device. More simple devices, such as drives or field devices, do not have their own user programs. The functionality of such devices is integrated into the firmware. We therefore differentiate between PROFInet components

- with programmable functionality

  The component has its own user program that can be downloaded from SIMATIC iMap to the device.

- with fixed functionality

  The component does not have its own user program.

Representation of PROFInet components

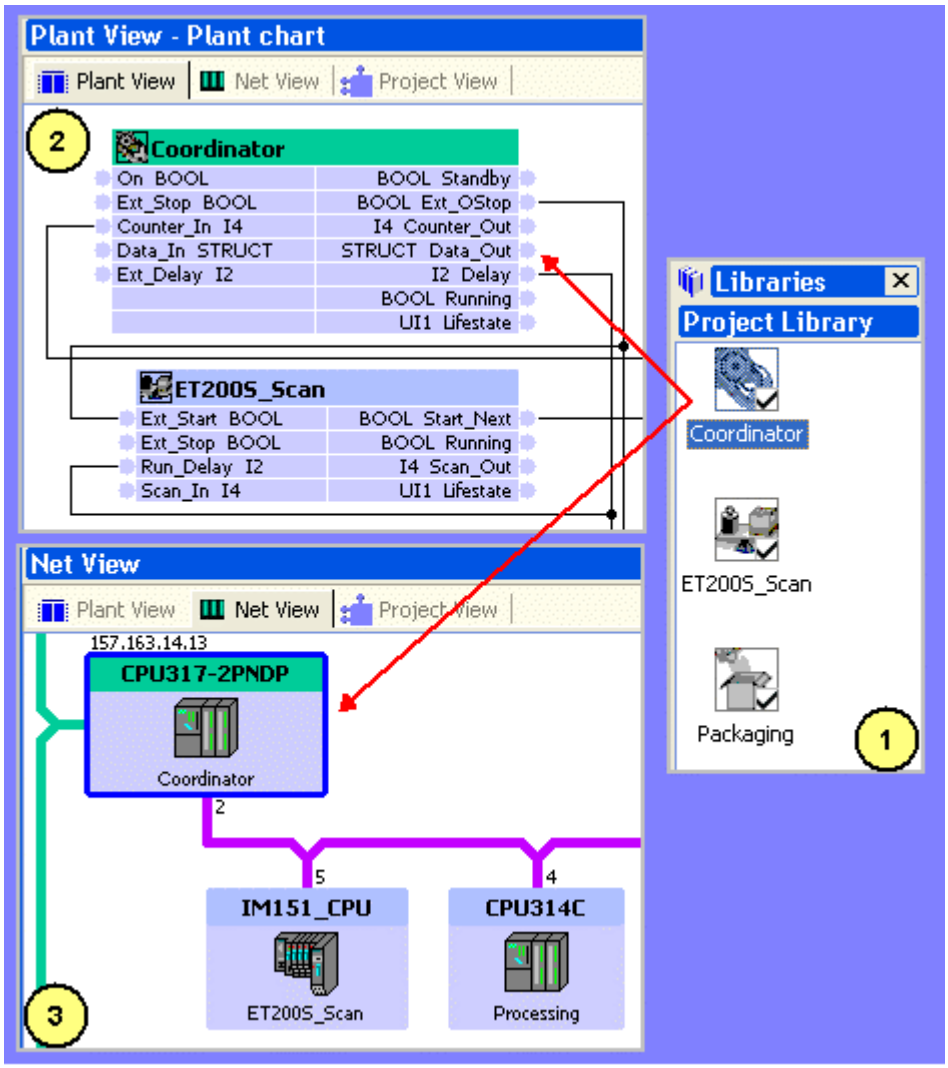


Figure 1-5 Representation of a PROFInet component in SIMATIC iMap

SIMATIC iMap represents PROFInet components in different ways:

- As part of a library (window 1), the PROFInet components are represented by a separate icon.
- In a SIMATIC iMap project, the instances of each PROFInet component are represented in different views: the technological functions in the plant view (window 2) and the devices in the net view (window 3).
- The assignment of PROFInet components to the associated instances is represented in the project view (see diagram below).

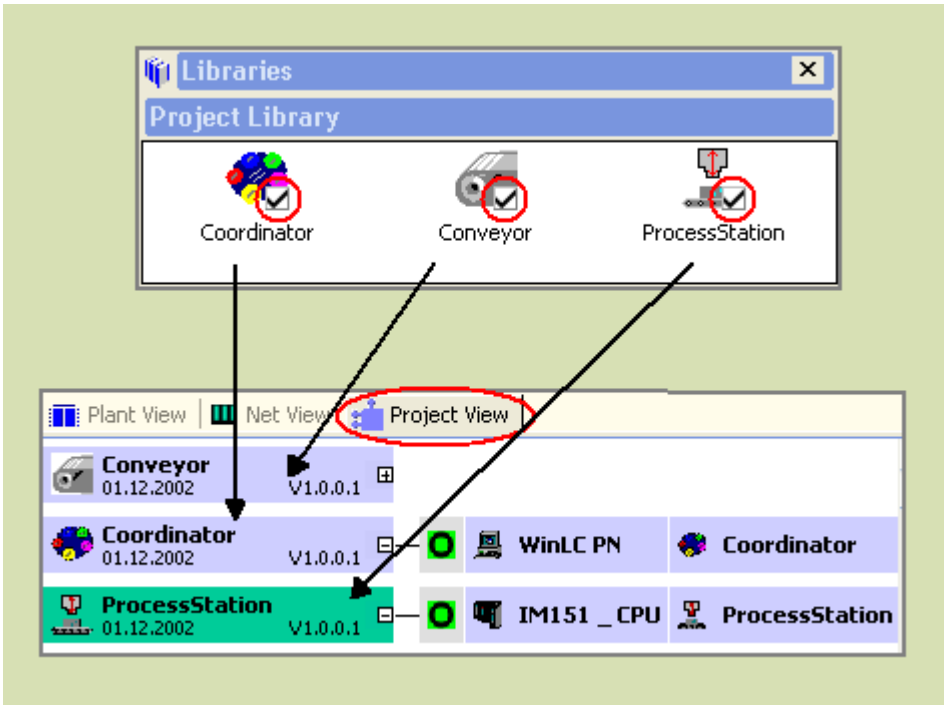


Figure 1-6 Project view in SIMATIC iMap

1.3 Technological function

Definition of a technological function

The technological function of a PROFInet component comprises the application-specific functionality of a programmable controller or field device and the component interface for communication with other PROFInet components.

The term "technological function“ frequently occurs in automation technology, and always in conjunction with the implementation of specific functions for an automation process, e.g. positioning, counting or controlling motors. In most cases, it means individual functions within the programmable controller. In terms of Component based Automation, a technological function means the entire functionality of a device or group of devices, whereas the associated hardware is represented by a device in the SIMATIC iMap net view.

Component Interface

The component interface defines the connectors - i.e. the inputs and outputs - of the PROFInet component. The connectors represent the external communication interface that is accessed via Ethernet or PROFIBUS. Every connector is characterized by the following features, as defined in the user program for the PROFInet component:

- Direction

  Every connector is either an input or an output.

- Interconnectability in SIMATIC iMap

  Inputs and outputs that are visible in SIMATIC iMap may be interconnected.

  Non-interconnectable connectors are not represented graphically in SIMATIC iMap. They can be accessed via other communication mechanisms, e.g. OPC (OLE for Process Control), and are generally used for operator control and process monitoring.

- Name

  Any connector names can be selected, provided that it conforms to the naming conventions and is no more than 24 characters long.

- Data type

  A data type, e.g. BOOL, I1 or U2, is defined for each connector. Complex data types, such as arrays, are also supported.

- Value

  While the plant is in operation, the current value of a connector can be displayed online in SIMATIC iMap. Online values of non-interconnected inputs may also be modified.

PROFInet data types

The following PROFInet data types, which conform to Microsoft OLE 2.0, are supported for the connectors of technological functions.

Table 1-1 Data types

Data type	Range of values
BOOL	TRUE / FALSE
I1	-128 to +127
UI1	0 to 255
R4	3.4E +/- 38
I2	-32,768 to +32,767
UI2	0 to 65,535
I4	- 2.147.483.648 to +2.147.483.647
UI4	0 to 4.294.967.295
DATE	01.01.1900 00:00:00 to 31.12.9999 23:59:59*)
BSTR	Character string
ARRAY	One-dimensional, from simple data types**)
STRUCT	Made up from simple data types**)

*) There may be restrictions in the range of values, depending on the type of device. For example, for SIMATIC devices this would be: 01.01.1990 00:00:00 to 31.12.2089 23:59:59.

** Simple data types are all the listed data types, apart from ARRAY and STRUCT. The maximum length depends on the amount of memory in the device.

Interconnections

In SIMATIC iMap, an interconnection is the connection between an output and an input. An output can be interconnected to one or more inputs. Once the interconnections have been downloaded to the programmable controllers, the corresponding communication links are automatically established between senders and receivers.

Representation of technological functions

The technological functions of a plant are represented by blocks with interconnectable inputs (1) and outputs (2). Interconnections are represented by connecting lines (3).

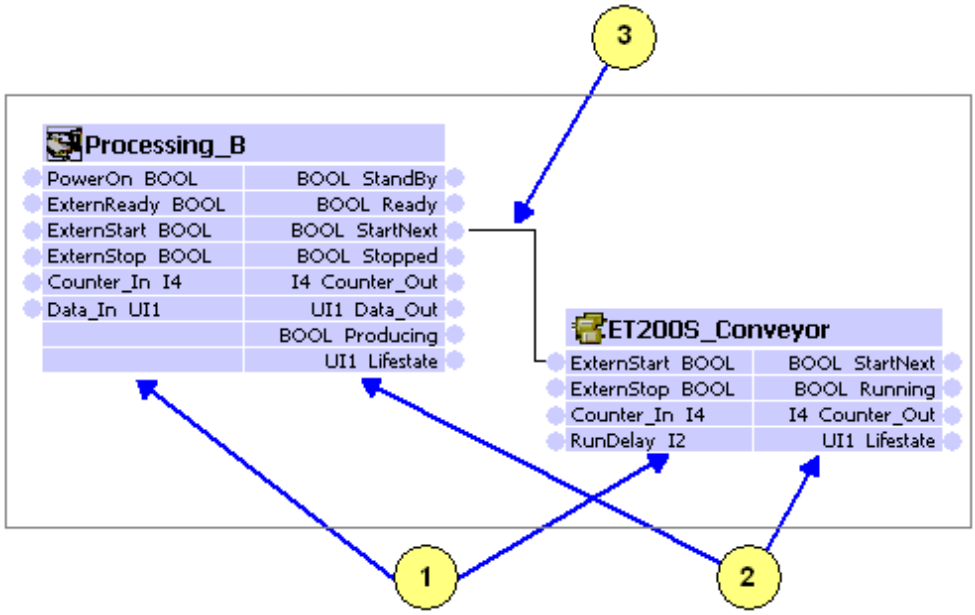


Figure 1-7 Interconnected technological functions

1.4 Devices of PROFInet components

PROFInet and PROFIBUS Devices

The device is the part of the PROFInet component that contains the hardware-specific data for that component.

In Component based Automation, a device is a representation of the physical device for which the PROFInet component was created. Such devices include programmable controllers, intelligent field devices and peripheral, hydraulic and pneumatic devices.

The main feature of a device is that it is integrated into the PROFInet communication via an Ethernet or PROFIBUS. We differentiate between the following types of device downstream of the bus connectors:

- PROFInet devices

  A PROFInet device always has an Ethernet connector. A PROFInet device may also have a PROFIBUS connector, and thus act as a master with proxy functionality.

- PROFIBUS devices

  A PROFIBUS device has just one PROFIBUS connector and is always a slave. It cannot participate directly in PROFInet communication, and must always be integrated via a PROFIBUS master with proxy functionality.

The following picture illustrates both types of device.

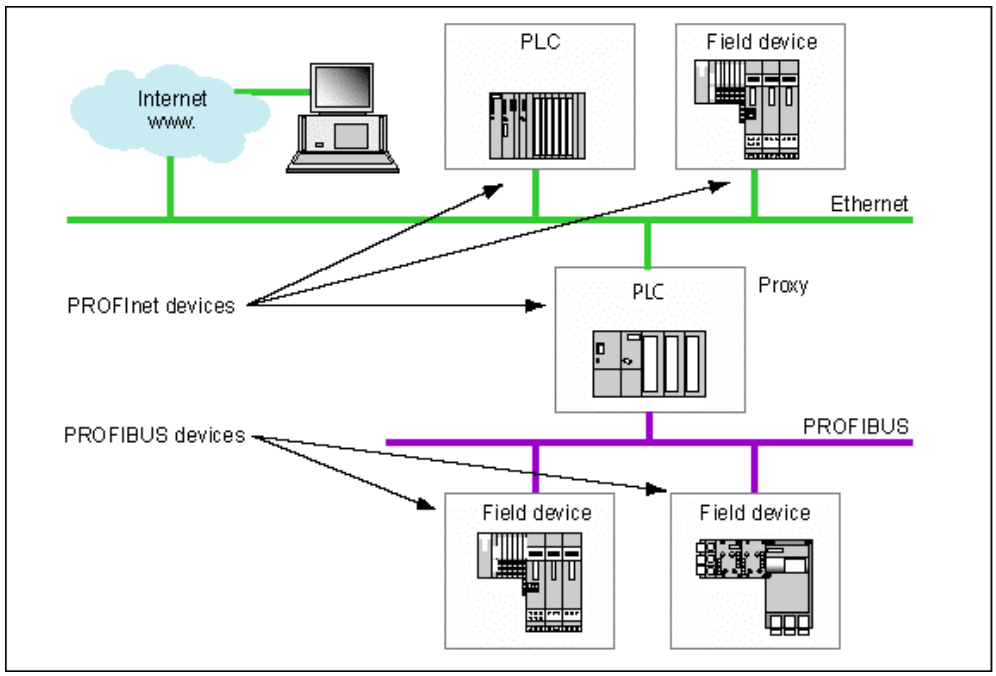


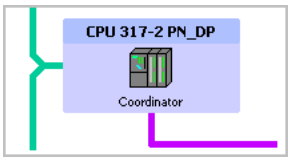
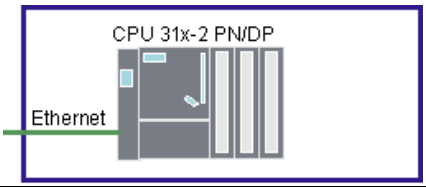
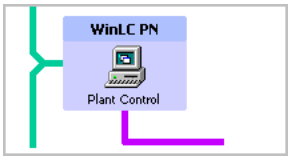
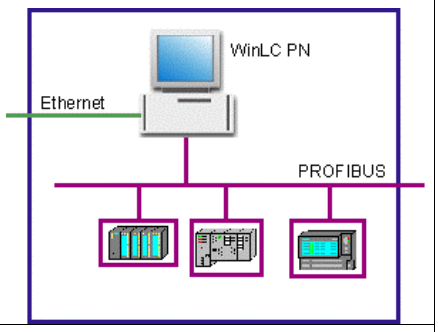
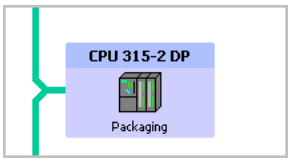
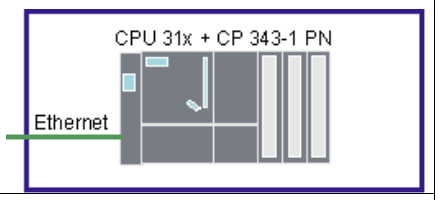
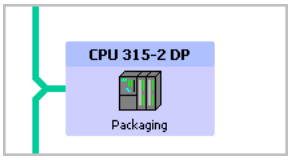
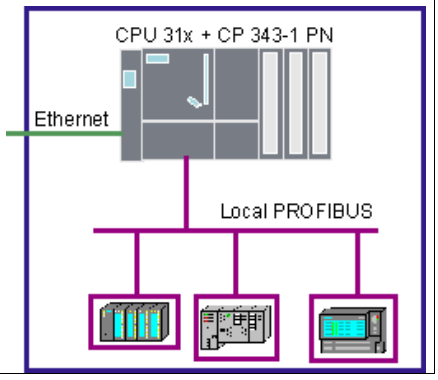
Figure 1-8 PROFInet and PROFIBUS Devices

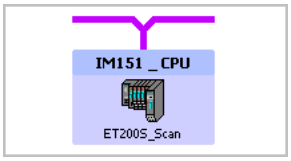
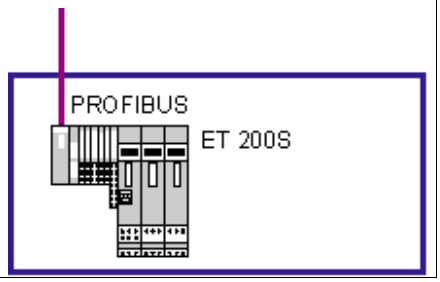
The PROFInet device with proxy functionality is a proxy of the PROFIBUS devices on the Ethernet. The proxy functionality allows a PROFIBUS device to communicate with all participants in the PROFInet communication, as well as with its own master.

PROFIBUS devices may also be coupled to the local PROFIBUS of a PROFInet device (see below, "Representation of the devices"), thus allowing existing PROFIBUS configurations to be integrated into PROFInet components. The local PROFIBUS of a device is not visible in SIMATIC iMap.

Representation of the devices

PROFInet and PROFIBUS devices are represented in the SIMATIC iMap net view.

Designation	Representation in SIMATIC iMap	Example: Hardware configuration for a PROFInet component
PROFInet device with proxy functionality		
PROFInet device with proxy functionality and local PROFIBUS		
PROFInet device without proxy functionality		
PROFInet device (with local PROFIBUS) without proxy functionality		

Designation	Representation in SIMATIC iMap	Example: Hardware configuration for a PROFInet component
PROFIBUS device (DP slave on the PROFIBUS)		

The diagram below illustrates the devices in the SIMATIC iMap net view.

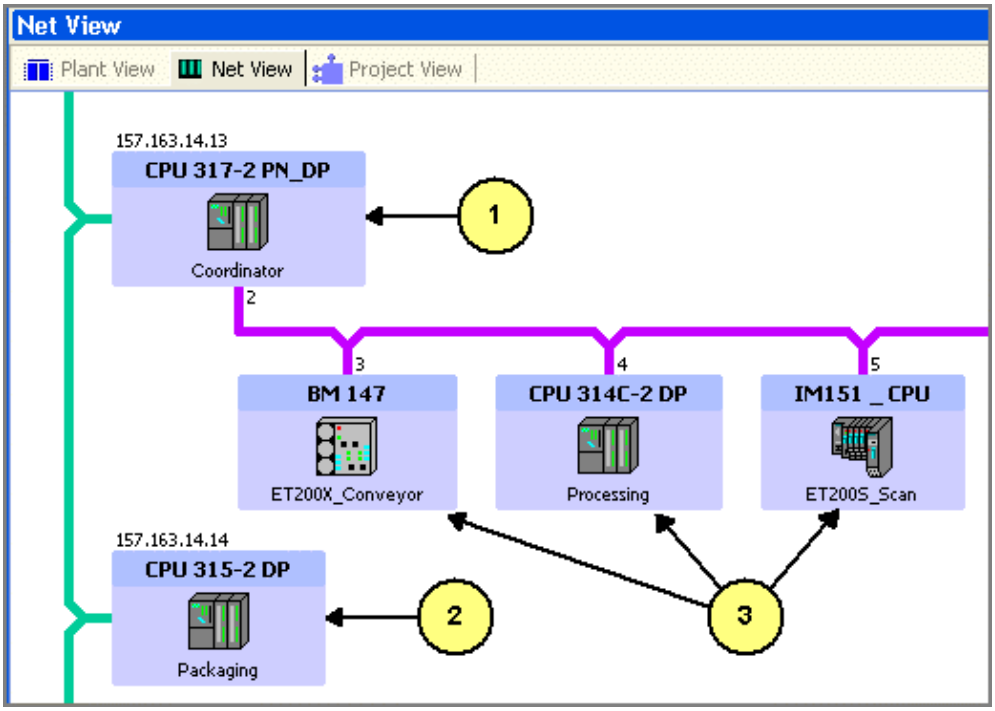


Figure 1-9 Example: Representation of the devices in the SIMATIC iMap net view

Table 1-2 Key

Icon	Meaning
1	PROFInet device with proxy functionality
2	PROFInet device without proxy functionality
3	PROFIBUS devices

1.5 New engineering concept with SIMATIC iMap

Device-independent engineering concept

SIMATIC iMap is a device-independent engineering tool for configuring, commissioning and operating plants using PROFInet components.

In addition to the technological plant view, SIMATIC iMap also provides a link to vendor-specific or proprietary programming and configuration tools for the programmable controllers and intelligent field bus devices.

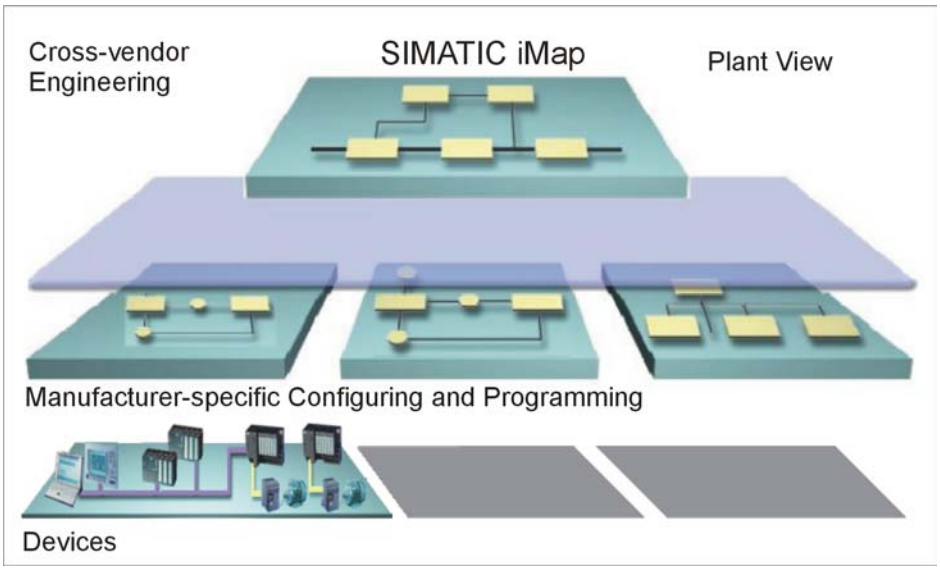


Figure 1-10 SIMATIC iMap engineering concept

The basic engineering procedure

The following steps must be carried out in order to structure and operate an automation system using SIMATIC iMap:

1. Planning the plant

   The plant planner defines the following aspects:

   - Which functions are needed
   - Which programmable controllers and field devices are to be used
   - Which functions can be combined to create reusable technological submodules
   - NEW for Component based Automation:
     Component interfaces and interaction between PROFInet components, plus variables for diagnostics and visualization.

2. Creating PROFInet components

   The plant and machinery constructor creates the PROFInet component using the vendor-specific configuration and programming tool by:

   - Configuring and programming the hardware
   - Creating the description of the component interface
   - Creating the user program
   - Testing the technological submodule
   - Creating the PROFInet component (XML file and associated data)
   - Optional: Importing the PROFInet component into a SIMATIC iMap library.

3. Configuring the plant in SIMATIC iMap

   The plant configuration engineer creates the project in SIMATIC iMap by:

   - Opening an existing library or creating a new library
   - If necessary: Importing the new PROFInet component into the library
   - Inserting the PROFInet Components into the Project
   - Networking the devices in the net view
   - Assigning the device addresses (IP address and/or PROFIBUS address) to the devices (this step is device-specific)
   - Interconnecting the technological functions in the plant view
   - Modifying the properties of the devices and functions
   - Checking the configuration
   - Documenting and archiving the project

4. Commissioning and testing the plant

   The plant operator is responsible for the following tasks:

   - Commissioning individual devices
   - Downloading project data to the devices in the plant
   - If necessary: Reworking devices and technological functions in the vendor-specific engineering tool
   - Testing the plant
   - Creating the symbol data for OPC access

5. Operating the plant

   - Monitoring and modifying process data online (vertical integration)
   - Diagnosing faults in the plant
   - Operator control and process monitoring
   - Carrying out maintenance and modifications

Support from SIMATIC iMap

SIMATIC iMap provides the following support for plant engineering:

- Storage of in-house and off-the-shelf PROFInet components in libraries

  Libraries are used to administer PROFInet components that you create yourself or purchase. The content of these libraries can be configured as required.

- Interconnection of technological functions in the plant view

  In the plant view, you can position and interconnect technological functions graphically, and easily check and modify their properties.

- Networking of devices in the net view

  In the net view, you can link devices graphically to a PROFIBUS or Ethernet subnet, and assign the corresponding addresses.

- Online monitoring and control of variables

  You can access the process data online at any time by using a variable table, incorporating HMI devices such as ProTool/Pro into your plant or using OPC-based client programs.

- Diagnosing PROFInet devices and technological functions

  The separate diagnostic window constantly displays the current status of PROFInet devices and technological functions. An online-offline comparison allows you to determine whether programs and/or interconnections need to be downloaded.

- Representation of the project in a hierarchical tree structure

  All parts of the plant needed for easy navigation and other administration functions within the project are clearly displayed.

- Automatic creation of the plant documentation

  Full documentation of the configured plant, including all devices, technological functions and their connectors, plus a graphical representation of the networking and interconnections can be created automatically in SIMATIC iMap.

- Checking the configuration

  You can check the configuration in SIMATIC iMap with reference to the device-specific performance parameters even before you generate the project.

- Looking up the device's online data.

  The online device analysis allows you to look up the online data for individual devices for testing and diagnostic purposes.

Vendor-specific configuration and programming tools

SIMATIC iMap provides the following functions for linking to vendor-specific configuration and programming tools:

- Software for creating PROFInet components for SIMATIC devices in STEP 7.
- Access to vendor-specific tools for configuring and diagnosing devices.

Transparent data access

PROFInet communication supports access to process data from different levels of the plant. Using PROFInet, you can now use standard communication and IT mechanisms, such as OPC, XML, COM/DCOM, in your automation system, which means that office-bound company managers can directly access the data from PROFInet devices at the control and production levels.

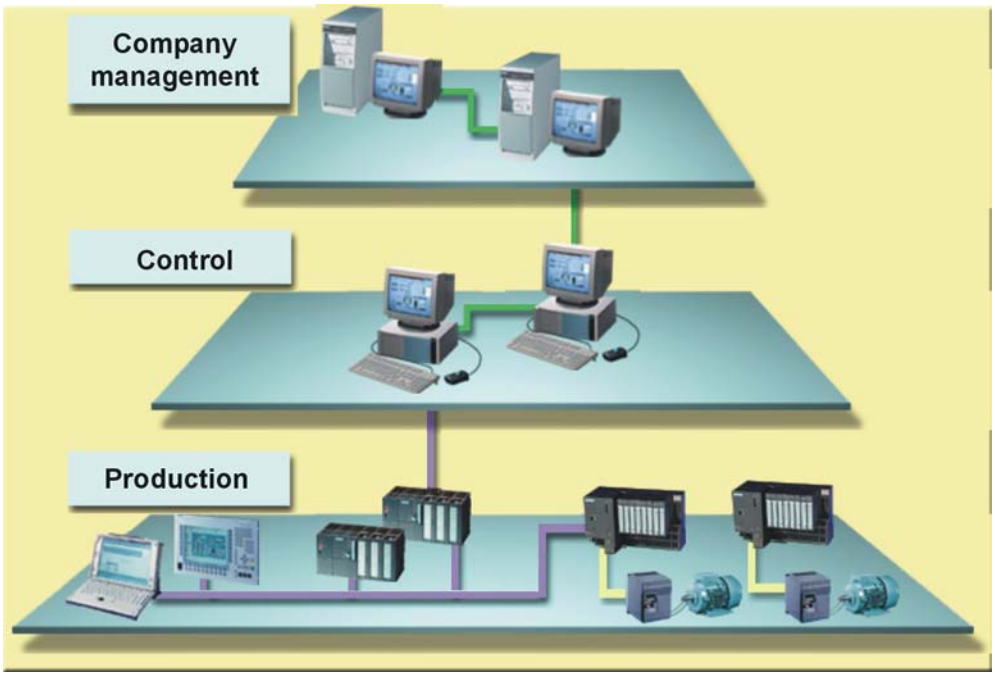


Figure 1-11 Access to process data

1.6 User documentation for SIMATIC iMap and Component based Automation

User documentation

The SIMATIC iMap and PROFInet documentation is broken down into various activities and target groups. The contents contain different levels of information.

Manual	Type of description	Content	Target group
Configuring Plants with SIMATIC iMap – manual	Introduction	• Component based Automation • SIMATIC iMap • PROFInet components	Beginners Plant planners
	Extensive description and instructions	• Installing SIMATIC iMap	Plant configuration engineers
		• Using SIMATIC iMap	
		• Configuring Plants	
		• Commissioning plants	Plant operators
		• Online Operation and Diagnostics	
Commissioning Systems – Tutorial	Detailed step-by-step instructions with reference to an example	• Creating PROFInet components with STEP 7 • Configuring Plants with SIMATIC iMap • Commissioning Plants with SIMATIC Devices	All
Getting Started with SIMATIC iMap	Brief introduction	• Creating PROFInet components with STEP 7 • Configuring Plants with SIMATIC iMap • Online Monitoring and Diagnostics with SIMATIC iMap	Beginners
Creating PROFInet components	Extensive description and instructions	• Creating PROFInet components with STEP 7 • Using SIMATIC Devices as PROFInet components	Plant constructors Machinery constructors

Options for accessing the user documentation

To call up the SIMATIC iMap documentation:

- Use the **Start > Programs > Component based Automation > Documentation > SIMATIC iMap > ...** command to open the PDF document in Windows.
- In SIMATIC iMap, you can open the complete documentation as online help using the **Help > Help Topics** menu command.

Additional information

The associated product documentation contains information on related topics, e.g. descriptions of individual devices.

Installing SIMATIC iMap

2

2.1 Requirements

Hardware Requirements

The computer on which SIMATIC iMap is installed must have at least the following configuration:

- Pentium processor, 700 MHz or faster (1 GHz recommended)
- 256 MB or more RAM (512 MB recommended)

General software requirements

Operating system:

- Microsoft Windows 2000 Professional, SP 4 or later, or
- Microsoft Windows XP as of SP1
- Microsoft Internet Explorer, V6.0 SP1 or later (on the SIMATIC iMap CD)

Recommendation:

We recommend that you also install the Microsoft Windows security patches.

Authorizations:

- You will need administrator rights to install SIMATIC iMap.
- You will need at least primary user rights to run SIMATIC iMap.

Software requirements for SIMATIC devices

If you are using PROFInet components of SIMATIC devices, you will also need the following software packages:

- STEP 7 V5.2, SP1 or later, including NCM for Industrial Ethernet and PROFIBUS, or
  - STEP 7 Professional V5.2 SP1
  - STEP 7 V5.3
- SIMATIC NET IE SOFTNET-PG, V6.1 or later – for using the OPC server and/or the WinAC PN.
- Software required for the SIMATIC devices used:

Device/Function	Software required
WinAC PN	WinAC PN V1.1 and V4.1 SIMATIC NET IE SOFTNET-S7 V6.1 or later
HMI Process Visualization	ProTool/Pro Configuration V6.0 + SP2 or later
Access to process variables via OPC	SIMATIC NET PN OPC Server, V6.1 or later
Access to process variables via OPC	SIMATIC NET IE SOFTNET-S7 V6.1 or later SIMATIC NET PN OPC Server, V6.1 or later

Other important information...

on SIMATIC iMap can be found in the readme file.

2.2 Installation

Requirement

- The conditions described in the "Requirements" section must be fulfilled.
- The floppy disk provided must contain the SIMATIC iMap copy protection.

To install SIMATIC iMap

1. Insert the floppy disk with the SIMATIC iMap copy protection in the floppy drive.
2. Insert the SIMATIC iMap CD into the CD-ROM drive.
   If the setup program starts automatically, you can continue from step 5.
   Otherwise continue from step 3.
3. Select the CD-ROM drive in Windows Explorer.
4. Double click on the setup.exe file to start the setup program.
5. Run the necessary setup programs in the order specified by clicking on the relevant buttons.

   During the installation you will be prompted to install the authorization.
   Following instructions in the "Authorization" section.

Note

When you have installed some software packages, you are prompted to restart the computer. Restart the computer if you are prompted to do so by the setup program.

Please follow the notes on installing and using SIMATIC iMap in the readme file, which is also on the CD-ROM.

2.3 Authorization

A product-specific authorization (right of use) is needed in order to use the SIMATIC iMap engineering software. SIMATIC iMap can only be used if the necessary authorization is detected on the hard drive of the PG/PC.

Authorization diskette

For the authorization, you will need the authorization diskette that is supplied with the software. This contains the actual authorization. The "AuthorsW" program that you will need to display, install and uninstall the authorization can be found on the CD-ROM that also contains SIMATIC iMap V2.0.

Note

For the SIMATIC iMap engineering software you will receive a red authorization diskette with the associated authorization.

Caution

Follow the instructions under iMap > Authors > Disk1 > Readme.wri on the CD-ROM. If you do not follow these instructions, you risk losing the authorization permanently.

You can also use SIMATIC iMap without the authorization to get to know the user interface and range of functions. However, you can only really use the program with the authorization installed. If you have not installed the authorization, you will be prompted at regular intervals to install it.

If you lose your authorization ...

An authorization can be lost if a hard disk fault occurs, for example, and you are unable to uninstall the authorization from the defective hard drive.

If you use the authorization, you can access the emergency authorization, which is also on the authorization diskette. This emergency authorization allows you to continue to use the software for a limited period. In this case, the time remaining until the authorization expires is shown on start-up. You should obtain a replacement for the lost authorization during this period. To do this, contact your local SIEMENS dealer.

Note

The time limit for the emergency authorization starts to run when you install the authorization, even if SIMATIC iMap is not started. The time limit will not stop even if you write the authorization back to the floppy disk.

Installing AuthorsW

The "AuthorsW" program that you will need to display, install and uninstall authorizations can be found on the CD-ROM that also contains SIMATIC iMap V2.0. Install this program on your hard disk via an option in the setup program. You can then use it from there for the authorization operations.

Note

The AuthorsW program can be found at

Start > SIMATIC > AuthorsW > AuthorsW.

Running the authorization at initial installation

You should run the authorization when a message prompts you to do so during the initial installation of SIMATIC iMap. The procedure is as follows:

1. Insert the authorization diskette when you are prompted to do so.
2. Then confirm the prompt.
3. The authorization is transferred to a physical drive.

Running the authorization at a later date

If you start SIMATIC iMap and there is no authorization installed, a message to this effect appears. To retrospectively install the authorization, start the AuthorsW program. The Help for this program contains detailed information on the procedure.

Note

The authorization will not work under Windows 2000/XP unless you are approved for write access on a local hard drive.

Working with SIMATIC iMap

3

3.1 Starting SIMATIC iMap

Requirement

SIMATIC iMap must be installed on your PC/PG.

Starting SIMATIC iMap

There are two ways to start SIMATIC iMap:

- Click on the **Start / Programs / Component based Automation / SIMATIC iMap** command or
- Double-click on the iMap icon on your desktop:

Result: The SIMATIC iMap user interface is opened:

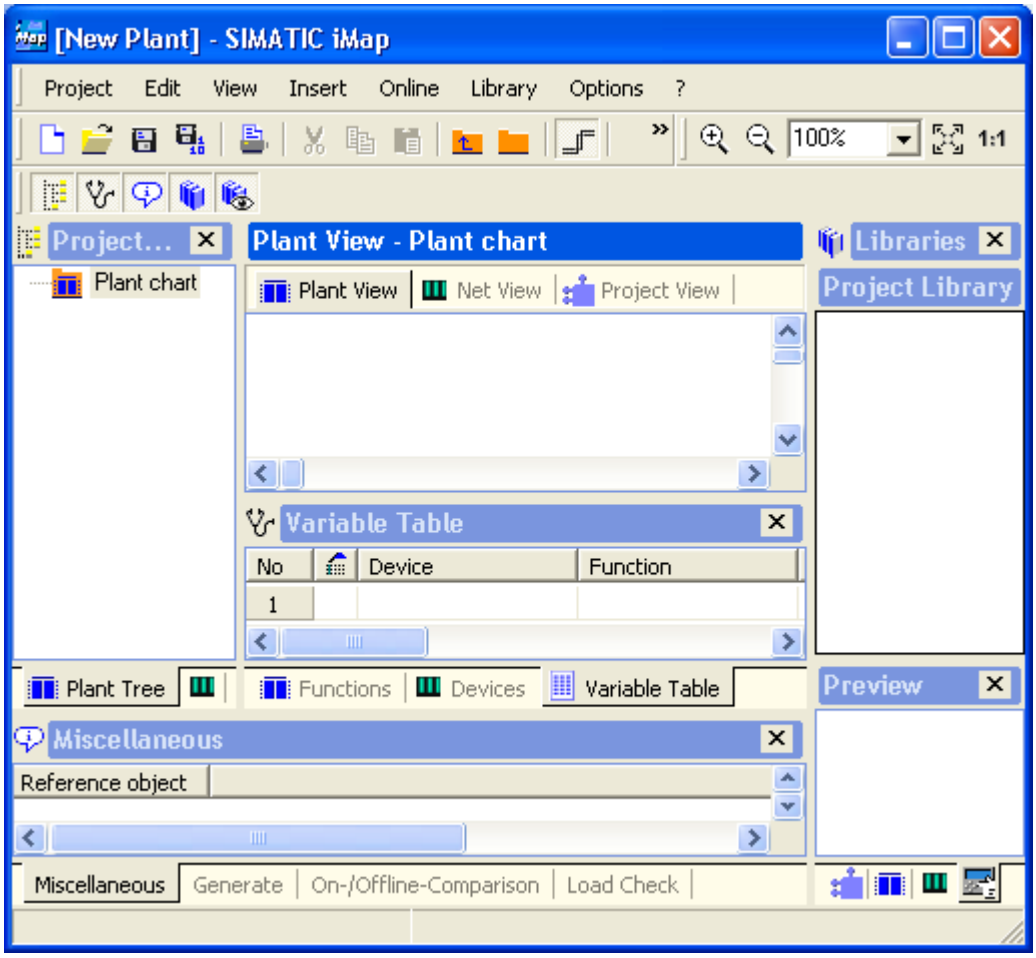


Figure 3-1 Start SIMATIC iMap: User interface

3.2 Help functions in SIMATIC iMap

Online help

SIMATIC iMap's built-in help system provides targeted information for the points in the program at which you need help. You can thus quickly and efficiently access the information you need. The ways in which you can obtain help for each procedure are described below.

Via the "?" menu

- **Help:** Displays information about the selected object or on the active dialog box or window.
- **Help Topics:** Opens the online help for "Component based Automation and SIMATIC iMap". You can then use the Content, Index and Find tabs to navigate within the online help.
- **Getting Started:** Describes the first steps that you have to carry out to create a working application.
- **About:** Opens an information box listing the most important properties of the installed software version.

In dialog boxes

In all dialog boxes containing a "Help" button, you can click on this button to obtain a description of the dialog box.

In messages

In all message boxes containing a "Help" button, you can click on this button to obtain a detailed description of the message.

Via the F1 function key

Use the F1 function key to move directly from your current working context to the point in the online help that describes this aspect. For example, if there is a dialog box on screen, pressing F1 will call up a description of this dialog.

In the status bar

The status bar displays a short help text that describes the selected command from the main or context menu (opened by clicking the right mouse button).

Via the Tooltip texts

If you move the cursor slowly over a button in the toolbar, a brief description appears for a short time.

SIMATIC iMap documentation

You can call up documentation about SIMATIC iMap:

- In Windows, open the individual documents as PDF files using the **Start > Programs > Component based Automation > Documentation > SIMATIC iMap > ...** command.
- In SIMATIC iMap, you can open the complete documentation as online help using the **Help > Help Topics** menu command.

3.3 Operating philosophy

3.3.1 Objects and object hierarchy

Ease of use

SIMATIC iMap's graphical user interface is designed to be as straightforward and intuitive to use as possible. It therefore contains objects with which you are familiar from your daily work: devices, functions and charts.

Object-oriented operation

In the SIMATIC iMap user interface, objects are represented by graphical symbols. You can open and edit the objects by selecting the symbols. In most cases, when you work with SIMATIC iMap you will use the normal Windows conventions.

Object hierarchy

In SIMATIC iMap, projects may have a hierarchical structure. By default, the project tree contains two tabs, the "plant tree“ and the "net tree“. The technological functions are listed under "Plant tree“, while the devices can be found under "Net tree “.

New charts, which may contain further charts or objects, may be inserted into the project tree under "Plant tree". PROFIBUS masters can be represented hierarchically with the associated PROFIBUS slaves under "Net tree ". Example:

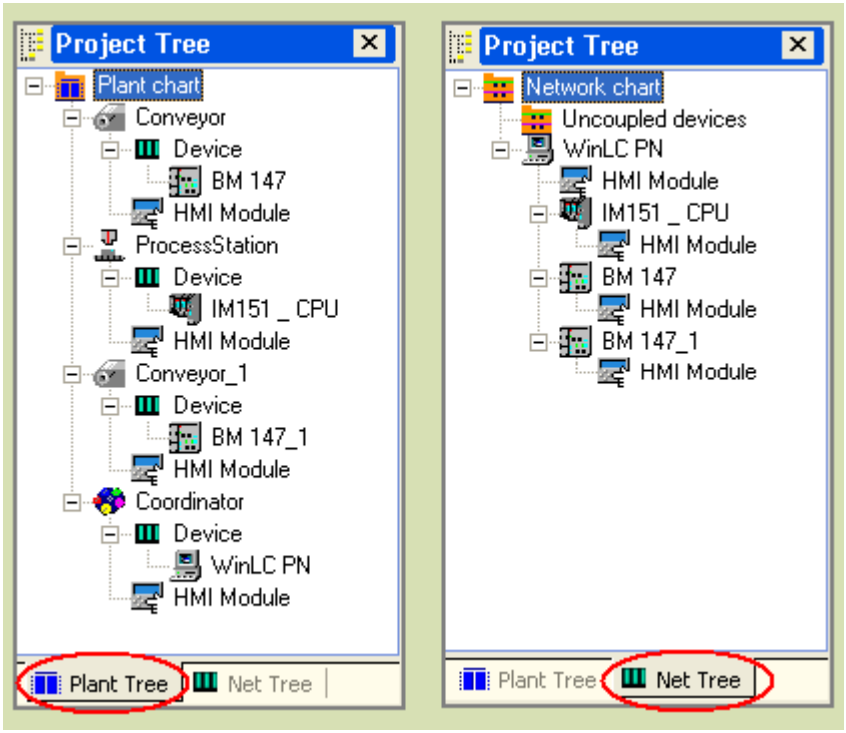


Figure 3-2 Project tree, example of an object hierarchy

Object properties

Objects have properties, e.g. addresses and connectors. Once you have selected an object, you can then open a dialog box using the **Properties** pop-up menu, for example, in order to make certain object-specific settings.

Actions on objects

You can carry out certain actions on each object, e.g. Copy, Cut, Paste. When you select an object, the actions that you can carry out on that object are displayed in the context menu.

Associated objects

The associated objects in a SIMATIC iMap project are: a PROFInet component and its instances (devices and optionally technological functions). The following diagram show how they fit into the project.

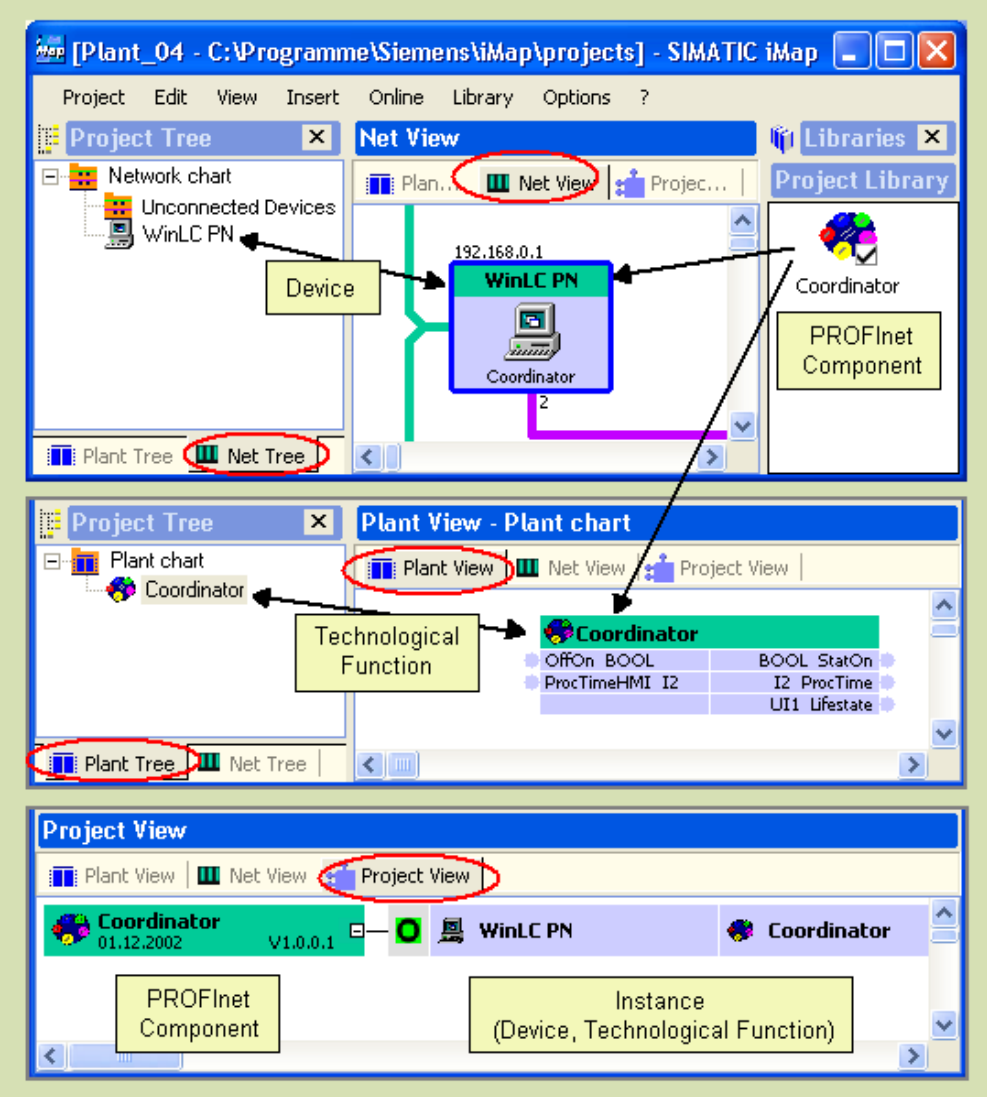


Figure 3-3 PROFInet components and their instances

3.3.2 Editing objects

Basic actions

Certain basic actions on objects are the same for all objects. These basic sequences of actions are summarized below. In the following chapters of this manual, we have assumed that you already know how to use them when we describe individual procedures. If you attempt to carry out an illegal action, you will be stopped and the cursor will change into a Stop sign.

The usual sequence of actions for handling objects is as follows:

- Create the object
- Select the object
- Perform actions with the object

Creating objects

With SIMATIC iMap you can create new libraries, projects and charts. The actual PROFInet components are created using a device-specific programming and configuration tool, e.g. STEP 7.

Use the following menu commands to create objects:

- **Library > New**
- **Project > New**
- **Insert > New Chart**

Creating an object hierarchy

The project forms an object hierarchy. The "Plant tree" and "Net tree " views are automatically created in the project tree. When a chart is opened, objects already contained in that chart appear in the project tree.

You can then structure the project further by inserting more charts into a project or even into another chart. You can also insert new charts into the project tree and plant view.

At the bottom of the object hierarchy are the technological functions and devices. These are automatically created when the PROFInet components are inserted into a project.

Opening objects

In SIMATIC iMap you can open libraries, projects and charts. These objects are opened using the following menu commands:

- **Library > Open**
- **Project > Open**
- **Edit > Open Selected Chart** or by double clicking on the chart.

Once you have opened an object, you can then create or modify its content. You cannot, however, open projects that are currently in use.

Setting object properties

Object properties are the data of an object that define its behaviour. The **Properties** context menu opens the dialog box in which you can read or set the properties of the highlighted object.

Note

If you change the settings of objects, e.g. interconnections, offline in SIMATIC iMap, they do not take immediate effect on the plant. These changes will not become active until you download the data to the target system.

Cutting, pasting and copying

Most objects can be cut, pasted and copied as is usual under Windows. The associated menu commands can be found in the **Edit** menu and the context menus that you access by clicking the right mouse button.

You can also Drag&Drop objects to copy them. If you attempt to drop the object at a destination that is not permitted, the cursor changes into a Stop sign.

Note

New PROFInet components are inserted into the project from a library.

PROFInet components that have already been inserted may be copied or inserted in the net or plant view, or may be dragged from the project tree and dropped in the net or plant view.

Selecting objects - Multiple selection

Several objects may be selected at the same time in the net and plant views (multiple selection). To do this, hold down the left mouse button and catch the objects using the lasso.

With multiple selection, only objects of the same type may be selected, e.g. only technological functions and charts or only connectors may be selected in the plant view. Objects are selected in the following order: If the lasso contains complete technological functions and charts, these objects are selected complete with all the associated interconnections. If this is not the case, any complete connectors that they contain are selected. If there are no connectors, then any interconnections that they contain are selected.

Note

Hint: You can also make multiple selections with the left mouse button by holding down the “Shift“ or “Ctrl“ key at the same time.

Copying subordinate charts

When you copy a subordinate chart, the entire hierarchy beneath that object is copied as well. This means that, once a subsystem has been developed, it can then be reused in many other systems.

Note

Please note that, in this case, PROFInet components without technological functions such as the IE/PB Link are not copied as well. If you wish to copy a PROFIBUS master together with its PROFIBUS slaves, we recommend that you make the multiple selection in the net view.

Renaming objects

In SIMATIC iMap you can change the names of technological functions, devices and charts. The names of PROFInet components in the libraries cannot be changed, however.

Technological functions and devices are given the name of the PROFInet component by default. If the same PROFInet component is used several times, then the name is supplemented by a consecutive number, regardless of which level of the hierarchy the component is located, e.g. Machining_1.

When a new chart is inserted, it is called "New Chart" by default. A second chart is called "New chart_1", and so on.

To rename, highlight the desired object and select **Edit > Properties...**. Change the name in the dialog box and click on the "OK" button. When you close the Properties dialog, the object is renamed and appears with the new name.

Moving objects

In SIMATIC iMap you can move the following objects using Drag&Drop:

- PROFInet components from one library to another.
- Devices in the net view from one Ethernet or PROFIBUS network to another.
- Technological functions in the plant view.
- Charts within the project tree.

Deleting objects

You can delete both folders and objects. When you delete a chart, you also delete all the objects contained in that chart.

The project tree and the SIMATIC iMap net , plant and project views are different representations of the same project. If an object is removed from one of the windows, it automatically disappears from the other windows.

Caution

The deletion operation cannot be reversed. If you might need an object again, then you should archive the entire project first.

When you delete an object, you also delete the corresponding interconnections with a technological function! It may therefore be necessary to reconnect the inputs and outputs to other technological functions.

Finding objects:

With the **Edit > Find...** menu command, you can find all the objects whose names contain a certain character string.
The components, instances, devices and functions thus found are listed in the information window. Double-click on an entry in the information window to select and display the corresponding object in the plant view, net view, project view or project library.

Highlighting associated objects

Once you have highlighted an object, you can double-click on that object or use the **Edit > Select in all Windows** menu command to highlight all the associated objects (PROFInet component, device and technological function, if applicable) in the other windows as well.

Example: If you double-click on a technological function in the plant view, the following objects are highlighted:

- in the library: the PROFInet component whose instance contains the selected function,
- in the project view: the instance of the PROFInet component,
- in the plant tree of the project tree: the same technological function and
- in the net tree of the project tree and in the net view: the associated device.

3.4 Windows and views

3.4.1 SIMATIC iMap user interface

Structure

The SIMATIC iMap user interface is made up of various windows that can be opened and closed as required by clicking on the icons in the toolbar.

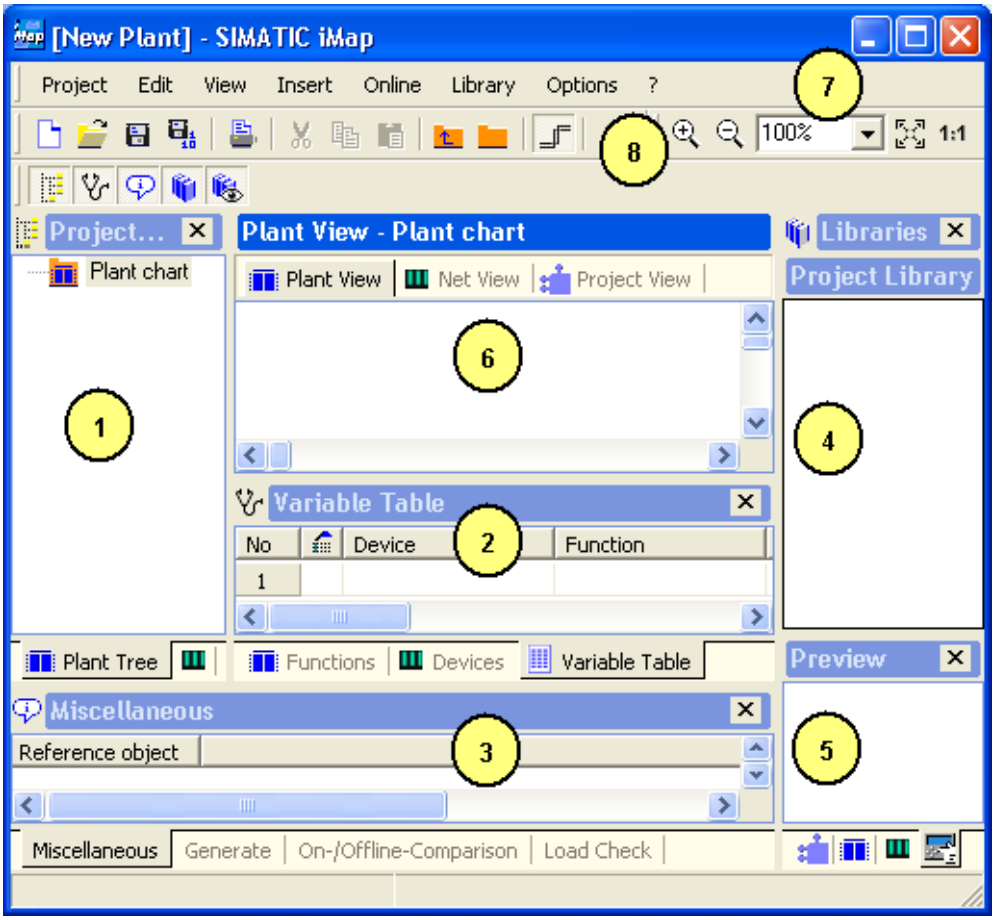


Figure 3-4 SIMATIC iMap user interface

Table 3-1 SIMATIC iMap user interface

No.	Window	Icon
1	Project tree	
2	Diagnostic window	
3	Information window	
4	Library window	
5	Preview window (can only be opened in conjunction with the library window)	
6	Plant view, net view or project view (always open)	
7	Menu bar (see description in the appendix)	
8	Toolbar (see description in the appendix)	

Using SIMATIC iMap

Depending on which window is active, various actions can be carried out. Features used in Windows applications are available here:

- Menu commands (menu bar, context menus or icons in the toolbar),
- Drag&Drop,
- Keyboard input

Calling help

To call up help about a window in the user interface, click in the window and press function key F1.

3.4.2 Plant view

Description

In the plant view, the instances of the inserted PROFInet components are visible as technological functions. The interconnections, i.e. the logical data connections between two or more technological functions, are represented by a line. These lines cannot be manipulated. Lines which cannot be displayed, for example, due to a lack of space are replaced by "continuation" connectors.

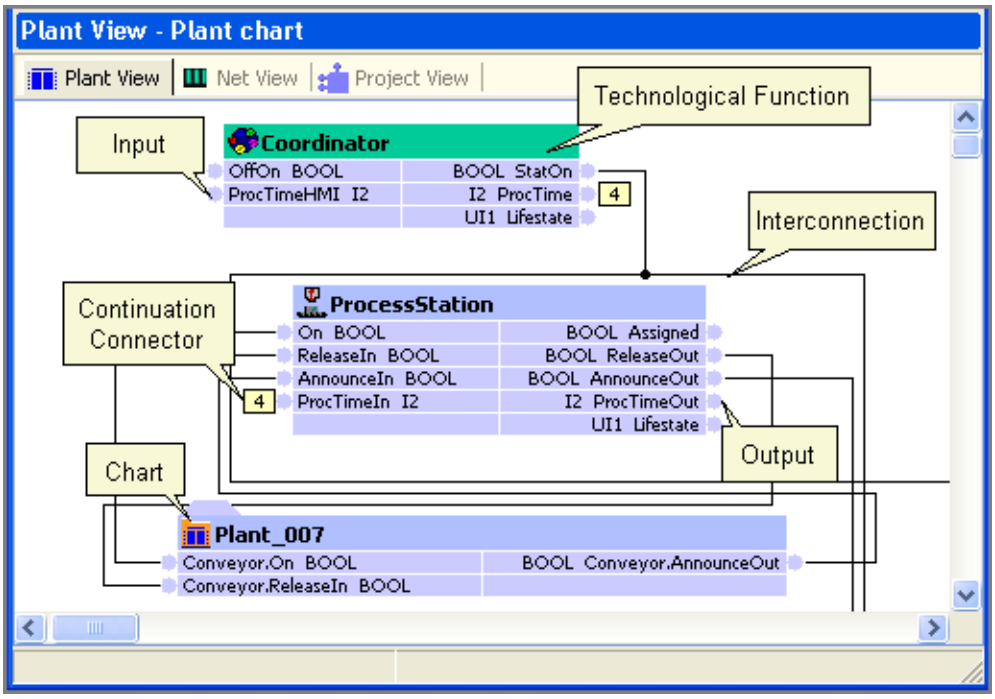


Figure 3-5 Plant view

Actions

The main actions available in the plant view are as follows:

- Inserting instances of PROFInet components from the libraries
- Displaying and modifying properties of instances.
- Creating and deleting interconnections
- Displaying and modifying properties of connectors
- Downloading interconnections and programs to the devices of the plant
- Inserting and deleting new charts
- Printing charts.
- Set and display online values
- Comparing online and offline data
- Diagnosing technological functions and interconnections

Reference to other windows and views

If a PROFInet component is inserted into the plant view, then the instance in the project view, the technological function in the plant tree and the device in the net tree of the project tree are displayed automatically.

From a highlighted object in the plant view you can use the **Go To** context menu to jump directly to the associated object in one of the other windows.

3.4.3 Net view

Description

In the net view the instances of inserted PROFInet components are displayed as objects with one or more network connectors. They are designated as "Devices" in the net view. The devices each have IP and/or PROFIBUS addresses.

The Ethernet is created as a green line and the PROFIBUS network as a violet horizontal line when a PROFInet component of a PROFIBUS master with proxy functionality is inserted from a library. Possible insertion positions are highlighted in color.

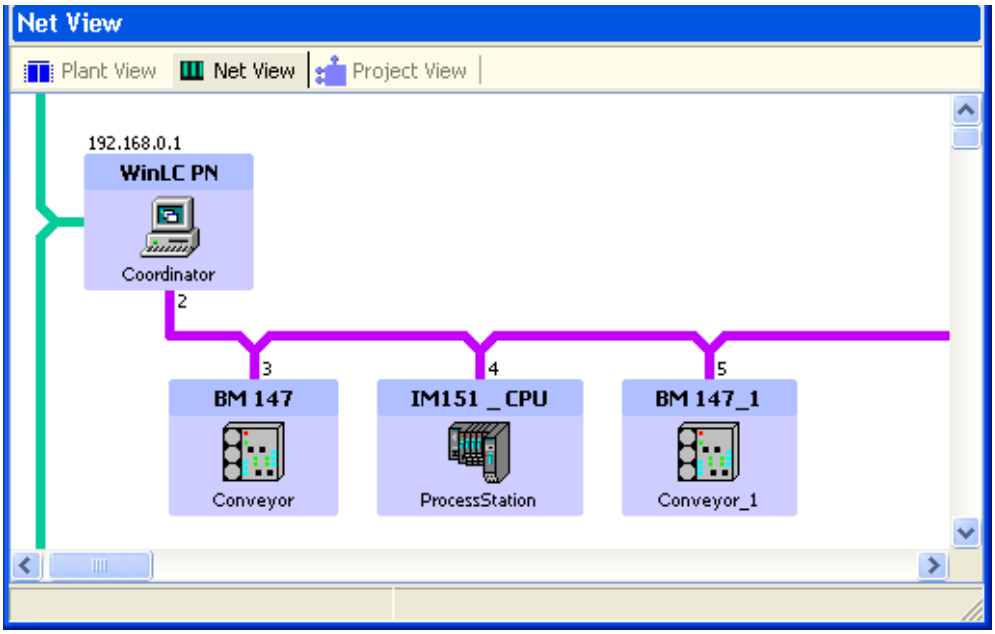


Figure 3-6 Net view

Actions

The main actions available in the net view are as follows:

- Inserting PROFInet components from the libraries.
- Moving, copying, cutting or deleting devices.
- Displaying and modifying properties of instances.
- Inserting, cutting, moving and deleting Ethernet nodes.
- Coupling uncoupled PROFIBUS devices to a PROFIBUS network.
- Assigning addresses.
- Downloading programs and interconnections to all or just the selected devices.
- Printing the net view.
- Online monitoring and diagnostics of devices.
- Comparing online and offline data.

To insert an Ethernet node:

The **Insert > New Ethernet node** menu command is used to create a new Ethernet node in the net view. Several PROFInet devices without proxy functionality may be coupled to it (see diagram below).

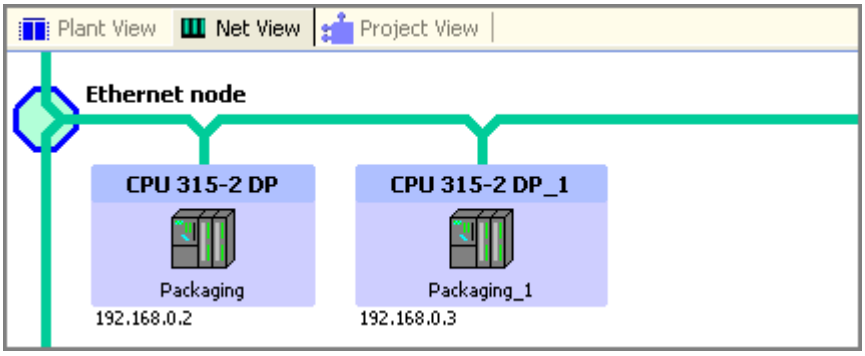


Figure 3-7 Ethernet node in the net view

Reference to other windows and views

If a PROFInet component is inserted into the net view, then the instance in the project view, the technological function in the plant tree and the device in the net tree of the project tree are displayed automatically if necessary.

From a highlighted object in the net view you can use the **Go To** context menu to jump directly to the associated object in one of the other windows.

Uncoupled PROFIBUS devices

Uncoupled PROFIBUS devices are saved in the net view above a separating line

- if no PROFInet component with proxy functionality has been inserted yet or
- if the PROFInet device with proxy functionality, to which they were coupled, was deleted from the project window or the net or plant view or
- when inserting the component into the plant view or project view, if the "Couple PROFIBUS devices automatically" check box is unchecked on the "Net view" tab in the Customize dialog box (**Options > Customize** menu command).

Uncoupled PROFIBUS devices can be coupled to a PROFIBUS network using Drag&Drop.

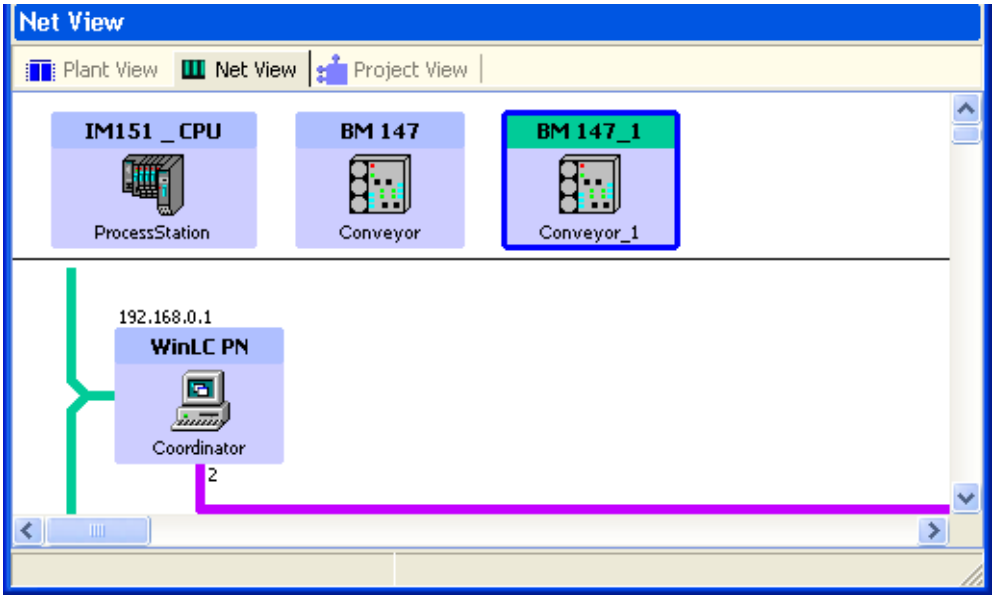


Figure 3-8 Net view, uncouple PROFIBUS devices

3.4.4 Project view

Description

The project view represents the association between the PROFInet components in the library and the inserted instances – functions and devices. The information is shown in table format (see diagram below).

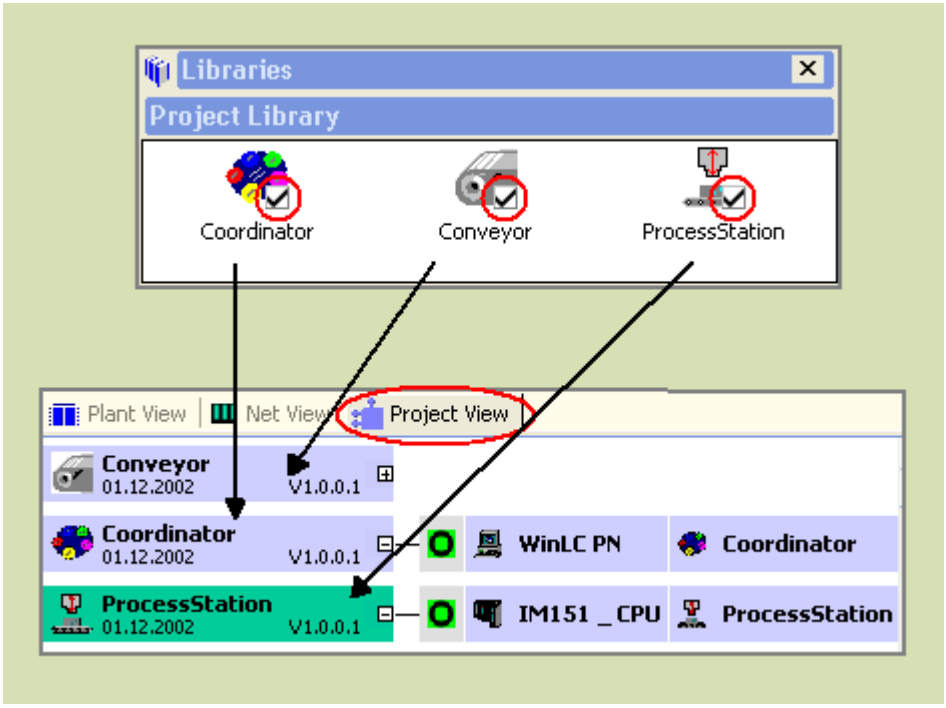


Figure 3-9 Project view

The instances present in the project plus the integrated HMI devices (if present) and their generation status are displayed for every PROFInet component.

Table 3-2 Information in the project view

Column	Content
Component	Name, version and creation date of the PROFInet component
Generation status of the instance	Graphical representation
Device	Icon and name of the device
Technological function	Icon and name of the technological function
Generation status of the HMI module	Graphical representation
HMI module	Integrated HMI module

Symbols for the generation status

Table 3-3 Generation status - graphical representation

Icon	Meaning
	The generation was successful.
	Generation is required

Hint: The generation status is displayed as a Tooltip.

Actions

You can carry out the following actions in the project view:

- Cutting, copying or deleting instances
- Replacing instances
- Looking up and modifying properties
- Showing/hiding instances

Showing/hiding instances

You can show and hide information about instances as follows:

- Using the menu commands:
  - **View > Project view > Show instances** or
  - **View > Project view > Hide instances**
- By clicking on the "+"- or "-" symbol in the Component column.

3.4.5 Project tree

Description

In the project tree, the objects in the project are shown hierarchically. The project tree has two parts:

- The plant tree – corresponds to the plant view
- The net tree – corresponds to the net view

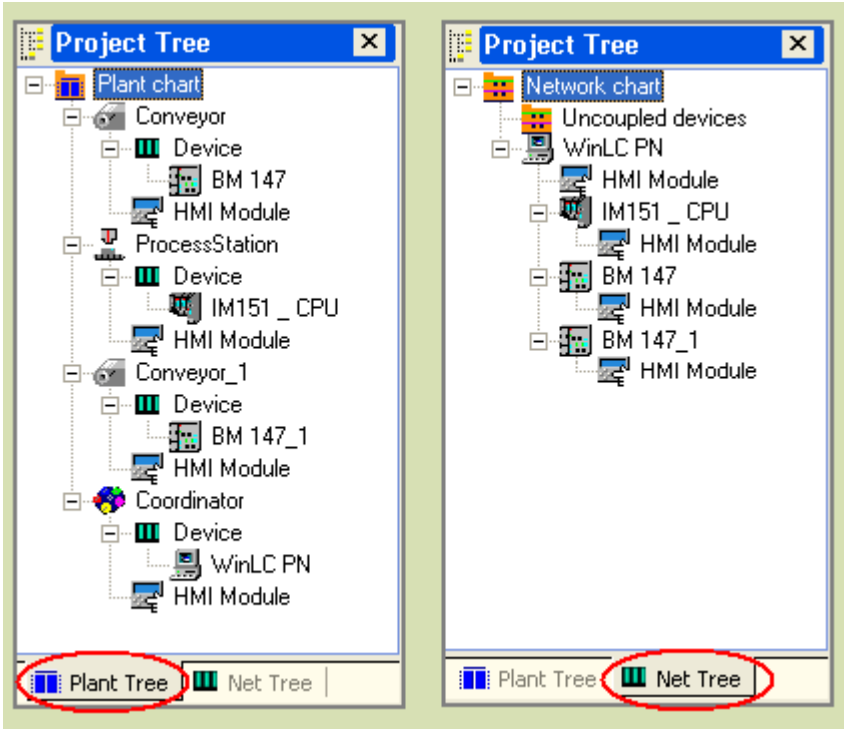


Figure 3-10 Project tree

The technological functions are displayed in the plant tree and the devices in the net tree when PROFInet components are inserted into the project. Subordinate charts are also displayed hierarchically in the plant tree. PROFInet components which do not contain a technological function, e.g. the IE/PB link, are only displayed in the net tree.

The plant tree contains the designation of each function, while the net tree contains the designation of the device, e.g. BM 147.

Changing the project view

You can use the **View > Project tree >...** menu command to:

- display additional information about the objects and
- show/hide hierarchical levels.

Actions

The main actions available in the project tree are as follows:

- Navigating between different charts.
- Moving, copying, inserting and deleting objects.
- Looking up and modifying properties.
- Downloading programs and interconnections to the devices of the plant.
- Comparing online and offline data.
- Creating and opening subordinate charts in the plant tree.

Reference to other windows and views

When you insert a PROFInet component into the SIMATIC iMap project, the technological function in the plant tree is automatically displayed in the project tree and the device is displayed in the net tree.

Double-clicking on an object in the project tree highlights all the associated objects in the other windows.

3.4.6 Library window

Description

Several libraries can be opened concurrently in the library window. Libraries are used to manage and structure PROFInet components.

The PROFInet component from a library can be displayed with large or small icons or as a list with or without detailed information via the **View** context menu.

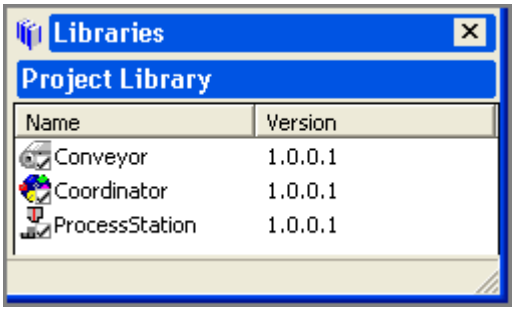


Figure 3-11 Library window

The project library is assigned to the most recently opened project. It is automatically opened, saved and closed together with the project.

Actions

You can carry out the following actions in the library window:

- Creating, opening and closing libraries.
- Importing PROFInet components from the file system into a library.
- Inserting PROFInet components from a library into the plant or net view.
- Cutting or copying PROFInet components and pasting them into other libraries.
- Displaying the properties of a PROFInet component.

Note

Libraries are stored as folders in the file system, where they can be moved, copied, inserted or deleted. Libraries which are deleted in Explorer can no longer be opened via SIMATIC iMap.

Reference to other windows

If a PROFInet component is selected in the library window, information on this component is displayed on four information tabs in the preview window.

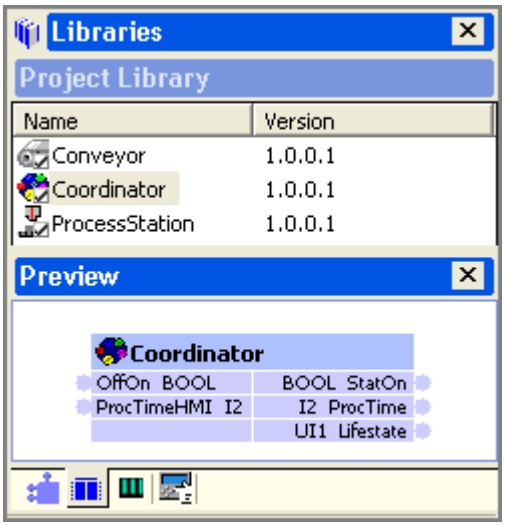


Figure 3-12 Library and preview windows

3.4.7 Preview window

Description

The preview window displays information on each PROFInet component selected in a library on four information tabs.

The library window must be open in order to open the preview window.

Info tab

This tab displays information on the PROFInet component selected in a library.

Double-click on the "Documentation" link to open the documentation for the PROFInet component. The link is only displayed if the component contains a documentation link.

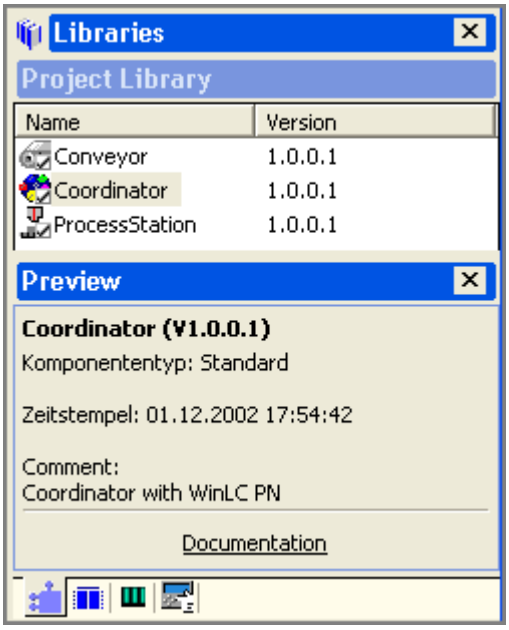


Figure 3-13 Preview window, Info tab

Function tab

This tab displays the technological function of the PROFInet component selected in a library.

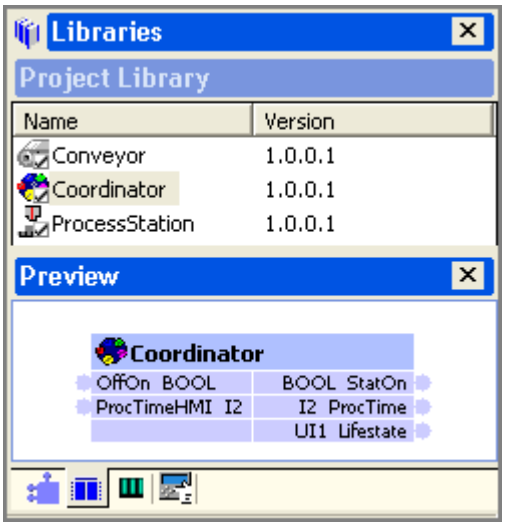


Figure 3-14 Preview window, Function tab

Device tab

This tab displays the device for the PROFInet component selected in a library.

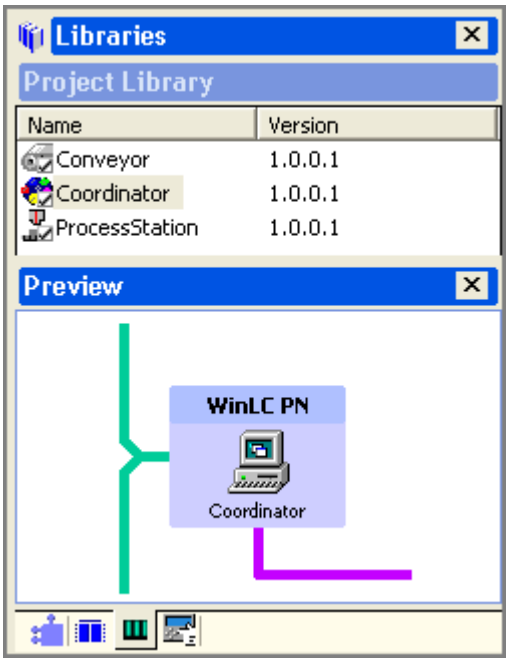


Figure 3-15 Preview window, Device tab

HMI tab

This tab displays the HMI units of the PROFInet component selected in a library (if present).

Actions

You can carry out the following actions in the preview window:

- On the Info tab: Open the documentation stored for a PROFInet component (if present).
- On the Function tab: Display the technological function.
- On the Device tab: Display the device.
- On the HMI tab: Display the HMI units.

Reference to other windows and views

The preview window can only be opened if the library window is open. The preview window is closed when the library window is closed.

3.4.8 Diagnostic window

Description

Diagnostic information on process variables and on faults in technological functions, devices and interconnections is displayed on three tabs in the diagnostic window. The three tabs in the diagnostic window are:

- Functions
- Device
- Variable table - described in a separate section.

To display the diagnostic information on the "Functions" and "Devices" tabs, select the **Online > Monitor** menu command.

Functions tab

All the malfunctions are displayed in the left-hand window. In the right-hand window, you will find detailed information about each selected object and, if relevant, buttons for downloading or calling up help or device-specific diagnostics.

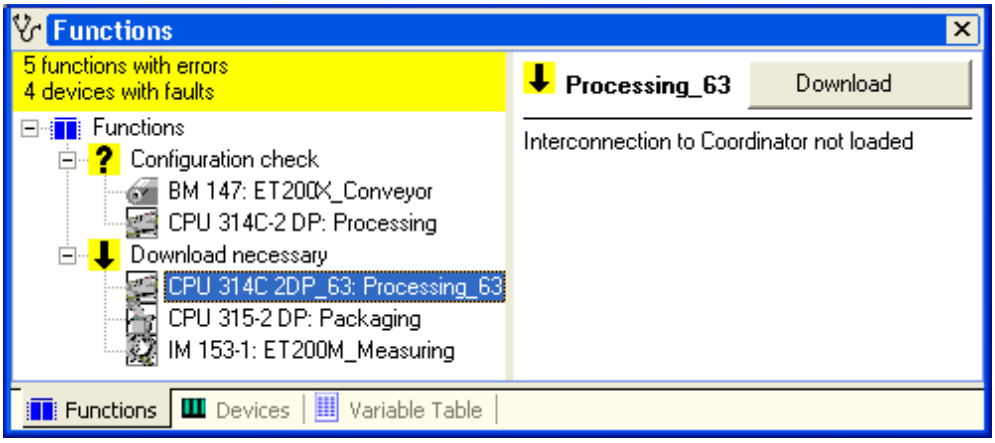


Figure 3-16 Diagnostic window, Functions tab

Devices tab

Information on all faulty devices is displayed in the left-hand window. In the right-hand window, you will find detailed information (and possible causes and remedies) about each selected object and buttons for calling up help or device-specific diagnostics.

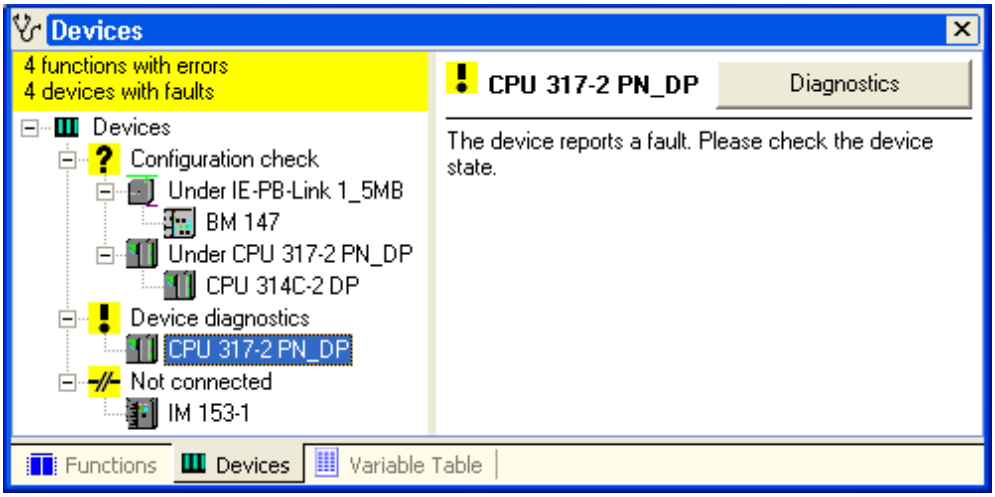


Figure 3-17 Diagnostic window, Devices tab

Actions

You can carry out the following actions in the diagnostic window:

- Finding and analyzing errors.
- Reading troubleshooting information, e.g. that a download is required.
- In the right-hand window, you can click on any buttons that are present:

Button	Action
Diagnostics	Calls up the device-specific diagnostics
Download	Downloading interconnections
Help	Calls up help

Reference to other windows and views

A fault that appears in the diagnostic window is identified by a symbol on the affected device in the net view, on the technological function in the plant view and on the instance in the project view.

Double click on a faulty function in the diagnostic window to display the affected technological function in the plant view.

Double-click on a faulty device in the diagnostic window to the affected device in the net view.

Example of faults in technological functions

The following diagram illustrates technological functions for which the interconnections will have to be downloaded. The right-hand window shows which interconnections have to be downloaded for the selected function. If you click on the "Download" button, the interconnections are downloaded to the target system.

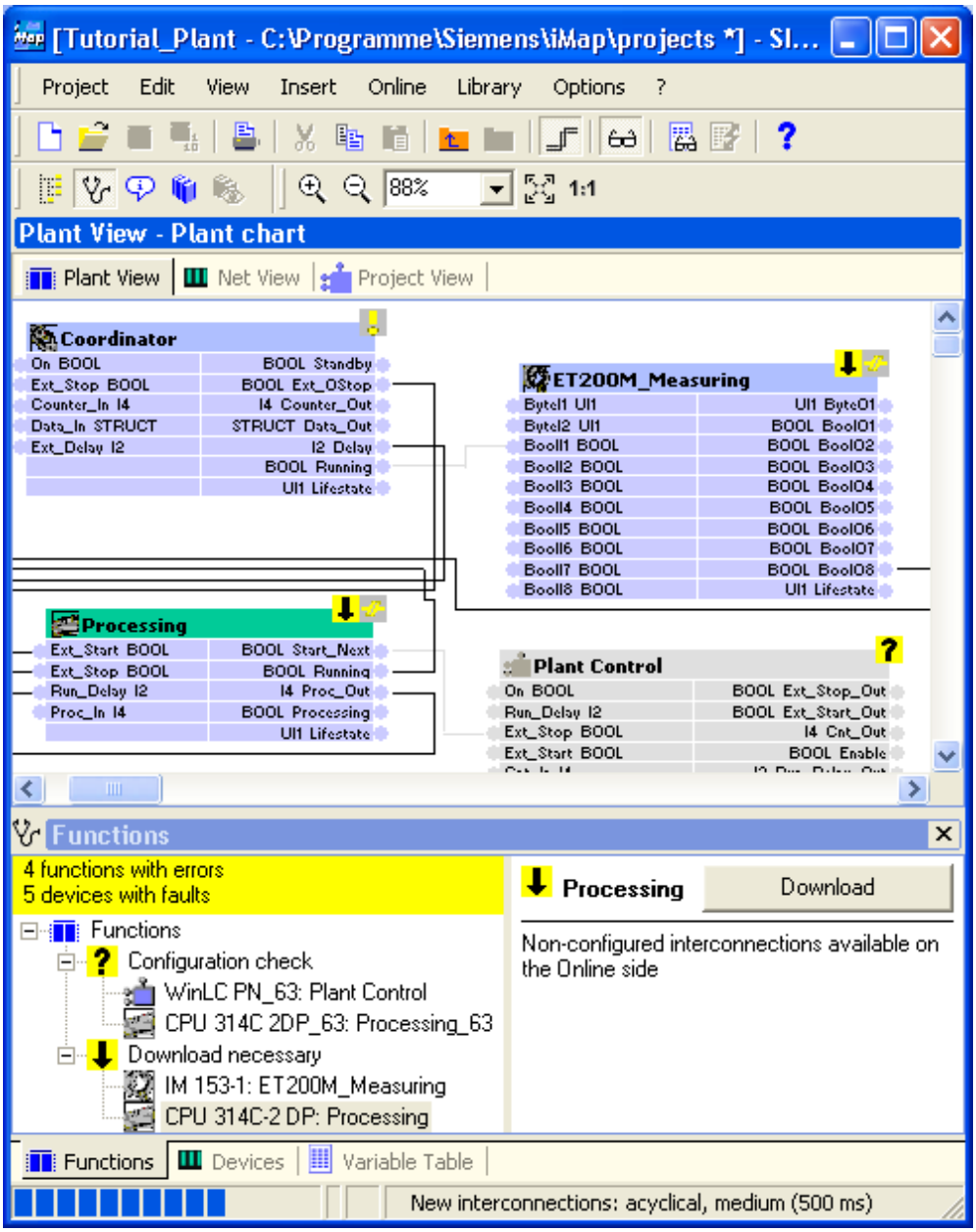


Figure 3-18 Diagnostic window: Example of faults in technological functions

3.4.9 Diagnostic window, "Variable table" tab

Description

The variable table is used in SIMATIC iMap for online monitoring and control of variables during the plant testing and commissioning phase. It has its own online mode that can be switched on and off independently of the online monitoring in the plant and net views.

The variable table contains the data for the connectors of the SIMATIC iMap project to be monitored. You can enter the connectors directly or use drag-and-drop to insert them from the plant view into the variable table.

Individual columns in the variable table can be shown / hidden using the **View > Variable table >**... menu command or with the **Columns >**... context menu.

The following diagram shows a variable table in the online view.

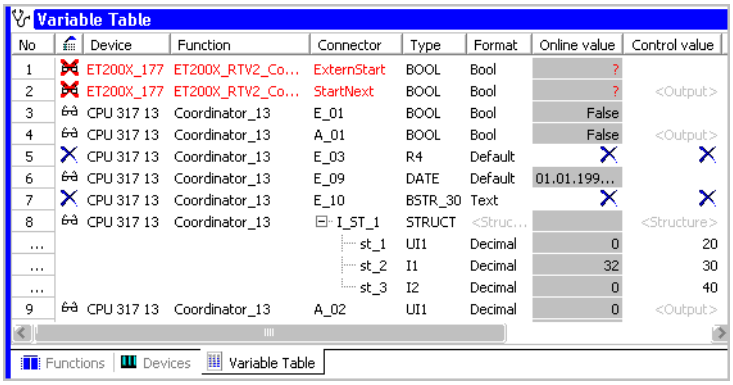


Figure 3-19 Diagnostic window, "Variable table" tab

Actions

You can carry out the following actions in the variable table:

- Adding, copying, deleting and sorting entries
- Changing the display format
- Showing/hiding columns
- Monitoring and controlling all or just selected variables online
- Editing control values and transferring them to the devices of the plant for testing purposes.
- Importing and exporting data

Reference to other windows

The **Go To > Function connector** context menu command highlights the associated connector in the plant view.

3.4.10 Information window

Description

The information window displays information about current actions in SIMATIC iMap. The appropriate tab is opened automatically when new information arises about an action.

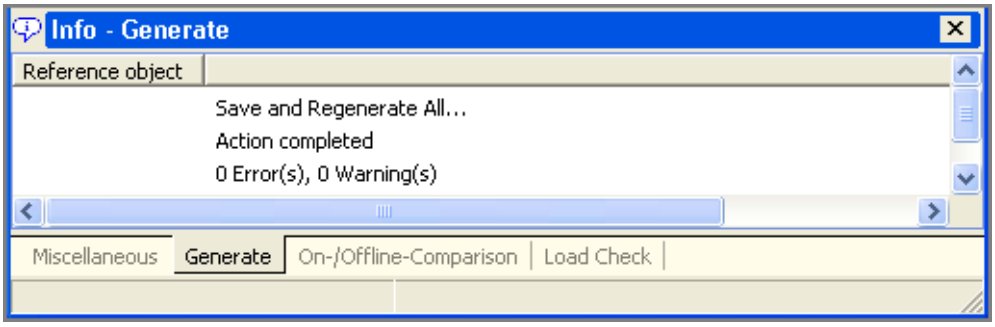


Figure 3-20 Information window

Content of the information window

The following messages are automatically displayed on the tabs in the information window:

Tab	Content
General	Status and progress of the action, plus any errors that occur while running commands, such as Open and Save, Download or Online Connection. Results when searching for objects.
Generate	Generation status and progress
Online / offline comparison	Result of the online / offline comparison of programs and interconnections
Utilization	Result of the utilization check for devices and functions

The "Reference object" column lists the names of the objects to which the messages relate.

Note

The old content of the information window is not automatically deleted when new messages are displayed.

Editing the content

You can edit the content of the information window as follows:

- Use the **Edit > Information window > Copy All** menu command to copy all the messages in text format to the clipboard so that they can be further edited, e.g. by pasting them into a text editor.
- Use the **Edit > Information window > Delete All** menu command to delete all the messages.

Reference to other windows

Double-click on a reference object to highlight the associated object in the relevant view.

3.4.11 Information window, "General" tab

Displays information about actions such as opening or creating projects and libraries in SIMATIC iMap. This information window tab opens automatically when new information arises about such actions.

3.4.12 Information window, "Generate" tab

Displays the progress and any errors during generation of the project. This information window opens automatically when a project is generated.

3.4.13 Information window, "Online-offline comparison" tab

Displays the results of the online/offline comparison of programs and/or interconnections. This information window tab opens automatically when an online/offline comparison is carried out.

3.4.14 Information window, "Utilization" tab

Displays the results of the utilization check of the configured devices and functions. This information window tab opens automatically when new information arises about such actions.

3.4.15 Menu bar

Description

The menu bar contains the menu commands for SIMATIC iMap. A brief description of the selected menu command is displayed on the SIMATIC iMap status bar. A summary of all the menu commands can be found in the appendix.

3.5 Setting up and starting tools

You can configure SIMATIC iMap so that you can start any software tool with a menu command, e.g. in order to further edit data from the current project.

To set up a new tool:

1. Select the **Options > Customiye** menu command and open the "Tools" tab
2. Click on the "New Entry" button.
3. In the "Name" box, enter the name under which the program is to be called in SIMATIC iMap.
4. In the "Command" box, enter the path of the program or click on the "Browse" button to select the program from the file system. You can select the following:
   - the actual program (e.g. winword.exe) or
   - a file (e.g. <document>.doc) to be opened with this program.
5. Click on "OK" or "Accept" to confirm your input.

Result: The program is added to the list of tools that can be called directly in SIMATIC iMap.

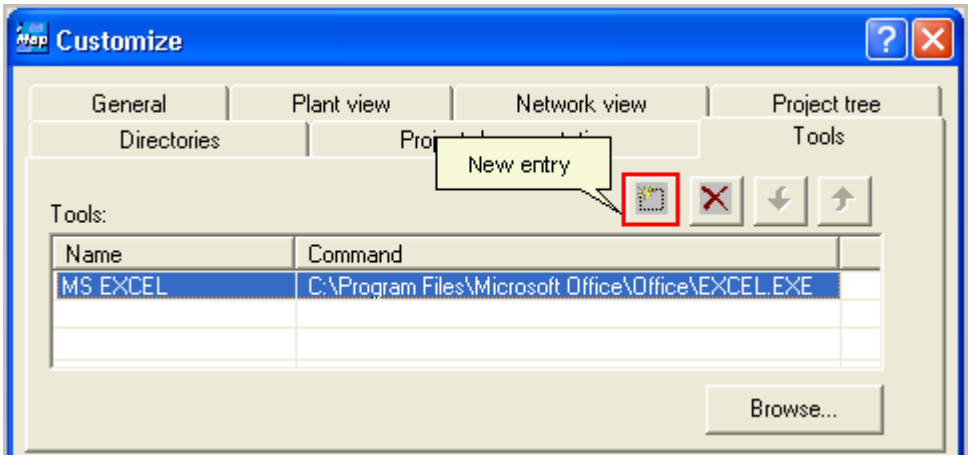


Figure 3-21 Setting up tools

Note

You can use the buttons in the Customize dialog to move or delete entries in the tools list.

To start a tool you have set up:

You can only call tools that are entered under "Tools" in the settings.

To start a tool, select the **Options > Tools >** ... menu command.

Result: The called program is started.

Configuring plants

4

4.1 Basic procedure for configuring the plant

Requirements

The following requirements must be fulfilled before you can configure a plant using SIMATIC iMap:

- SIMATIC iMap must be installed on your PC/PG.
- The device-specific configuration and programming tool, e.g. STEP 7, is installed on your PC/programming device (optional). Depending on the type of device, this software is needed in order to carry out certain actions, e.g. Generate.
- The necessary PROFInet components must have been created.

Basic procedure

1. Start SIMATIC iMap
2. Create or open a project.
3. The options are as follows, depending on whether the PROFInet components have already been imported into a target library:
   - If yes, then open the library with the PROFInet components.
   - If no, then open a library or create a new library and import the PROFInet components.
4. Insert PROFInet components into the SIMATIC iMap project.
5. Couple devices in the net view.
6. Assign IP and/or PROFIBUS addresses to the devices.
7. Interconnect technological functions in the plant view.
8. Modify properties (optional).
9. Check the configuration (utilization) of the devices and functions (optional).
10. Re-edit PROFInet components (optional)
11. Replace instances (optional).
12. Generate a SIMATIC iMap project.
13. Document a SIMATIC iMap project (optional).
14. Print a SIMATIC iMap project (optional).
15. Archive a SIMATIC iMap project and library (optional).

4.2 Working with projects

4.2.1 Creating a new project

Creating a new project

A new SIMATIC iMap project is always opened when you open SIMATIC iMap. You can edit and save this project or open an existing project for editing.

How to create a new SIMATIC iMap project

The options for creating a new SIMATIC iMap project are as follows:

- Restart SIMATIC iMap or
- Select the **Project > New** menu command.

A new SIMATIC iMap project opens in both cases. The associated project library is opened in the library window.

The SIMATIC iMap project is stored in a folder.

Notice

The content of a SIMATIC iMap project folder must only be edited with SIMATIC iMap.

If you change the project data using Windows Explorer, for example, it may no longer be possible to open the project in SIMATIC iMap.

The actual project folder may be renamed, moved, copied or deleted in Windows Explorer, however.

Note

In SIMATIC iMap, you can only edit one project at a time. If you wish to edit several projects at the same time, then you must start several instances of SIMATIC iMap.

4.2.2 Opening and closing projects

Requirement

A new, empty SIMATIC iMap project is always opened when you open SIMATIC iMap. You can open a different project at any time, provided that this project was saved in SIMATIC iMap.

In SIMATIC iMap, only one project may be open at any given time. When you open a new project, the current project is closed and you are prompted to save any changes you have made.

Note

A SIMATIC iMap project cannot be open in two SIMATIC iMap applications concurrently.

To open a project in SIMATIC iMap

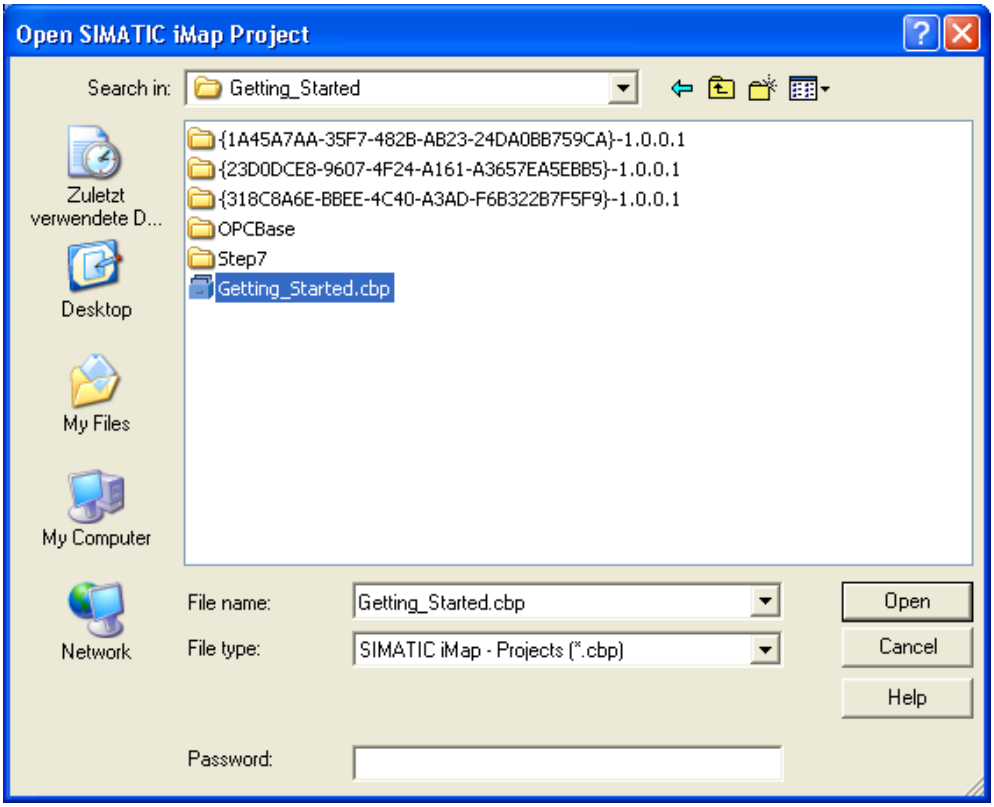


Figure 4-1 Open the SIMATIC iMap project

1. Select the **Project > Open...** menu command.

   A dialog box for browsing the file system for existing projects opens. Look for a project file with the extension .cbp.

2. Select the project folder from the "Search in" box. The box beneath display only directories and files of the desired file type - SIMATIC iMap project.

3. Select the file name with the extension .cbp.

   The file name is displayed in the "File name" box.

4. If the selected project is password-protected, enter your password in the "Password" box.

5. Click on the "Open" button.

Result: The project is opened in SIMATIC iMap.

Hint: The "File name" drop-down list contains the most recently opened SIMATIC iMap projects.

To close a project in SIMATIC iMap

To close a project in SIMATIC iMap, you can either:

- Exit SIMATIC iMap,
- Create a new project or
- Open another project.

Each of these options closes the current project. If you have made any changes to the current project or to the project library, you are first prompted to save these changes. A dialog box with the following selection options opens:

- "Yes" to save the changes to the current project before closing
- "No" to close the current project without saving
- "Cancel" to cancel the operation and return to the current project.

Note

Changes that have to be saved with the project include the following:

- Changes to the project library
- Changes to the variable table
- Changes to the OPC prefix

Projects from the previous version

The way in which data is stored in the latest version of SIMATIC iMap (V2.0) has changed, and is no longer compatible with the previous version (V1.2).

If you want to edit a project that was created in SIMATIC iMap V1.2, you will have to convert the data storage system to the current version. The associated SIMATIC iMap library must be open to be able to convert the PROFInet components used.

1. Start SIMATIC iMap
2. Use the **Library > Open...** menu command to open the library that was used for the project from the earlier version.
3. Open the project using the **Project > Open** menu command.

Result: The project is converted to the new version of the data storage system, and the PROFInet components used are imported into a project library.

Notice

After conversion, you will no longer be able to open the project using SIMATIC iMap V1.2.

Recommendation:

If you wish to continue opening the project in SIMATIC iMap V1.2, create a copy of the project before you open it in the current version.

4.2.3 Saving and archiving projects

Data storage for a SIMATIC iMap project

A SIMATIC iMap project is created in the form of a directory tree, and can be stored as an archive file.

If you save it, all the files belonging to the SIMATIC iMap project are stored in a separate folder. You are prompted to enter the path when you save the project for the first time. You can enter any name for the project file. It is automatically given the extension .cbp. The project file is stored together with other project data in a folder of the same name.

If you archive it, all the project data is stored in an archive file. You can enter any file name, and the archive file is automatically given the extension .arp.

Note

Use the **Options > Customize** menu command to define, on the "Directories", a storage location that will be suggested by default when you open, save or archive projects.

Password protection

You can assign a password to your SIMATIC iMap project in order to protect it against unauthorized access. This password is defined via **Project > Properties** on the "General" tab, and must be entered whenever you open the project. The project cannot be opened without the password.

When you archive a project, it retains its password protection.

To save a SIMATIC iMap project:

The options for saving a project in SIMATIC iMap are as follows:

- Select the **Project > Save** menu command to save the current project under the same name. The old project is overwritten.
- Select the **Project > Save As...** menu command to save the current project under a different name. The old project remains unchanged. You can enter any path and name for the new project.

If you save a project with a new name, it retains its password protection. The project library is saved together with the project.

To archive a SIMATIC iMap project:

Note

You cannot archive SIMATIC iMap projects unless they are closed. To archive the current project, you must first close it by creating a new project or opening another project.

To archive a project, proceed as follows:

1. Make sure that the project to be archived is closed and that no other programs are accessing the project folder.
2. Select the **Project > Archive...** menu command.

   A dialog box for browsing the file system for existing projects opens. Look for a project file with the extension .cbp.
3. Select the project folder from the "Search in" box. The box beneath displays only directories and files of the desired file type - SIMATIC iMap project.
4. Select the file name with the extension .cbp.

   The file name is displayed in the "File name" box.
5. Click on the "Open" button.

   A dialog box for selecting the storage location opens.
6. In the "Archive iMap project library as..." dialog box, select the folder in which the archive file is to be stored.
7. Accept the name suggested in the "File name“ box or enter a different name for the archive file, and click on "Save“.

Result: The archive file is created and the result is signalled on screen. The project library is archived together with the project.

To retrieve a SIMATIC iMap project:

Note

You can only retrieve projects that were archived with SIMATIC iMap.

To retrieve a project, proceed as follows:

1. Select the **Project > Retrieve...** menu command.

   A dialog box for browsing the file system for existing archive files opens.
2. Select an archive file (.ARP file). There are two options:
   - Search for the required archive file in the "Search in" box or
   - Select the most recently archived projects from the "File name" drop-down list.
3. Click on the "Open" button.

   A dialog box for selecting the target folder opens.
4. Select the folder to which you wish to save the retrieved project and click on "OK".

Result: The project folder is created in the specified target folder and the result is signalled on screen.

Note

When you archive a project, it retains its password protection.

4.2.4 Generating the project

Generating in SIMATIC iMap

You must generate a project before you can download data from that project to the devices of the plant. When you generate the project in SIMATIC iMap, the current project data for all instances of PROFInet components contained in the SIMATIC iMap project is prepared for specific devices, so that it can be downloaded to those devices in the plant.

To generate, SIMATIC iMap requires the vendor-specific configuration and programming tool for the configured devices, e.g. STEP 7 for SIMATIC programmable controllers. A separate generation process is required for each integrated vendor-specific configuration and programming tool. The current version of SIMATIC iMap supports the following generation processes:

Menu command	Device type
Project > Generate > Control unit >	Control units of the SIMATIC programmable controllers
Project > Generate > HMI units >	HMI units of the SIMATIC programmable controllers

Unless expressly stated, the following descriptions relate to generation of the control units of the SIMATIC programmable controllers. A description of the HMI units can be found under "Special PROFInet component types, PROFInet components with HMI units".

The shadow project

The shadow project is a folder that contains the vendor-specific data for the control units in the project. HMI units and singleton components are not contained in the shadow project (see the section entitled “Special PROFInet component types“).

The shadow project is created from the component projects in the project library when the SIMATIC iMap project is generated for the first time. All changes to PROFInet components in the SIMATIC iMap project, e.g. IP addresses or PROFIBUS addresses, are transferred to the shadow project whenever the project is generated again.

The shadow project is needed for program downloads.

Note

The **Project > Save** menu command does not update the shadow project.

Caution

The shadow project must not be modified directly via the vendor-specific configuration and programming tool (e.g. STEP 7).

Changes to the shadow project may lead to inconsistent data in the SIMATIC iMap project, preventing any further downloads.

Possible remedies

- **Re**generate SIMATIC iMap project
- Create new PROFInet components from the modified shadow project and replace the old instances.

The **Edit > Check Consistency** menu command compares the current shadow project with the corresponding component project(s). The result of the consistency check is displayed on the "General" tab in the information window.

Which actions are transferred when the project is generated?

The following actions in SIMATIC iMap are transferred when the project is generated:

- Cutting, copying or deleting devices or technological functions and their interconnections
- Replacing instances
- Inserting new instances of PROFInet components into the project
- Changing the properties of instances, e.g. names or addresses
- Changes to the device networking, e.g. coupling and uncoupling PROFIBUS devices

Note

If you have made any of the above changes to the project, they cannot be downloaded to the devices of the plant until you have generated the control units in the project.
You can tell from the generation status whether the generation is required. The generation status of the instance of a PROFInet component is displayed in the project view and in the Properties dialog box for the instance. The generation status "generated" means that downloading to the devices of the plant is possible.

Which actions are not transferred when the project is generated?

- Changes to the device-specific data of the shadow project that you make using one of the **Edit > Special...** menu commands. These changes must be downloaded to the devices in the plant using the vendor-specific configuration and programming tool.
- Changes to the graphical representation, e,g, the position within the plant view.

Requirement

Before you generate a project, you must ensure that the necessary vendor-specific configuration and programming tool, e.g. STEP 7, is installed on the computer.

To generate the changes to the control units of the project:

Call the **Project > Generate > Control unit > Changes only** menu command to generate just the changes to the project. The generation progress messages and any error messages are displayed on the "Generate" tab in the information window.

When you run this menu command for the first time, the shadow project is created from the component projects in the library(ies). Whenever this menu command is called again, the shadow project is updated with any changes you have made.

If the generation was successful, all the components of the project receive the generation status “generated“. The program can then be downloaded. The generation status can be seen in the project view (green icon) or from the properties of the instances.

To regenerate the control units of the project:

If the SIMATIC iMap project cannot be generated because the shadow project contains incorrect or inconsistent data, for example, then the shadow project must be recreated. When you regenerate, the shadow project is recreated from the component projects for the PROFInet components in the library(ies).

Select the **Project > Generate > Control unit > All** menu command. If the project has already been generated, a message appears to indicate the effect that the command has had. Click on "Yes" to acknowledge this message if you wish to regenerate.

The generation progress messages and any error messages are displayed on the "Generate" tab in the information window.

Result: The shadow project is created once more from the component projects for the PROFInet components in the project library. The regenerated shadow project does not contain changes you have made using the vendor-specific configuration and programming tool. A copy is made of the old shadow project. You can use this to copy any changes in the new shadow project.

Note

Only 3 backup copies of the shadow project are kept in the project directory.

If there are 3 backup copies already, then the oldest is deleted during the generation process.

Cancelling generation

Generation can take a long time for large projects, You can cancel and subsequently resume the generation of changes at any time by clicking on the "Cancel" button in the message box. Any data you have already generated is retained when you cancel.

If you then call the **Project > Generate > Control unit > Changes only** menu command again, only the new, modified and still ungenerated parts of the project are generated.

Generating the HMI units

The HMI units of the instances are generated using the **Project > Generate > HMI units** menu command.

Further information can be found under "Special PROFInet component types, PROFInet components with HMI units".

4.2.5 Documenting and printing a project

Content of the project documentation

You can create documentation containing the following information for a SIMATIC iMap project:

- General project data such as name, path and creation date
- All the technological functions and subordinate charts of the plant chart and their interconnections
- All the PROFInet and PROFIBUS devices of the network chart
- The PROFInet components used as library elements and their instances (devices and functions) in the project
- Optional – descriptions of the interconnectable and non-interconnectable connectors of the component interfaces
- Optional – graphical representations of all charts (network chart, plant chart and optionally subordinate charts)

To create the project documentation

1. Select the **Project > Documentation** menu command.
2. In the "Create Project Documentation" dialog box, activate the options for the information to be transferred to the documentation.
3. If necessary, click on the "Modify" button and change the path under which the project documentation is stored.
4. Confirm by clicking on the "OK" button.

Result: The most current version of the project is documented. The project documentation is stored as a collection of HTML files together with the associated graphics files (icons, etc.) in the folder.

The project documentation is structured as an online document, rather than as a template for printing. Use the menu command **Project > print** to print the project data.

Note

The project documentation is recreated whenever you call the **Project > Documentation** menu command.

You can display stored project documentation versions by opening the HTML file directly in an HTML browser.

To set up the page for printing:

Select the **Project > Page Setup** menu command to make the following settings for printing the current window:

- Paper size and source
- Paper orientation (portrait or landscape)
- Width of the page margins

To set up the header and footer

You can set up the header and footer as follows in order to print the plant or net view:

1. Select the **Project > Headers and Footers** menu command.

   A dialog box for setting the header and footer opens.

2. Enter the content of your header and footer. You can edit the “Left“, “Middle“ and “Right“ boxes. The field buttons can be used to automatically insert field functions, such as the project name or page.
3. Specify the font and point size, if necessary.
4. You can specify the type of separating lines to be inserted between adjacent pages and for the lines in the header and footer.
5. Click on “OK“ to accept the settings.

To print the project:

- Select the **Project > Print > Active Window** menu command to print the plant view, net view or project view for the current project. The active window is printed with the current zoom factor.
- Use the menu command **Project > Print > All Charts** menu command to print all the charts in the project, i.e. the net view and the plant view, and all subordinate charts. They are printed with the zoom factor 100%.

Large projects are printed on several pages.

Hint: Use the menu command **View > Plant view > Show Page Margins** to show and hide the page margins in the plant view, thus providing a preview of the printed area.

4.3 Working with libraries

4.3.1 Library types in SIMATIC iMap

Project libraries and global libraries

There are two types of library in SIMATIC iMap:

- Project library, which is contained in a SIMATIC iMap project and is opened, closed, archived and retrieved automatically with the project. The project library contains all the PROFInet components whose instances are contained in the project. The information needed to generate the project is thus available.
- (Global) library that can be opened, closed archived and retrieved using menu commands. The global library contains PROFInet components that can be used in several projects.

  In the following descriptions, the global library is simply called the "library".

When a PROFInet component is inserted from a global library into the project, it is automatically inserted into the project library as well. PROFInet components that have already been inserted into the project are identified in the project library by a tick (see diagram below).

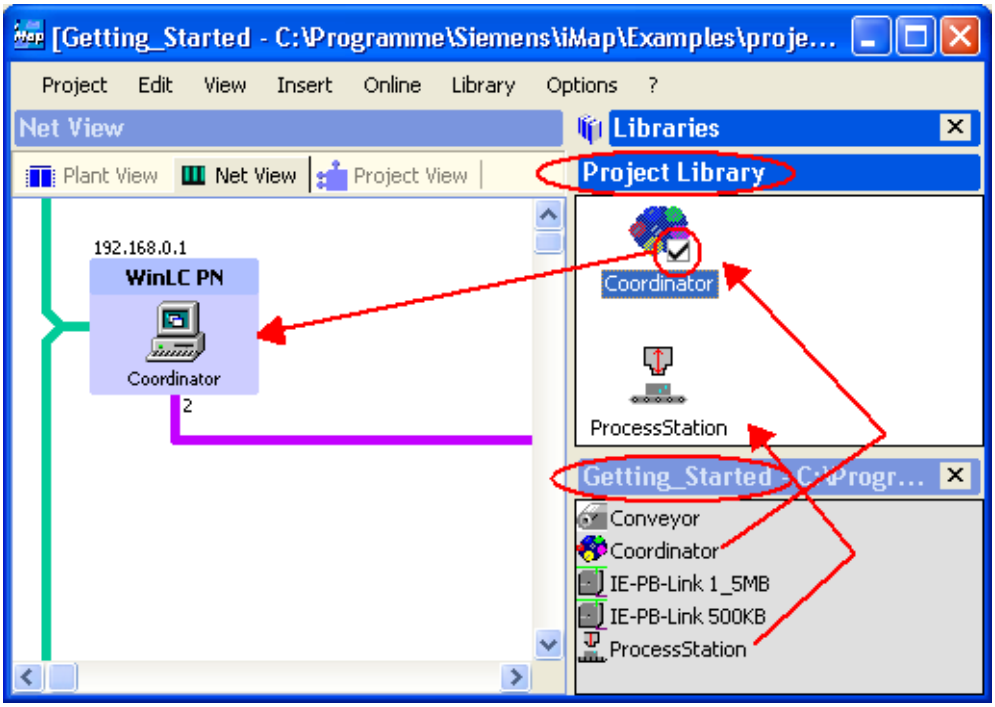


Figure 4-2 Example: Project library and global library

Comparison between a project library and a global library

Property/Action	in the project library	in global libraries
Create	automatically with the project	independently of the project, using the **Library > New...** menu command
Name	Project library	any
Open / Close	automatically with the project	separately from the project, using the **Open library...** or **Close library** menu command
Import PROFInet Components	• automatically when the PROFInet component is inserted into the project from a global library or • using the **Library > Import components** menu command	using the **Library > Import components** menu command
Number of open libraries	just one	any
Copy PROFInet component	any	any
Delete PROFInet component	only possible if there is no instance of the PROFInet component in the project	any
Archive / Retrieve	automatically with the project	using the **Library > Archive...** or **Library > Retrieve...** menu command

4.3.2 Creating a new library

Data storage system for SIMATIC iMap libraries

You can open, create or close any number of libraries in the SIMATIC iMap library window, regardless of which project you are editing.

New libraries are created as folders in SIMATIC iMap. When you create a new library, a library file with the extension .cbl is generated. You can specify any name. The file is stored in a folder of the same name. You can enter any path.

You can also archive an existing library. In this case, the entire content of the library is stored in an archive file with the extension .arl. You can enter any path and name for the archive file.

To create a new library:

1. In SIMATIC iMap, select the **Library > New...** menu command.

   A dialog box for browsing the file system opens.

2. Select the folder in which the library is to be created from the "Search in" box.
3. Enter the name of the library in the “File name“ box. The name is automatically assigned the extension .cbl.
4. Click on the "Save" button.

Result: The library is created and opened.

4.3.3 Opening and closing libraries

Requirement

The library must have been created in SIMATIC iMap.

To open an existing library:

1. In SIMATIC iMap, select the **Library > Open...** menu command.
   A dialog box for browsing the file system for existing libraries opens.
2. Select the library folder from the "Search in" box. The box beneath display only directories and files of the desired file type - SIMATIC iMap library.
3. Select the file name with the extension .cbl.

   The file name is displayed in the "File name" box.
4. Click on the "Open" button.

Result: The library is opened in the SIMATIC iMap library window.

Hint: The "File name" drop-down list contains the most recently opened SIMATIC iMap libraries.

To close a library

1. Click on the library that you wish to close.
2. You can then either:
   - Click on the cross (X) in the top right-hand corner of the library or
   - Select the **Library > Close** menu command or
   - Select the **Close library** command from the context menu.

Libraries from earlier versions

When you open a library that was created with an earlier version of SIMATIC iMap, it is automatically converted to the data storage system of the current version.

Notice

After conversion, the library can no longer be opened with the earlier version of SIMATIC iMap.

Recommendation:

If you would like to continue opening the library with the earlier version of SIMATIC iMap, then create a copy of the library before you open it in the current version.

4.3.4 Importing PROFInet components

PROFInet components in libraries

A PROFInet component must be located in a library before it can be inserted into a SIMATIC iMap project. Instances of the PROFInet component can then be inserted from this library into the project.

When you create a PROFInet component, you can define whether it should be stored in the file system or imported into an existing global library. If a PROFInet component was created in the file system, then it can subsequently be imported into a library in SIMATIC iMap.

Unique identification of PROFInet components

PROFInet components are uniquely identified by the identification (ID) and the version number. Both the ID and the version number are displayed in the "Properties" dialog for the PROFInet component.

Note

PROFInet components cannot be overwritten by importing into a library. If the library already contains a PROFInet component with the same version number and identification (ID), then the selected component will not be imported.

Requirement

The PROFInet component must have been created using the vendor-specific configuration and programming tool, e.g. STEP 7, and must have been stored in the file system.

To import a PROFInet component into a library:

1. Click on the library into which you wish to import the PROFInet component.
2. Select the **Library> Import components** menu command.

   A dialog box for browsing the file system for existing PROFInet components opens, and the system searches for the associated .XML files.
3. Select an XML file.

   Hint: Click on the down arrow in the "File name" box to display a list of the most recently opened XML files.
4. Click on "Open" to import the selected PROFInet component.

Result: The selected PROFInet component is imported and the component's icon appears in the library.

4.3.5 Administering PROFInet components in libraries

Editing PROFInet components in the library

You can edit PROFInet components contained in one or more libraries in the following ways:

- Move from one library to another
- Cut
- Copy
- Paste cut or copied PROFInet components

To move a PROFInet component:

You can move a PROFInet component from one library to another:

- Using Drag&Drop
- By cutting and pasting

To delete a PROFInet component:

You can delete a PROFInet component from a library:

- Using the "Delete" key
- Using the **Edit > Delete** menu command.

PROFInet components can only be deleted from the project library if they are not being used in the project.

Copying, cutting and pasting PROFInet components

You can use the following menu commands:

- **Edit > Copy** – Copies the selected PROFInet component to the clipboard.
- **Edit > Cut** – Cuts the selected PROFInet component and places it on the clipboard.
- **Edit > Paste** – Inserts the clipboard contents.

The commands are also available in the context menu, depending on which window is active.

4.3.6 Archiving and retrieving libraries

The following description relates solely to global libraries. The project library is always automatically archived and retrieved together with the project.

Data storage system for global SIMATIC iMap libraries

A global SIMATIC iMap library is created in the form of a directory tree, and can be stored as an archive file.

When you archive a global library, all the data for the PROFInet components contained in that library is stored in an archive file. You can enter any file name, and the file is automatically given the extension .arl.

Note

Use the **Options > Customize** menu command to define, on the "Directories" tab, a storage location for global libraries that will be suggested by default when you create, open or archive global libraries.

To archive a global library:

1. Select the **Library > Archive...** menu command.

   A dialog box for browsing the file system for existing libraries opens. Look for a file with the extension .cbl.

2. Select the library folder from the "Search in" box. The box beneath display only directories and files of the desired file type - SIMATIC iMap library.

3. Select the file name with the extension .cbl.

   The file name is displayed in the "File name" box.

4. Click on the "Open" button.

   A dialog box for selecting the storage location opens.

5. In the "Archive iMap library as..." dialog box, select the folder in which the archive file is to be stored.

6. Accept the name suggested in the "File name“ box or enter a different name for the archive file, and click on "Save“.

Result: The archive file is created and the result is signalled on screen.

To retrieve a library:

Note

You can only retrieve libraries that were archived with SIMATIC iMap.

To retrieve a library, proceed as follows:

1. Select the **Library > Retrieve...** menu command.

   A dialog box for browsing the file system for existing archive files opens.

2. Select an archive (.ARL file). There are two options:
   - Search for the required archive file in the "Search in" box or
   - Select a file from the list of most recently archived libraries from the "File name" box. (Click on the down arrow in the "File name" box to display a list of the most recently archived libraries.)

3. Click on "Open" to select the archive file.

   A dialog box for selecting the target folder opens.

4. Select the folder to which you wish to save the retrieved library and click on "OK".

Result: The library folder is created in the specified target folder and the result is signalled on screen.

4.4 Working with instances of PROFInet components

4.4.1 Inserting PROFInet components into a SIMATIC iMap project

Options for inserting into the SIMATIC iMap project

You can insert a PROFInet component into your SIMATIC iMap project from a library. You can insert a PROFInet component:

- into the plant view,
- into the net view,
- into the project view,
- into the project tree (plant tree and net tree).

In all cases, both parts of the PROFInet component are inserted - the technological function and the associated device. PROFInet components with no technological function can also be inserted into the specified windows, although they cannot be viewed in all of those windows.

Instances of a PROFInet component

When you insert a PROFInet component from a library into the SIMATIC iMap project, it creates an **instance** of the PROFInet component in the project, i.e. one usage of this component type. One or more instances of a PROFInet component may be inserted into a project. Each instance is assigned additional properties, for example, a name and address.

The association between all the instances and the original PROFInet component is indicated by their identical identification (ID) and version number.

Requirement

The PROFInet components that you want to insert into your project must be contained in a library in SIMATIC iMap.

To insert a PROFInet component into the project:

1. Select the PROFInet component from the library.
2. Insert it into the window You have several options, e.g.:
   - Drag-and-drop
   - **Copy** and **Paste** menu commands (into the net view, plant view, project view or project tree).

     When you call the menu command, you must position the instance in exactly the right place, as with drag-and-drop.

Result: The technological function of the component - if it contains one - appears in the plant view and in the plant tree of the project tree. The associated device appears in the net view and in the net tree of the project tree.

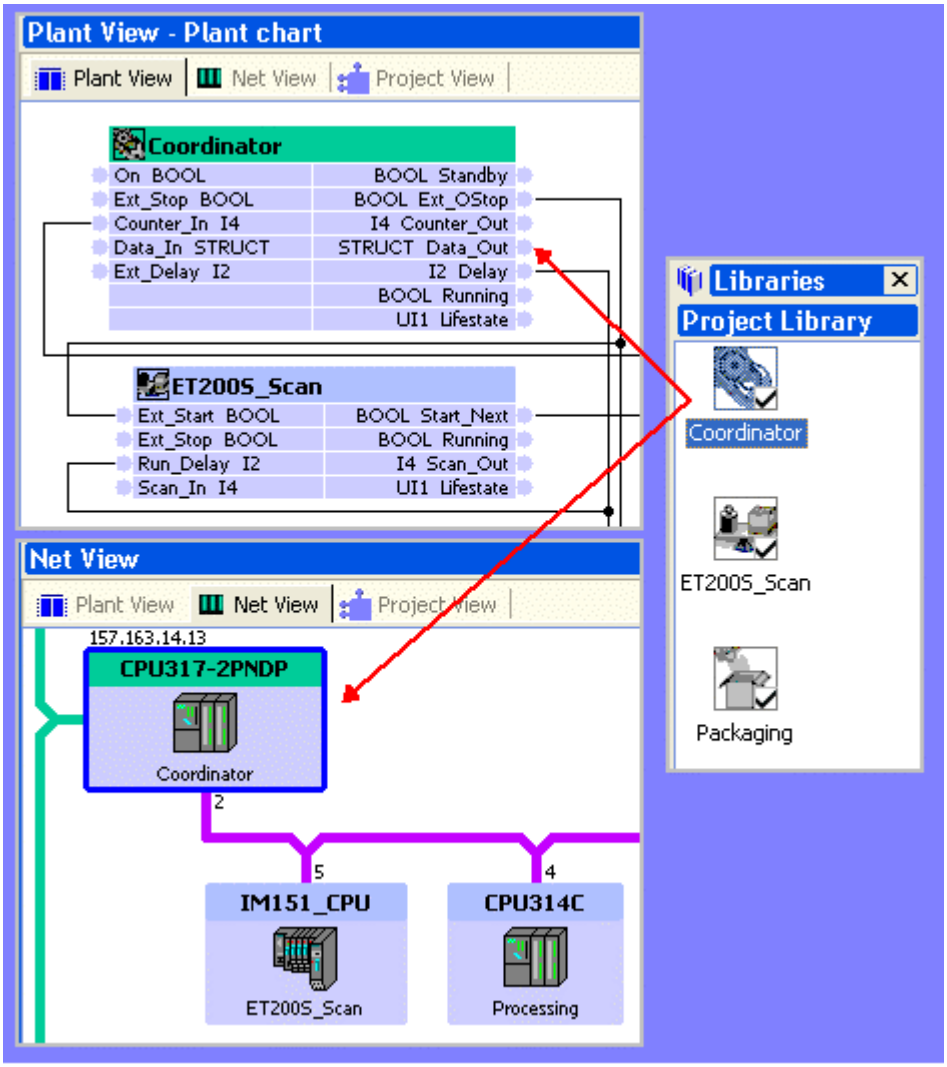


Figure 4-3 Inserting a PROFInet component into a SIMATIC iMap project

The association between PROFInet components and their instances is represented in the project view (see diagram below).

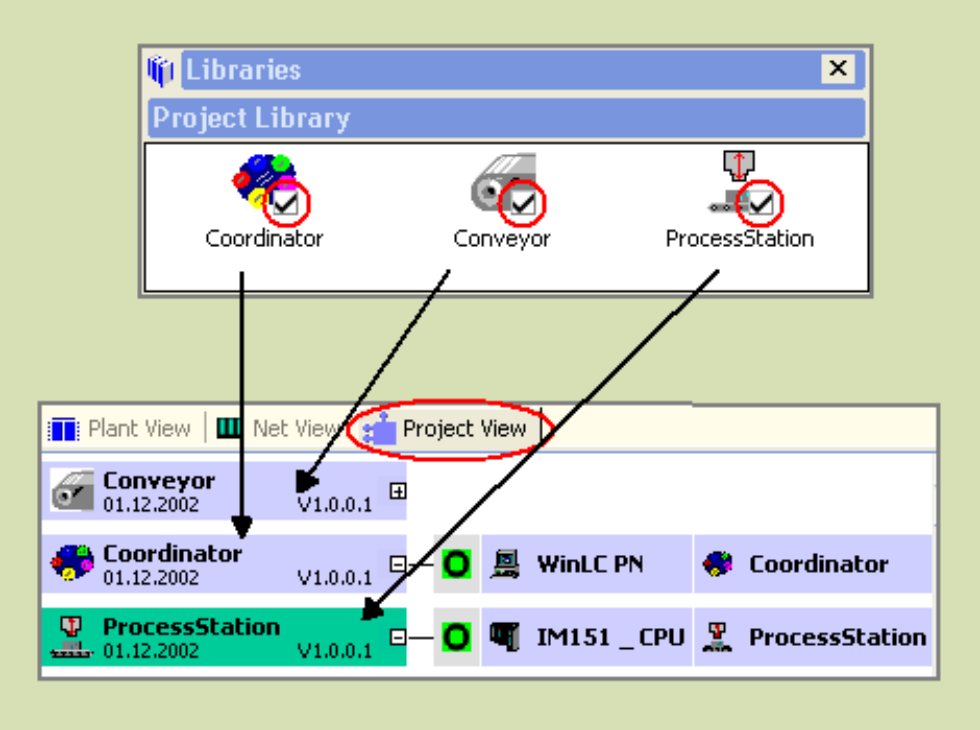


Figure 4-4 PROFInet components and their instances in the project view

4.4.2 Coupling devices in the net view

Arrangement of the devices in the net view

The devices in the net view are always arranged according to the following rules:

- All PROFInet devices with Ethernet connections are automatically connected to the Ethernet bus.
- PROFIBUS devices are automatically coupled or are coupled using drag-and-drop to the PROFIBUS of the DP master.

Changing the networking

You can make the following changes to the networking:

- Coupling a free-standing PROFIBUS device to a PROFInet device with proxy functionality.
- Moving and copying the PROFIBUS devices to the same or another PROFIBUS. In this case, remember that the PROFIBUS addresses on a PROFIBUS must not be assigned more than once.
- Moving and copying the PROFInet devices as required on the vertical or horizontal Ethernet bus. PROFInet devices with proxy functionality can only be coupled to the vertical Ethernet bus. PROFInet devices without proxy functionality may be coupled and moved both on the vertical Ethernet and on the horizontal Ethernet nodes.

Accurate positioning of devices

You can position devices accurately by pasting them from the library into the net view or into the net tree:

- directly with drag-and-drop,
- using the **Copy** and **Paste** menu commands.

When you call the menu command, you must position the device in exactly the right place, as with drag-and-drop. The possible insertion positions are indicated in color.

Positioning devices automatically

If you do not position the devices accurately in the net view or net tree using drag-and-drop, but rather insert them into the plant view or project view, for example, then they are positioned automatically.

- PROFInet devices are automatically coupled to the Ethernet bus.
- PROFIBUS devices are positioned according to how the "Couple PROFIBUS devices automatically" option is set.

"Couple PROFIBUS devices automatically" option

You can use the **Options > Customize...** menu command the "Net view" tab to activate the "Couple PROFIBUS devices automatically" option. This setting takes effect if you do not position instances accurately in the net view or net tree using drag-and-drop, but rather insert them into the plant view or project view, for example.

- Option activated:
  Newly inserted PROFIBUS devices (DP slaves) are automatically coupled to the PROFIBUS of the most recently inserted PROFInet device with proxy functionality.

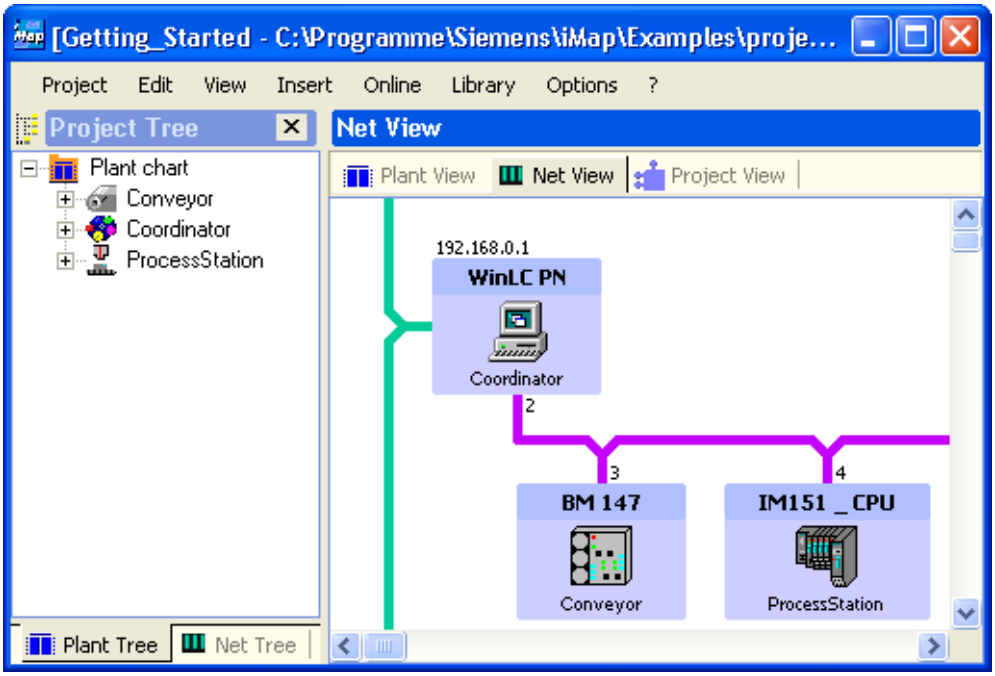


Figure 4-5 Coupled PROFIBUS devices

- Option deactivated:
  Newly inserted PROFIBUS devices (DP slaves) remain uncoupled and must be subsequently positioned.

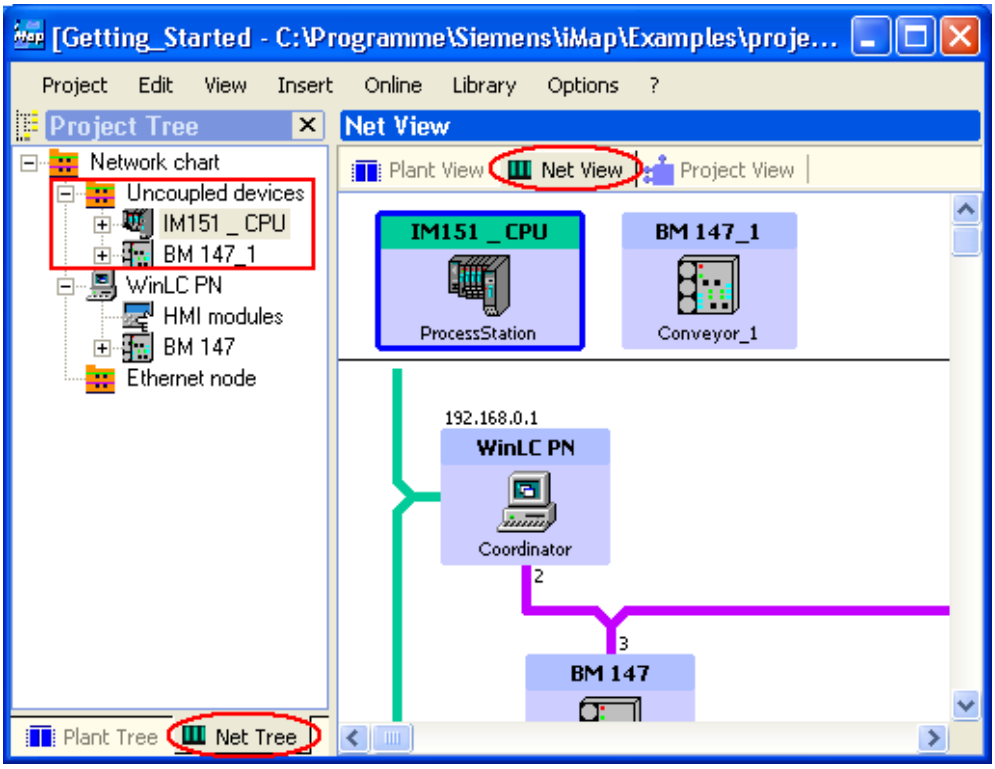


Figure 4-6 Uncoupled PROFIBUS devices

4.4.3 Interconnecting technological functions

4.4.3.1 Interconnecting technological functions

Rules for interconnection

- An interconnection may only be set up between an output and an input. An output may be interconnected with several inputs, but an input can only be interconnected with one output.
- The two connectors of an interconnection must be of the same data type, e.g. both of type I2 or type R4.

  Connectors with composite data types must be of the same type, i.e. arrays and structures must have the same structure.

Requirement

The technological functions to be interconnected must have been inserted into the project.

To interconnect technological functions:

1. Open the plant view.
2. Click on a connector. The connector changes color, and the shape of the cursor also changes.
3. There are two options:
   - Hold down the mouse button and drag to the second connector or
   - Click on the second connector of the interconnection.

With this procedure, those connectors that are suitable for the data type of the technological functions are always highlighted in color.

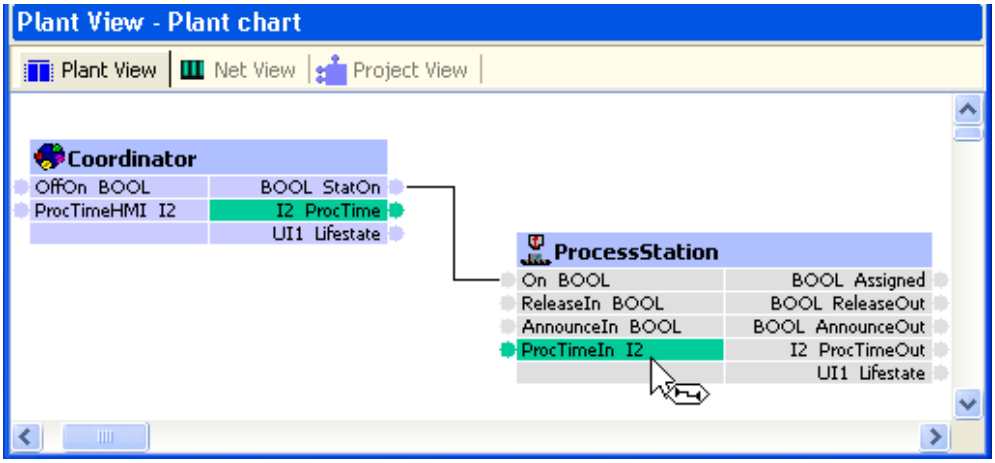


Figure 4-7 Interconnecting technological functions

The interconnection appears between the two connectors as a line or in the form of continuation connectors (see below "Displaying the interconnection lines").

Hint: Multiple interconnections

Used to connect several inputs to one output:

- Hold down the CTRL key and select the required inputs.
- Release the CTRL key and select the output to be interconnected.

Result: All the selected inputs are interconnected to this output.

Interconnections

An interconnection is represented by a line that connects the input of a technological function to the output of a second technological function.

When you delete a technological function, all the associated interconnections are deleted.

When you move a technological function, the course of the associated interconnections is also changed.

If the course of a line cannot be calculated due to lack of space, for example, then only the two ends of the interconnection are displayed. These are known as continuation connectors.

The color of the line changes when you select an interconnection. You can delete a selected interconnection or look up and modify its properties.

Displaying the interconnection lines

Use the **View > Plant view > Display Interconnection Lines** menu command to show or hide the interconnection lines.

You can switch off the interconnection lines temporarily by removing the tick from the menu command in order to work more efficiently in the plant view. In this case, only the end points of the interconnections are displayed in the form of interconnection endpoints. Interconnection endpoints with the same number represent an interconnection. In this display mode, your computer does not have to constantly recalculate the lines, which allows you to move and interconnect technological functions faster.

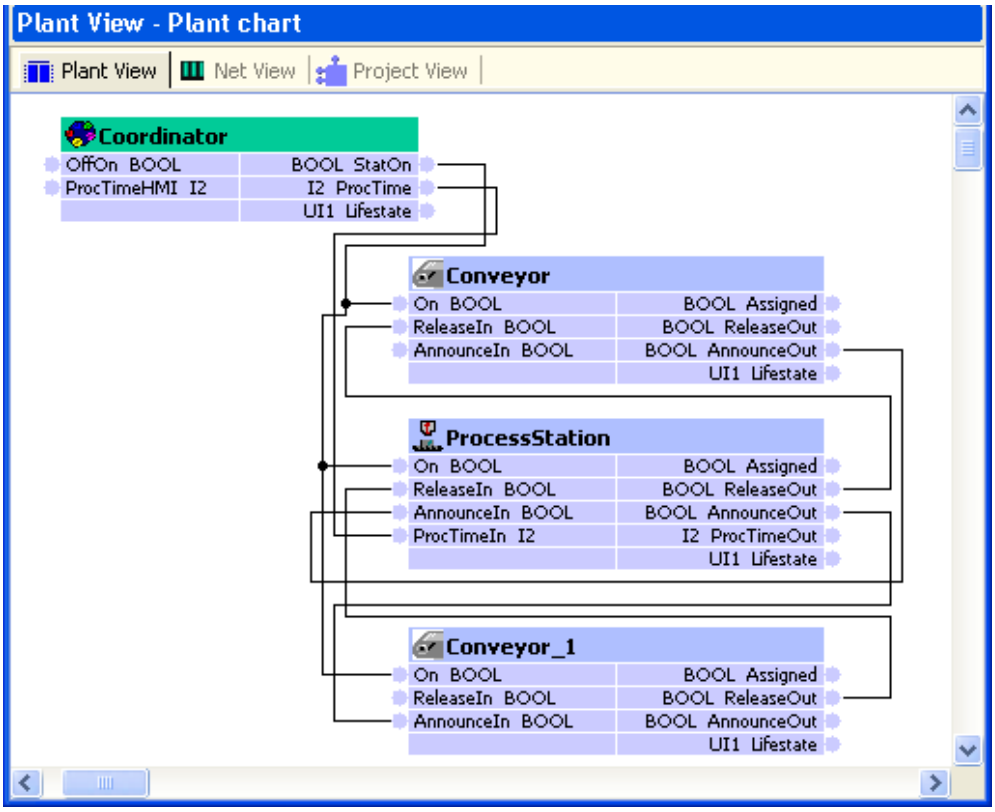


Figure 4-8 Display Interconnection Lines

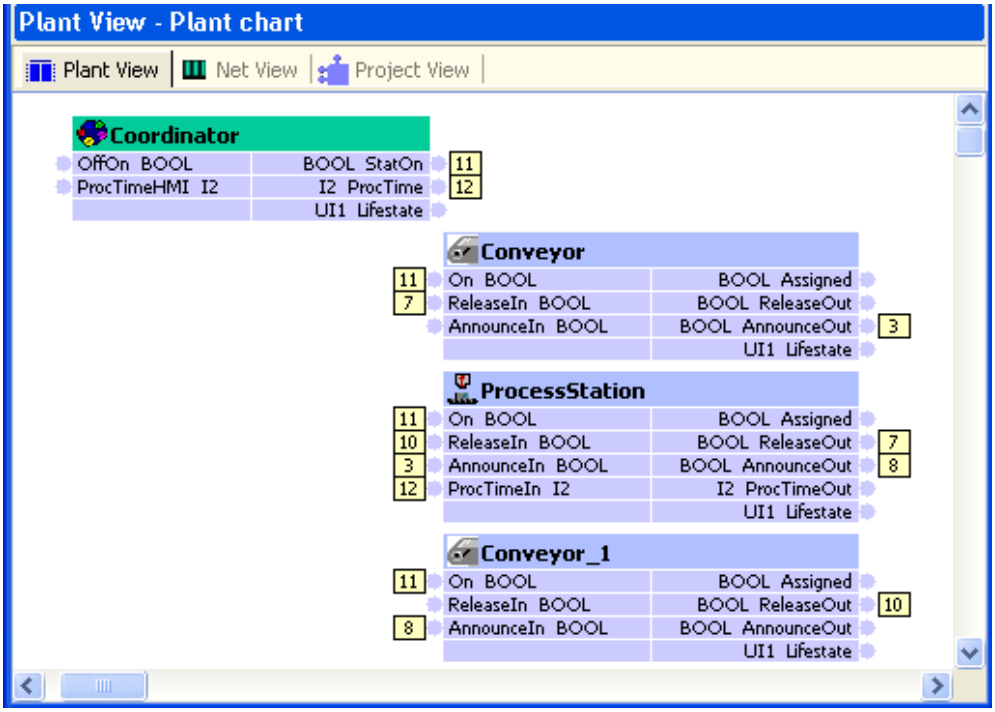


Figure 4-9 Displaying the interconnection endpoints

Hint: Recalculate Interconnection Lines

The **View > Plant view > Recalculate Interconnection Lines** menu command or function key F5 is used to refresh the representation of the interconnection lines.

4.4.3.2 Interconnecting with constant values

Constant values at component inputs

Some technological functions require a constant value to be applied at an input, in order to test the function, for example. This value can be set using SIMATIC iMap.

Rules

In SIMATIC iMap, only inputs can be interconnected with constant values. This is not possible with outputs.

Requirement

The input to be interconnected must not already be interconnected. If this is the case, the existing interconnection must first be deleted.

To interconnect an input with a constant value:

1. Select the input so that the mouse pointer with the interconnection icon appears.
2. Select **Interconnect Constants** from the context menu.
3. Enter the desired value in the "Interconnection with Constant Value" dialog box and click on the "OK" or "Accept" button.

The input is identified by a constant icon, and the value of the constant is displayed at the input.

Example

The selected input is interconnected with the value 30.

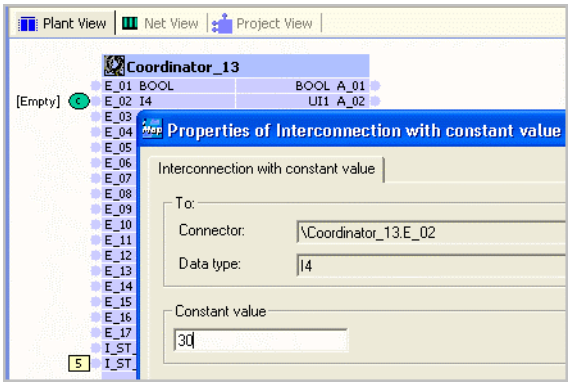


Figure 4-10 Interconnection with a constant value

To modify the interconnection with a constant value:

1. Select the constant icon for the input.
2. Open the interconnection properties.
3. Enter the required value in the Constant Value" box in the "Interconnection with Constant Value" dialog box.
4. Click on the "OK" or "Apply" button.

The changed value is displayed at the input.

Constant values for composite data types

With composite data types such as arrays or structures you can enter constant values for each individual element.

With arrays, you can also enter the same constant value for all the elements in the array. To do this, enter the required value in the "Constant value" box and click on the "for all array elements" button.

Example: Constant values for a connector of the type STRUCT

The following diagram shows how to enter a constant value for a structure element of the type UI1 (byte):

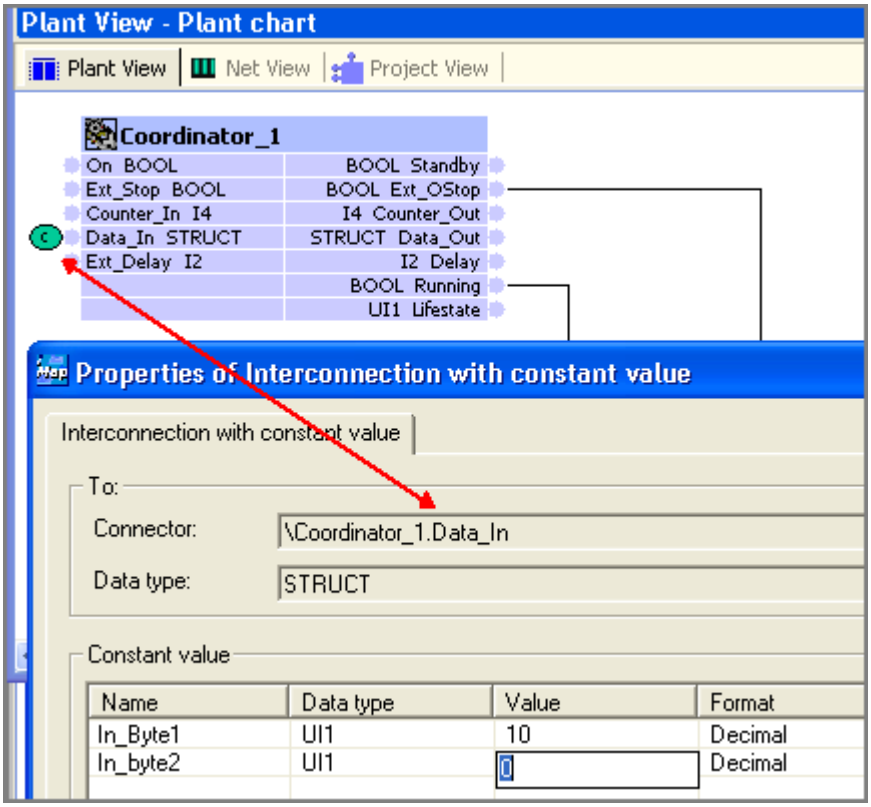


Figure 4-11 Interconnecting with constant values for a connector of the data type STRUCT

To delete an interconnection with a constant value:

1. Select the constant icon for the input.
2. Select the **Delete Interconnection** command from the context menu.

The constant icon disappears, and the input can be interconnected once more.

4.4.3.3 Configuring substitute values

Substitute values

If a fault occurs on a device such that the values that are sent via its interconnections are no longer valid, then the recipient switches to substitute values.

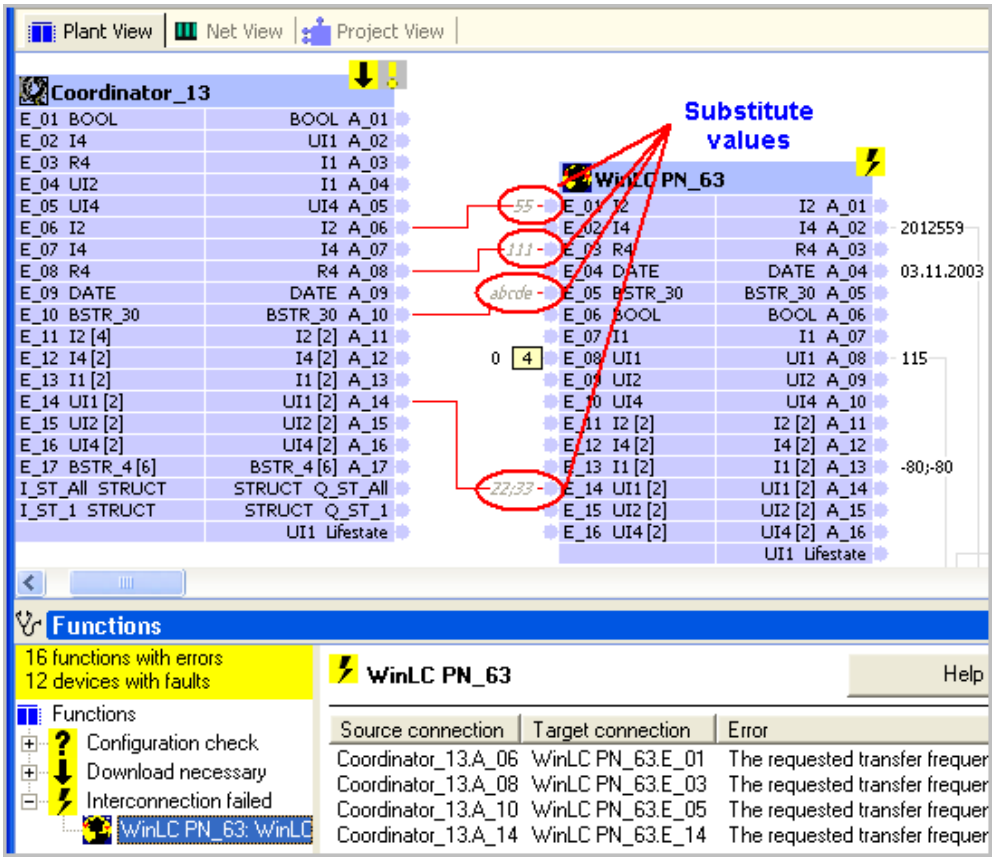


Figure 4-12 Example - Substitute values

In SIMATIC iMap, there is a default substitute value for every interconnection. This may be the last known value or a user-defined value.

Note

Substitute values can only be configured for interconnections between PROFInet devices.

If a PROFIBUS device is involved, then only substitute value 0 may be used. Exception:“1.1.2000“ is always used as the substitute value for connectors of the type DATE.

To change the default substitute value of an interconnection:

1. Select the interconnection from the plant view.
2. Select **Properties** from the context menu.
3. In the "Properties" dialog box, activate the required option in the "Substitute value" box. If you wish to activate a specified value as the substitute value, then enter the required value.
4. Click on the "OK" or "Accept" button to confirm the changes.
5. Select the function with the affected input (on the recipient side) and select **Download Selected Device > Interconnections only** from the context menu to download the newly configured interconnection to the associated device.

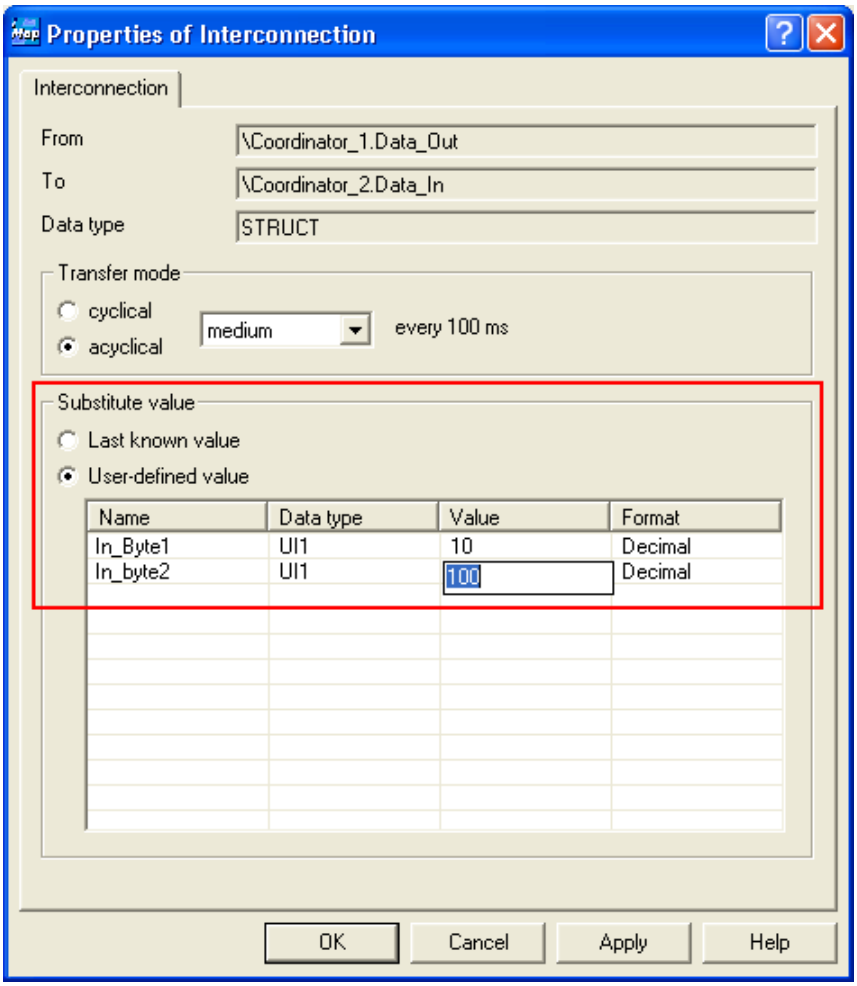


Figure 4-13 Example - Changing substitute values

Result: The change takes effect immediately. If there is already a fault on the device, you can monitor the modified substitute value online.

Substitute values for composite data types

With composite data types such as arrays or structures you can enter a user-defined substitute value for each individual element.

With arrays, you can also enter the same user-defined substitute value for all the elements in the array. To do this, enter the required value in the "User-defined value" box and click on the "for all array elements" button.

4.4.3.4 Transfer properties of the interconnections

In SIMATIC iMap, the following PROFInet communication properties can be defined as properties of the interconnections:

- Transfer mode
- Transfer frequency and scanning frequency

Interconnections to local and remote communication partners

- Interconnections to local communication partners are:
  - Interconnections between two PROFIBUS devices on the same PROFIBUS
  - Interconnections between a PROFIBUS device and the associated PROFInet device with proxy functionality
  - Interconnections inside the device
- Interconnections to remote communication partners are interconnections that run via Industrial Ethernet.

Transfer mode

PROFInet communication via Industrial Ethernet supports the following transfer modes:

- Cyclical transfer, e.g. for time-critical process data.

  The data is transferred cyclically, regardless of whether the values have changed.

- Acyclical transfer, e.g. for engineering data and non time-critical data.

  The data is polled cyclically, i.e. checked for changes. The data is only transferred if it has changed, however.

  The data is polled on the sender side of the interconnection (output from a technological function).

The supported transfer modes are device properties. They can be taken from the properties of the PROFInet component concerned.

Quality of service (QoS)

A quality of service is defined for both transfer modes:

- Transfer frequency (cyclical):

  For cyclical transfer, the transfer frequency is the time after which a data item is transferred again, e.g. every 100 ms.

- Scanning frequency (acyclical):

  For acyclical transfer, the scanning frequency is the frequency with which the data is polled, e.g. every 200 ms. The scanning frequency is thus the maximum time that elapses before a change in value is transferred.

Scanning frequency and transfer frequency values

Three frequency levels are defined for both transfer modes

- Fast – high frequency
- Medium – medium frequency
- Slow – low frequency

A transfer value of between 1 ms and 1000 ms may be set centrally for each frequency level.

Settings within the project

You can set the following in the properties of the SIMATIC iMap project (**Project > Properties**, "Interconnections" tab) menu command:

- Default transfer properties for new interconnections – these will apply to all subsequent new interconnections
- Time values for the frequency levels – apply to all instances of the SIMATIC iMap project.

Example

The following diagram shows the transfer properties set within the project:

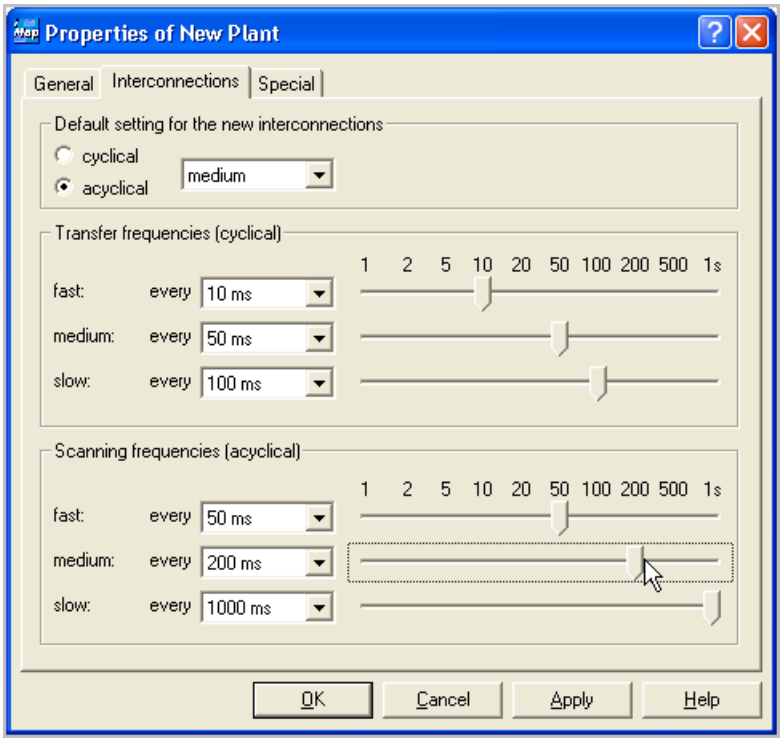


Figure 4-14 Transfer properties within the project

The following have been set:

- Default setting for new interconnections:

  Transfer mode: acyclical
  Scanning frequency: medium, i.e. every 200 ms.

  All subsequently created interconnections will have these properties.

- Transfer values for the individual frequency levels and transfer modes
  - Transfer frequencies (cyclical):
    fast– every 10 ms
    medium– every 50 ms
    slow– every 100 ms
  - Scanning frequency (acyclical):
    fast– every 50 ms
    medium– every 200 ms
    slow– every 1000 ms

A transfer frequency of 100 ms is thus set for all interconnections with cyclical transfer and the frequency level "slow", for example. This means that every 100 ms the data is transferred via these interconnections cyclically.

4.4.3.5 Setting the transfer properties of interconnections

Central settings and individual adaptations

Every interconnection is assigned a transfer mode and a transfer value in SIMATIC iMap. The following is defined centrally in the project settings:

- The default setting for new interconnections.
- The precise transfer values for the frequency levels "fast", "medium" and "slow" in milliseconds for all interconnections.

You can change the transfer mode and the frequency level "fast", "medium" or "slow" in the properties of the individual interconnections.

Note

The transfer properties (transfer mode, transfer frequency and scanning frequency) are only of relevance for interconnections to remote communication partners via Industrial Ethernet.

During a download, interconnections are checked, however, regardless of whether they are remote interconnections or not. The transfer properties must therefore still be specified at the configuration stage for internal device interconnections and interconnections within a proxy system.

Note

Interconnections with cyclical transfer only work between communication partners that are on the same subnet.

To define the transfer properties for the interconnections of the entire project:

1. Select the **Project > Properties** menu command.
2. Open the "Interconnections" tab.
3. In the "Default setting for the new interconnections“ box, select:
   - the transfer mode "acyclical" or "cyclical" and
   - the frequency level "fast", "medium" or "slow".

   These settings will apply to all subsequently created interconnections.
4. In the "Transfer frequency (cyclical)" box, select the transfer values for the three frequency levels. There are two options:
   - Select the required value from the drop-down list or
   - drag the pointer onto the required value.
5. In the "Scanning frequency (acyclical)" box, select the transfer values for the three frequency levels (as in step 4).
6. Click on the "OK" or "Accept" button to confirm your input.

The settings in step 4 and 5 apply to all the interconnections in the project with the corresponding transfer mode and frequency level. These values are retained in SIMATIC iMap until they are changed again.

You can change the transfer properties of individual interconnections via the interconnection properties.

Hint: The transfer properties of a highlighted interconnection are also displayed as a Tooltip.

To change the transfer properties of an interconnection

1. Select the interconnection in the plant view and select the **Edit > Properties** menu command.
2. In the "Properties“ dialog box select:
   - the transfer mode "acyclical" or "cyclical" and/or
   - the frequency level "fast", "medium" or "slow". The precise transfer value in milliseconds for this transfer mode and frequency level can be taken from the project settings.
3. Click on "OK" or "Accept“ to confirm.

Example: Transfer properties for the entire project

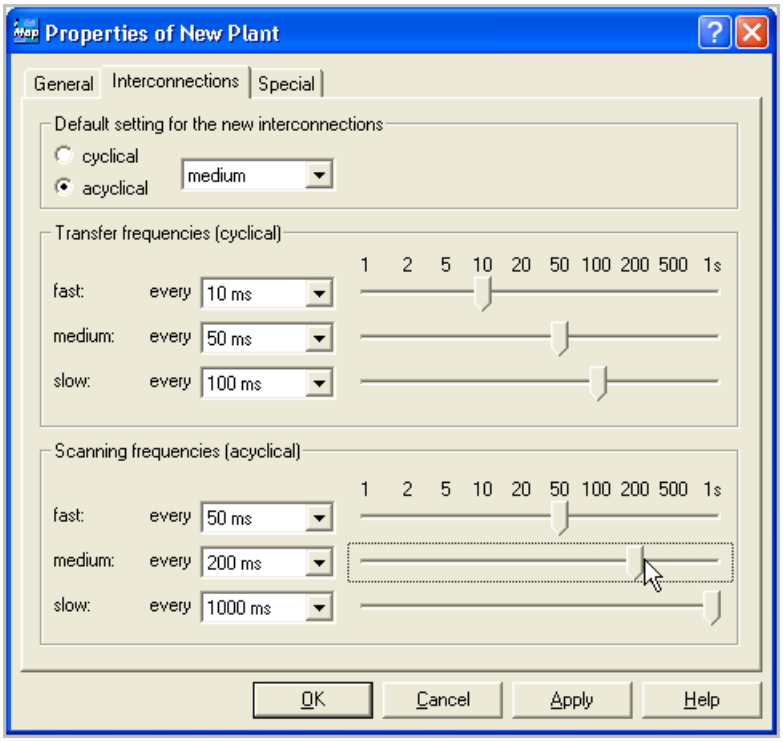


Figure 4-15 Transfer properties for the entire project

Example: Transfer properties of an interconnection

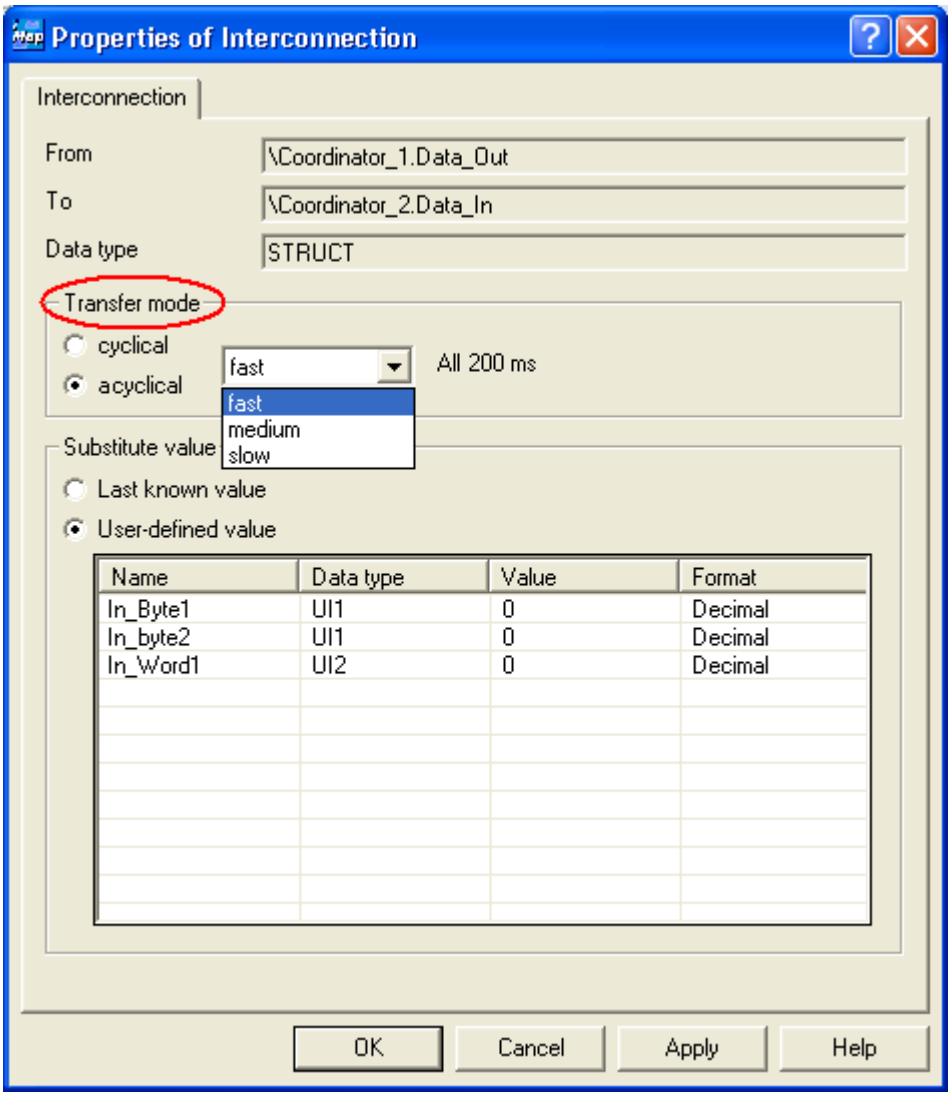


Figure 4-16 Transfer properties of an interconnection

4.5 Properties

4.5.1 Looking up and modifying properties

Properties – Overview

In SIMATIC iMap you can view and, if necessary, modify the properties of the following objects:

- Project
- Instance
- Chart
- Interconnection
- Connector
- Library
- PROFInet component

A description of the properties can be found in the context-sensitive help for the "Properties" dialog boxes.

To modify the properties of objects:

Proceed as follows:

1. Open the desired window.
2. Select the object and then select one of the following menu commands:
   - **Edit > Properties** from the menu bar or
   - **Properties** from the context menu.

   The "Properties" dialog box opens.
3. Modify the desired properties and click on "Accept" to confirm your changes.
4. Close the dialog box:
   - Click on OK if you want your changes to take effect
   - Click on "Cancel" if you want to cancel all your changes.

4.5.2 Addresses of PROFInet devices

PROFInet devices may have the following addresses, depending on the bus ports used:

Bus port	Address
Ethernet	IP address
PROFIBUS	PROFIBUS address

IP address and subnet mask

The IP address and the subnet mask each consist of 4 decimal numbers with a range of values from 0 to 255. The decimal numbers are each separated by a dot.

Example: IP address 192.168.0.20

Subnet mask 255.255.255.0

The IP address is made up of

- The address of the (sub-)net
- The address of the node (generally called the host or network node)

The subnet mask separates these two addresses. It determines which part of the IP address the network addresses and which part of the IP address is addressed by the node.

In binary format, the 4 decimal numbers of the subnet mask must contain a continuous sequence of 1s from the left and a continuous sequence of 0s from the right. The bits set for the subnet mask determine the network part of the IP address.

As a rule:

- The network address is obtained by an AND combination of IP address and subnet mask.
- The node address is obtained by an AND-NOT combination of IP address and subnet mask.

Association between the IP address and default subnet mask

There is a convention concerning the assignment of IP address areas and the "default subnet masks". The first decimal number (from the left) of the IP address determines the structure of the default subnet mask with regard to the number of "1" values (binary) as follows:

IP address	IP address (bin.)	Address class	Default subnet mask
1.0.0.0 to 126.255.255.255	0xxxxxxx.xxxxxxxx....	A	255.0.0.0
128.0.0.0 to 191.255. 255.255	10xxxxxx.xxxxxxxx...	B	255.255.0.0
192.0.0.0 to 223.255.255.255	110xxxxx.xxxxxxxx...	C	255.255.255.0

Note

Only class A, B or C IP addresses are permitted.

Example: IP address and subnet mask

Addresses	Example
IP address	141.30.0.5
Subnet mask	255.255.0.0
Subnet	141.30
Host	0.5

Decimal and binary representation of the subnet mask in the above example:

255.255.0.0 = 11111111.11111111.00000000.00000000

Meaning: The first 2 bytes of the IP address determine the subnet, i.e. 141.30. The last two bytes address the node, i.e. 5.

Router

You will need a network transition (router) if you want the device to be able to communicate with other devices outside its own subnet. In this case, you will have to enter the router address for every node on the subnet. The structure of your plant will determine whether you use a network transition or not. The address is specified by the network administrator or plant operator.

The IP address of a node on the subnet and the address of the network transition (router) must only differ at the points at which the subnet mask is set to "0".

PROFIBUS address

The PROFIBUS address is entered as a decimal number from 1 to 125. The current range of values depends on the module concerned.

4.5.3 Assigning addresses

Addresses of PROFInet and PROFIBUS devices

The IP and/or PROFIBUS addresses are assigned to the devices via the “Properties“ dialogs. IP addresses and subnet masks must be assigned in order to be able to establish online connections with the devices of the plant.

Note

The IP address and subnet mask that you assign to a PROFInet device in SIMATIC iMap must be exactly the same as the IP address and subnet mask of the device within the plant, otherwise the device cannot be accessed online from SIMATIC iMap.

If you use a network transition: The IP address of the device and the IP address of the network transition must belong to the same subnet.

Requirement

The IP addresses and associated subnet masks have to be assigned to the devices of the plant using vendor-specific configuration tools. They are generally defined by the network administrator.

To assign addresses:

1. Select the required device from the net view or the associated function from the plant view.
2. Open the object properties
   - using the **Properties** context menu or
   - using the **Edit > Properties** menu command.
3. Enter the addresses required for the device type on the Addresses" tab.
   - IP address and subnet mask:
     Enter the IP address and subnet mask to be assigned to the device at the node (e.g. via the vendor-specific configuration and programming tool).
   - PROFIBUS address:
     Enter the PROFIBUS address to be assigned to the device, e.g. using the DIL switches. The default is the PROFIBUS address defined when the PROFInet component was created. If this is already in use, then the lowest free address on the PROFIBUS becomes the default.
4. If you use a router (network transition), you must activate the "Network transition, Use router" option and enter the IP address of the router in the "Address" box.
5. Confirm your input by clicking on the
   - “OK“ button to accept the input and close the dialog box
   - “Accept“ button to accept the input and leave the dialog box open.

Result: The assigned addresses are displayed on the device in the net view.

4.5.4 Password protection for SIMATIC iMap projects

Effect of the password

You can assign a password to your SIMATIC iMap project to protect it against unauthorized access. The password is defined in the project properties and must be entered when you open the project.

If you attempt to open a project and do not enter the correct password, the project will not be opened.

Defining a password

To define a password for the project:

1. Open the project properties using the **Project > Properties** menu command and follow the procedure detailed below:
   - To enter a new password for the first time, enter the password in the "New password" box and then repeat it in the "Confirm password" box.
   - To change an existing password, enter the old password in the "Old password" box. Then enter the new password in the "New password" box and then repeat it in the "Confirm password" box.
2. Click on "OK" or "Accept" to confirm your input.

Cancelling password protection

To cancel the password protection for a project:

1. Open the project properties using the **Project > Properties** menu command.
2. Enter the old password in the "Old password“ box and leave the "New password“ and "Confirm password" boxes blank.
3. Click on "OK" or "Accept" to confirm your input.

4.5.5 Generation status

Status of the shadow project

The shadow project is generated in SIMATIC iMap from the component projects of the PROFInet components present within the project.

The generation status of the instance of a PROFInet component is displayed on the "Instance" tab in the Properties. Highlight the technological function or device and select the **Properties...** context menu to open this dialog.

Generation status	Meaning	Action
Not generated	The shadow project has not yet been generated or does not yet contain the PROFInet component	Generating the Project Changes only All
Generated	The shadow project has been generated, it contains the PROFInet component and the properties of the PROFInet component are consistent with the STEP7 shadow project	No action required
Inconsistent/modified	The properties of the PROFInet component have been modified and are no longer consistent with the shadow project	Generating the Project
Generation not possible	The properties of the PROFInet component contain illegal values (e.g. an address is assigned twice) which make generation impossible.	Eliminate the error(s) and then generate the project again

Graphical representation of the generation status

The generation status of an instance is represented graphically in the project view (see "Windows and views, project view").

4.5.6 Checking the utilization

Application

From runtime version V2.0.0.0 onwards, PROFInet devices have performance parameters that describe the PROFInet communication properties of the devices (see also the section entitled "Performance parameters of PROFInet devices").

The performance parameters can be used to check the device utilization even during the configuration phase in SIMATIC iMap. This allows you to see at an early stage whether the devices can meet the needs of the SIMATIC iMap project without causing faults in the plant due to overloading at runtime.

If the performance parameters are exceeded or undershot during the configuration phase, they can thus be traced and rectified before the project is generated.

What is checked?

The following is checked:

- Whether the configuration has exceeded any of the device's performance parameters, e.g. the maximum number of interconnections or the maximum transfer values for the interconnections.
- Whether the device supports the configured transfer properties of the interconnection (e.g. cyclical transfer).
- For PROFIBUS devices only: Whether the PROFIBUS device and the associated PROFInet device with proxy functionality are compatible with respect to the PROFInet runtime version.

The performance parameters can be found on the “Device“ tab in the PROFInet component properties. Highlight the PROFInet component in the library window and select **Properties** from the context menu.

Rules

Only PROFInet devices can be checked.

With a PROFInet device with proxy functionality, the utilization check relates to the entire proxy system, consisting of the actual device and any PROFIBUS devices coupled to it.

To check the utilization of PROFInet devices:

1. In the net view, highlight the PROFInet devices to be checked.
2. Select the following command from the context menu:
   - **Verify utilization > Default**, to call up a summary of the results. Only those performance parameters that have been exceeded or undershot are listed.
   - **Verify utilization > Detailed**, to call up a detailed description of the results. This lists all the performance parameters with their current values and limit values (Act./Max. or Act./Min.).

     Result: The check is carried out and the results are displayed on the "Utilization" tab of the information window.
3. In the event of overloading: Correct the configuration of the devices or interconnections, if necessary, or change the networking of the devices.

Hint: Finding objects

If the utilization check discovers that limit values are exceeded or undershot, the affected object appears in the "Reference object" column in the information window, highlighted with a warning symbol. Double-click on the reference object to select the relevant object. You can then check its properties and correct them if necessary.

Hint: Check the online utilization

Use the **Online > Online device analysis** menu command to call up the online data for a certain PROFInet device, including a comparison of the downloaded configuration data against the performance parameters (see "Online device analysis").

4.5.7 Performance parameters of the PROFInet devices

For PROFInet devices from PROFInet runtime version 2.0 onwards, certain performance parameters are defined that are important for PROFInet communication.

The performance parameters can be found on the “Device“ tab in the PROFInet component properties. Highlight the PROFInet component in the library window and select **Properties** from the context menu.

PROFInet performance parameters

Parameter	Description
General parameters	
PROFInet runtime version	see below
Communication on the PROFIBUS (proxy system)*)	
Maximum number of slaves that can be operated	Maximum number of PROFIBUS devices that can be coupled to the PROFInet device with proxy functionality. This includes DP slaves on the local PROFIBUS.
Maximum number of connectors (including slaves)	Maximum number of connectors for the technological function(s). For PROFInet devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.
Maximum data length for arrays and structures	Maximum data length for arrays and structures in bytes*) (see "Connector data types").
Maximum number of internal device and PROFIBUS interconnections	Maximum number of interconnections: • between PROFIBUS devices on the same PROFIBUS • between the PROFIBUS device and the associated PROFInet device with proxy functionality • on the same device (internal)
Communication on the Industrial Ethernet*) (to remote communication partners)	
Maximum number of remote interconnection partners	Maximum number of communication partners via Industrial Ethernet.
Remote interconnections with acyclical transfer	
• Minimum interval for scanning frequency	Minimum time interval for the scanning frequency with frequency level "fast" in milliseconds
• Maximum number of incoming interconnections	Maximum number of interconnected inputs.
• Maximum number of outgoing interconnections	Maximum number of interconnected outputs.**)
Remote interconnections with cyclical transfer	
• Minimum interval for transfer frequency	Minimum time interval for the transfer frequency with frequency level "fast" in milliseconds
• Maximum number of incoming interconnections	Maximum number of interconnected inputs.
• Maximum number of outgoing interconnections	Maximum number of interconnected outputs.**)

*) For PROFInet devices with proxy functionality: including the coupled PROFIBUS devices (see following rule).

**) Outputs interconnected multiple times with remote partners are counted multiple times accordingly.

PROFInet runtime version

The PROFInet runtime version identifies the release of the PROFInet functionality in the firmware on the PROFInet device.

The PROFInet runtime version of a PROFInet device with proxy functionality is particularly important for the coupled PROFIBUS devices. The coupled PROFIBUS devices will not be able to use certain functions unless they are supported by the proxy device, such as connectors of data type STRUCT.

Rule

With a PROFInet device with proxy functionality, the performance parameters relate to the entire proxy system, consisting of the actual device and any PROFIBUS devices coupled to it.

4.5.8 Utilization parameters for PROFInet devices

For the detailed utilization check – using the **Verify utilization > Detailed** menu command – all the parameters are listed in the information window with their current values and limits. For the standard utilization check – using the **Verify utilization > Standard** menu command – only those parameters for which the limits are exceeded or undershot are listed in the information window.

Exceeded and undershot utilization parameters are identified by a warning symbol in the information window. The quantitative deviations can be seen from the Actual/Max and Actual/Min values.

Validity of the utilization parameters

The parameters listed below apply to:

- a PROFInet device without proxy functionality or
- the entire proxy system of a PROFInet device with proxy functionality.

Descriptions of the utilization parameters

The utilization parameters can be subdivided into the following parameter groups:

- Device parameters
- General non interconnection-specific parameters
- Parameters for acyclical remote interconnections of master and slaves
- Parameters for cyclical remote interconnections of master and slaves

The "Remedy" column contains possible remedies in the event that utilization parameter limits are exceeded or undershot.

<Actual> represents a current actual value, while <Min> and <Max> are limit values.

Device parameters

These parameters apply to the entire proxy system of the PROFInet device with proxy functionality.

Parameter	Meaning	Remedy
Number of coupled PROFIBUS devices	Number of PROFIBUS devices that are coupled to the PROFInet device with proxy functionality. This includes DP slaves on the local PROFIBUS.	Reduce the number of coupled PROFIBUS devices.
Sum of all master and slave connectors	Total number of connectors for the technological function(s). For PROFInet devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.	
Maximum data length for arrays and structures for master and slaves [bytes]	Total data length for arrays and structures in bytes (see "Connector data types"). For PROFInet devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices. Possible cause: The data length of at least one connector of a coupled PROFIBUS device is too long for this master	Couple the PROFIBUS device to another PROFInet device with proxy functionality.
Sum of the data lengths of all master and slave inputs [byte]	Total data length of all inputs of the technological function(s) in bytes (see "Connector data types"). For PROFInet devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.	Reduce the number of coupled PROFIBUS devices.
Sum of the data lengths of all master and slave outputs	Total data length of all outputs of the technological function(s) in bytes (see "Connector data types"). For PROFInet devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.	
Memory required for type descriptions of all master and slave connectors	This parameter comprises the memory required for the description of the data types of all connectors. This memory is required in addition to the working data (sum of the data lengths of all inputs and outputs).	

General non interconnection-specific parameters

These parameters are independent of the transfer mode.

Parameter	Meaning	Remedy
Number of internal device and PROFIBUS interconnections for master and slaves	Number of interconnections: • between PROFIBUS devices on the same PROFIBUS • between PROFIBUS devices and the associated PROFInet device with proxy functionality • on the same device (internal)	If necessary, reduce the number of internal device interconnections and PROFIBUS interconnections.
Sum of the data lengths of all internal device and PROFIBUS interconnections of master and slaves	Total data length in bytes for all connectors with the following interconnections: • between PROFIBUS devices on the same PROFIBUS • between PROFIBUS devices and the associated PROFInet device with proxy functionality • on the same device (internal)	
Number of interconnections with constants of master and slaves	Number of interconnections with constants. For PROFInet devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.	Reduce the number of interconnections with constants.
Sum of the data lengths of all interconnections with constants of master and slaves	Total data lengths of all interconnections with constants. For PROFInet devices with proxy functionality, this incorporates the functions of the coupled PROFIBUS devices.	
Number of remote interconnection partners of master and slaves	Number of remote communication partners (via Industrial Ethernet).	Reduce the number of remote communication partners of the device
Utilization due to the number of device relationships between master and slaves and with remote interconnection partners	This parameter shows the utilization (as a percentage) in relation to the number of directed communication relationships between the device and its communication partners, in both the local and the remote proxy system. All interconnections in a direction – e.g. from outputs of device A to inputs of device B – are regarded as directed communication relationships between devices A and B. All interconnections in the other direction – from outputs of device B to inputs of device A – are regarded as another directed communication relationship between devices A and B.	Reduce the number of directed communication relationships of the device. It is not sufficient simply to remove some of the interconnections that form a directed communication relationship. All the interconnections in the same direction between two devices must be removed in order to remove a directed communication relationship between these devices.

Parameters for acyclical remote interconnections of master and slaves

Parameters for interconnections with acyclical transfer to remote communication partners. For PROFInet devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.

Parameter	Meaning	Remedy
Minimum interval for scanning frequency	Minimum time interval for the scanning frequency with frequency level "fast" in milliseconds	Increase the minimum interval for the scanning frequency for frequency level "fast" in the project settings.
Incoming interconnections:	Interconnection at the inputs of technological function(s)	
Number	Number of incoming interconnections. For PROFInet devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	• Reduce the number of incoming interconnections with acyclical transfer to remote communication partners or • use interconnections with cyclical transfer, if necessary.
Sum of the data lengths	Sum of the data lengths of all connectors with incoming interconnections in bytes. For PROFInet devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	
Distribution by frequency:	This parameter is represented as follows: • OK – if the distribution of interconnections by frequency level is OK. • With a warning symbol – if the distribution of interconnections by frequency level is not suitable. The following parameters show whether the performance parameters are exceeded or undershot by the configuration of the interconnection for each frequency level.	If a warning symbol appears on the line: • Determine the frequency level at which at least one device parameter limit value is exceeded or undershot by the associated configured value and • distribute the incoming remote interconnections for the affected frequency level to other frequency levels or • use interconnections with cyclical transfer, if necessary.
Device parameter: fast (<Min> ms); Interconnections: <Max>; Total data length: <Max> byte	Device performance parameters (limit values) for the frequency level "fast": • The minimum time interval for the scanning frequency with frequency level "fast" in milliseconds • The maximum number of incoming interconnections with frequency level "fast" • The total data length of all inputs with interconnections of frequency level "fast" in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by frequency..." line.

Parameter	Meaning	Remedy
Configured: fast (<Actual> ms); Interconnections: <Actual>; Data length: <Actual> byte	Current configured values for incoming interconnections with frequency level "fast": • The configured time interval for the scanning frequency with frequency level "fast" in milliseconds • The current number of incoming interconnections with frequency level "fast" • The current total data length of all inputs with interconnections of frequency level "fast" in bytes.	
Device parameter: medium (<Min>ms); Interconnections: <Max>; Data length: <Max> byte	Device performance parameters (limit values) for the frequency level "medium": • The minimum time interval for the scanning frequency with frequency level "medium" in milliseconds • The maximum number of incoming interconnections with frequency level "medium" • The total data length of all inputs with interconnections of frequency level "medium" in bytes.	
Configured: medium (<Actual> ms); Interconnections: <Actual>; Data length: <Actual> byte	Current configured values for incoming interconnections with frequency level "medium": • The configured time interval for the scanning frequency with frequency level "medium" in milliseconds • The current number of incoming interconnections with frequency level "medium" • The current total data length of all inputs with interconnections of frequency level "medium" in bytes.	
Device parameter: slow (<Min>ms); Interconnections: <Max>; Data length: <Max> byte	Device performance parameters (limit values) for the frequency level "slow": • The minimum time interval for the scanning frequency with frequency level "slow" in milliseconds • The maximum number of incoming interconnections with frequency level "slow" • The total data length of all inputs with interconnections of frequency level "slow" in bytes.	

Parameter	Meaning	Remedy
Configured: slow (<Actual> ms); Interconnections: <Actual>; Data length: <Actual> byte	Current configured values for incoming interconnections with frequency level "slow": • The configured time interval for the scanning frequency with frequency level "slow" in milliseconds • The current number of incoming interconnections with frequency level "medium" • The current total data length of all inputs with interconnections of frequency level "slow" in bytes.	
Outgoing interconnections:	Interconnection at the outputs of technological function(s)	
Number	Number of outgoing interconnections. For PROFInet devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	• Reduce the number of outgoing interconnections with acyclical transfer to remote communication partners or • use interconnections with cyclical transfer, if necessary.
Sum of the data lengths	Sum of the data lengths of all connectors with outgoing interconnections. For PROFInet devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	
Distribution by frequency:	This parameter is represented as follows: • OK – if the distribution of interconnections by frequency level is OK. • With a warning symbol – if the distribution of interconnections by frequency level is not suitable. The following parameters show whether the performance parameters are exceeded or undershot by the configuration of the interconnection for each frequency level.	If a warning symbol appears on the line: • Determine the frequency level at which at least one device parameter limit value is exceeded or undershot by the associated configured value and • distribute the outgoing remote interconnections for the affected frequency level to other frequency levels or • use interconnections with cyclical transfer, if necessary.
Device parameter: fast (<Min>ms); Interconnections: <Max>; Data length: <Max> byte	Device performance parameters (limit values) for the frequency level "fast": • The minimum time interval for the scanning frequency with frequency level "fast" in milliseconds • The maximum number of outgoing interconnections with frequency level "fast" • The total data length of all outputs with interconnections of frequency level "fast" in bytes.	These lines never contain a warning; they are used for breakdown purposes only. The potential overload is highlighted in the "Distribution by frequency..." line.

Parameter	Meaning	Remedy
Configured: fast (<Actual> ms); Interconnections: <Actual>; Data length: <Actual> byte	Current configured values for outgoing interconnections with frequency level "fast": • The configured time interval for the scanning frequency with frequency level "fast" in milliseconds • The current number of outgoing interconnections with frequency level "fast" • The current total data length of all outputs with interconnections of frequency level "fast" in bytes.	
Device parameter: medium (<Min>ms); Interconnections: <Max>; Data length: <Max> byte	Device performance parameters (limit values) for the frequency level "medium": • The minimum time interval for the scanning frequency with frequency level "medium" in milliseconds • The maximum number of outgoing interconnections with frequency level "medium" • The total data length of all outputs with interconnections of frequency level "medium" in bytes.	
Configured: medium (<Actual> ms); Interconnections: <Actual>; Data length: <Actual> byte	Current configured values for outgoing interconnections with frequency level "medium": • The configured time interval for the scanning frequency with frequency level "medium" in milliseconds • The current number of outgoing interconnections with frequency level "medium" • The current total data length of all outputs with interconnections of frequency level "medium" in bytes.	
Device parameter: slow (<Min>ms); Interconnections: <Max>; Data length: <Max> byte	Device performance parameters (limit values) for the frequency level "slow": • The minimum time interval for the scanning frequency with frequency level "slow" in milliseconds • The maximum number of outgoing interconnections with frequency level "slow" • The total data length of all outputs with interconnections of frequency level "slow" in bytes.	

Parameter	Meaning	Remedy
Configured: slow (<Actual> ms); Interconnections: <Actual>; Data length: <Actual> byte	Current configured values for outgoing interconnections with frequency level "slow": • The configured time interval for the scanning frequency with frequency level "slow" in milliseconds • The current number of outgoing interconnections with frequency level "medium" • The current total data length of all outputs with interconnections of frequency level "slow" in bytes.	

Parameters for cyclical remote interconnections of master and slaves

Parameters for interconnections with cyclical transfer to remote communication partners. For PROFInet devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.

Parameter	Meaning	Remedy
Minimum interval for transfer frequency	Minimum time interval for the transfer frequency with frequency level "fast" in milliseconds	Increase the minimum interval for the transfer frequency for frequency level "fast" in the project settings.
Incoming interconnections:	Interconnection at the inputs of technological function(s)	
Number	Number of incoming interconnections. For PROFInet devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	• Reduce the number of incoming interconnections with cyclical transfer to remote communication partners or • use interconnections with acyclical transfer, if necessary.
Sum of the data lengths	Sum of the data lengths of all connectors with incoming interconnections. For PROFInet devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	
Distribution by frequency:	The following parameters comprise the current configuration data for incoming interconnections with cyclical transfer, distributed by frequency level.	No limit values are displayed, so no remedy is required.
Configured: fast (<Actual> ms); Interconnections: <Actual>; Data length: <Actual> byte	Current configured values for the incoming interconnections with frequency levels "fast", "medium" and "slow": • The configured interval for the transfer frequency in milliseconds • The current number of outgoing interconnections with the relevant frequency level • The current total data length of all outputs with interconnections of the relevant frequency level in bytes.	
Configured: medium (<Actual> ms); Interconnections: <Actual>; Data length: <Actual> byte		
Configured: slow (<Actual> ms); Interconnections: <Actual> ; Data length: <Actual> byte		
Utilization for interconnections of all frequency levels: <Actual>%	This parameter shows the device utilization by incoming interconnections with cyclical transfer of all frequency levels (as a percentage).	• Reduce the number of incoming interconnections with cyclical transfer to remote communication partners or • redistribute the incoming interconnections to other frequency levels or • use interconnections with acyclical transfer, if necessary.

Parameter	Meaning	Remedy
Outgoing interconnections:	Interconnection at the outputs of technological function(s)	
Number	Number of outgoing interconnections. For PROFInet devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	• Reduce the number of outgoing interconnections with cyclical transfer to remote communication partners or • use interconnections with acyclical transfer, if necessary.
Sum of the data lengths	Sum of the data lengths of all connectors with outgoing interconnections in bytes. For PROFInet devices with proxy functionality, this incorporates the interconnections of the coupled PROFIBUS devices.	
Distribution by frequency:	The following parameters comprise the current configuration data for outgoing interconnections with cyclical transfer, distributed by frequency level.	No limit values are displayed, so no remedy is required.
Configured: fast (<Actual> ms); Interconnections: <Actual>; Data length: <Actual> byte	Current configured values for the outgoing interconnections with frequency levels "fast", "medium" and "slow": • The configured interval for the transfer frequency in milliseconds • The current number of outgoing interconnections with the relevant frequency level • The current total data length of all outputs with interconnections of the relevant frequency level in bytes.	
Configured: medium (<Actual> ms); Interconnections: <Actual>; Data length: <Actual> byte		
Configured: slow (<Actual> ms); Interconnections: <Actual>; Data length: <Actual> byte		
Utilization for interconnections of all frequency levels: <Actual>%	This parameter shows the device utilization by incoming interconnections with cyclical transfer of all frequency levels (as a percentage).	• Reduce the number of incoming interconnections with cyclical transfer to remote communication partners or • redistribute the incoming interconnections to other frequency levels or • use interconnections with acyclical transfer, if necessary.

Error messages for interconnections with cyclical transfer

Error message	Remedy
The device does not support remote interconnections with cyclical transfer.	• Replace the device with one with runtime version 2.0 or later that supports cyclical transfer or • use interconnections with acyclical transfer
The capacity limit for remote interconnections with cyclical transfer between <Device 1> and <Device 2> with a transfer frequency of <nn> ms was exceeded.	Reduce the volume of data transferred between the specified interconnection partners at the specified frequency level, i.e.: • Reduce the number of interconnections to remote partners • Redistribute the affected remote interconnections to other frequency levels or • use interconnections with acyclical transfer
The connector <name> cannot be interconnected remotely with cyclical transfer due to its data length.	Use interconnections with acyclical transfer, if necessary.

4.5.9 Checking the consistency

What is the consistency check?

The consistency check is a comparison between the device-specific data of the shadow project and the data of the original component project. This allows you to identify changes to the shadow project that were made with the vendor-specific configuration and programming tool.

The result of the consistency check is displayed on the "General" tab in the information window.

What is checked?

For SIMATIC programmable controllers, the consistency is checked using STEP 7. This compares the program blocks for the station in the shadow project with those of the original component project in the SIMATIC iMap library. The check determines whether program blocks have been added, removed or changed in the shadow project.

Requirement

The vendor-specific configuration and programming tool (e.g. STEP 7) must be installed on the PG/PC.

To run a consistency check:

1. Highlight the instances to be checked in the plant view or net view.
2. Select the **Edit > Check Consistency** menu command.

The consistency check is carried out and the results are displayed on the "General" tab of the information window.

4.6 Structuring projects

4.6.1 Creating subordinate charts

Subordinate charts

Subordinate charts are used to create a hierarchical structure for your plant, just like a directory tree in the file system.

In the plant tree of the project view, a subordinate chart is represented as a folder that can contain technological functions and further subordinate charts. There are no subordinate charts in the net tree of the project view.

In the plant view, a subordinate chart looks like a technological function with a chart interface for creating interconnections. The chart interface contains the inputs and outputs of the technological functions contained in the subordinate chart, which can extend beyond the limits of individual charts.

To create a subordinate chart

1. Open the project plant view.
2. Select the **Insert > New chart** menu command.

   The new chart is inserted and is displayed in both the plant view and the project window.
3. Give the subordinate chart a name
   - Via the editable name box in the plant view or
   - Via the "Properties" dialog
4. Open the subordinate chart by double-clicking or using the **Open chart** context menu command.
5. Insert your PROFInet components from the library and interconnect.
6. For each connector to be contained in the chart interface, select the connector and activate the **In chart interface** option from the context menu If the connector is already contained in the chart interface, this is indicated by a tick in the context menu.

If you then return to the chart one level up, the subordinate chart is represented in the same way as a technological function with the defined chart interface.

To move technological functions to a new chart:

If you want to create a new subordinate chart from several technological functions:

1. Select the technological functions.
2. You have several options: Select:
   - the **Paste > New Chart** menu command or
   - the "Insert new chart" icon from the toolbar or
   - the **Move to new chart** command from the context menu.

Result: A new subordinate chart is created and the selected technological functions are moved to this chart. Any existing interconnections between charts are automatically inserted into the chart interface.

Working with subordinate charts

You can work with subordinate charts just as though they were technological functions, i.e. they can be interconnected, moved, deleted, cut and copied.

The content and connectors of a subordinate chart can be modified as required.

It is not possible to download a selected subordinate chart to all devices. To carry out a specific download, you must select individual objects. If you download to all devices in the plant, those devices whose functions are contained in the subordinate chart are included in the download.

Hint: Navigation aid

Select a connector of a subordinate chart and select **Go To > Function connector** from the context menu to access the associated connector of the technological function.

4.6.2 Data storage system in SIMATIC iMap

Overview

The SIMATIC iMap data storage system essentially comprises the following types of folder:

- PROFInet components
- SIMATIC iMap projects
- SIMATIC iMap libraries

The storage structure of these folders is described below.

SIMATIC iMap also uses other file types, such as:

- Archive files
- Project documentation
- Variable tables
- OPC symbol files
- Online device analyses
- Re-edited component projects

There are default storage locations in SIMATIC iMap for all of the file types and folder types used.

Project structure for PROFInet components

Different types of project occur over the life cycle of a PROFInet component. The content and structure of these project is determined by the vendor-specific configuration and programming tool used for the component. We distinguish between the following types of project:

- The **basic project** is the project from which the PROFInet component was created using the vendor-specific configuration and programming tool, e.g. a STEP 7 project.
- The **component project** is a copy of the basic project that is assigned to the finished PROFInet component. It is stored in the file system or in a library together with the PROFInet component. The component project is the basis for upgrading the PROFInet components.

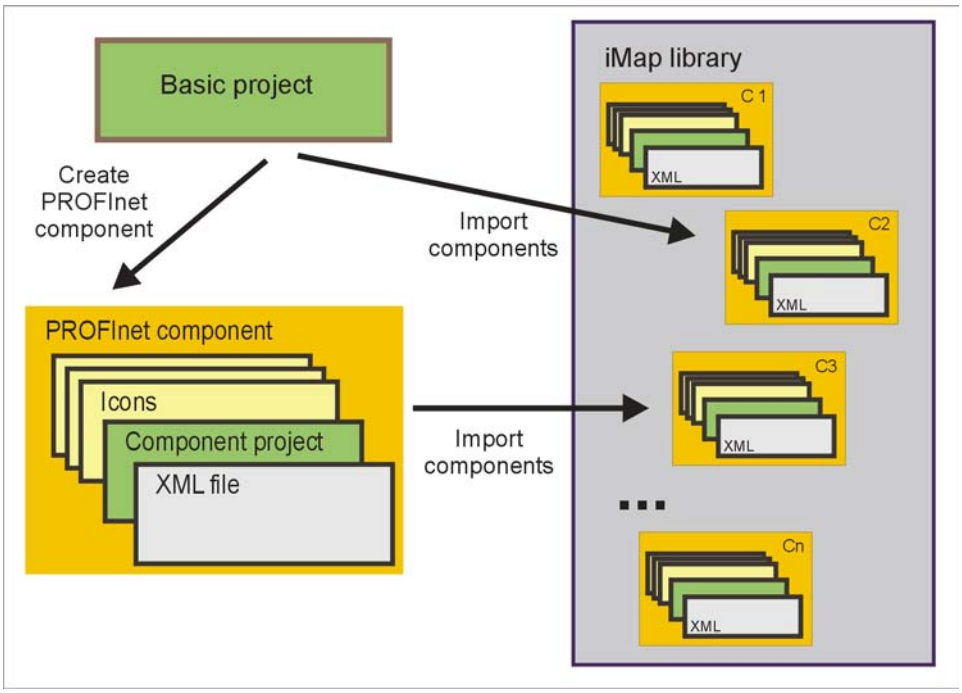


Figure 4-17 Project structure for PROFInet components

Storage structure for PROFInet components

A PROFInet component consists of a folder containing:

- The XML file containing the description of the PROFInet component and, in particular, the technological function. The system searches for this XML file when importing to a library.
- The icon files
- The component project (copy of the relevant part from the basic project).
- The documentation link file (optional).

The folder name is formed from the name, the identification (class ID) and the version number of the PROFInet component. This file structure is retained for all instances of the PROFInet component.

Storage structure for SIMATIC iMap libraries

A SIMATIC iMap library is created as a folder. The important part is the library file of the same name, but with the extension .cbl, that must be specified when the library is opened. A library also contains the PROFInet components folder.

Storage structure for SIMATIC iMap projects

The **SIMATIC iMap project** is the working project that contains the configured instances of the PROFInet components and their interconnections for a specific plant.

A SIMATIC iMap project is created as a folder. The important part is the project file of the same name, but with the extension .cbp, that must be specified when the project is opened. A project folder also contains:

- information about the inserted instances of the PROFInet components
- the project library
  - visible as a separate folder if the project is open
  - not visible (compressed) if the project is closed.
- one or more shadow projects that are created when the SIMATIC iMap project is generated.
- a variable table, if one was created.

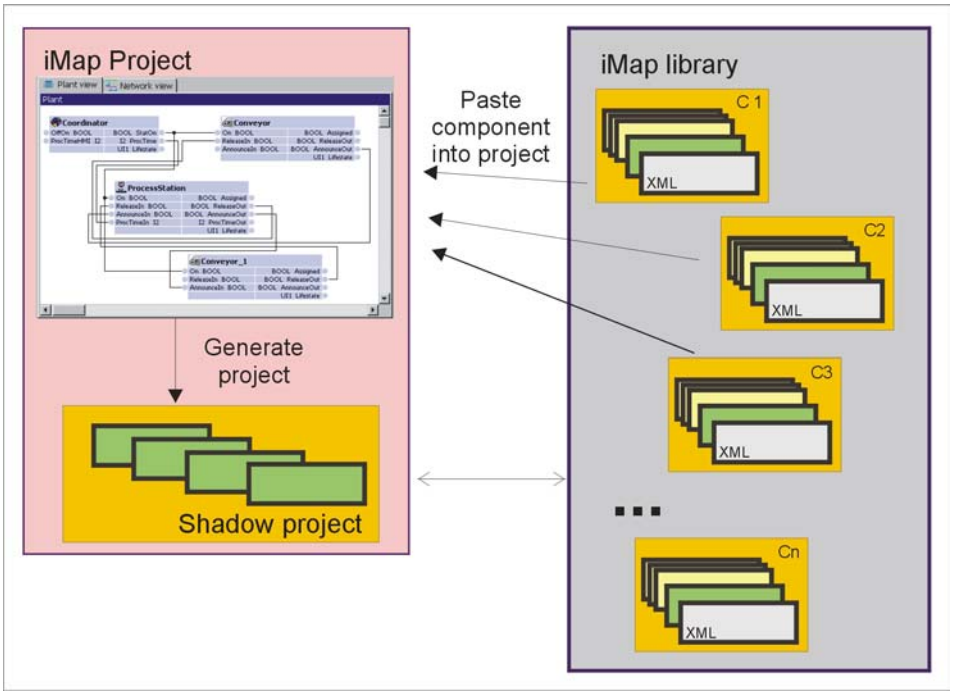


Figure 4-18 Folder structure of iMap libraries and projects

The **shadow project** contains the vendor-specific data for the control units of the SIMATIC iMap project. It is created from the component projects in the project library when the SIMATIC iMap project is generated for the first time. The shadow project is needed for program downloads.

The shadow project is either device-specific or vendor-specific. For example, the HMI units of a SIMATIC iMap project form a separate shadow project.

Note

The way in which data is stored in the latest version of SIMATIC iMap (V2.0) has changed, and is no longer compatible with the previous version (V1.2).

If you want to edit a project that was created in SIMATIC iMap V1.2, you will have to convert the data storage system to the current version. The associated SIMATIC iMap library must be open to be able to convert the PROFInet components used.

Accessing iMap libraries and projects

SIMATIC iMap libraries and projects behave just like normal documents. You can open, modify, save and archive them in SIMATIC iMap.

Notice

The content of a SIMATIC iMap project folder must only be edited with SIMATIC iMap.

If you change the project data using Windows Explorer, for example, it may no longer be possible to open the project in SIMATIC iMap.

The actual project folder may be renamed, moved, copied or deleted in Windows Explorer, however.

You cannot access several SIMATIC iMap projects at the same time.

Deleting iMap libraries and projects

You can delete SIMATIC iMap libraries and projects by deleting the folder concerned from the file system using Windows Explorer.

Default storage locations

The "Directories" tab on the **Options > Customize** menu command displays the default directories used as storage locations for the file types used in SIMATIC iMap. These directories are suggested first when you create, save and select the corresponding file types.

Click on the "Modify" button to change the paths.

These settings apply to all SIMATIC iMap projects.

4.6.3 Connecting multiple projects

Interconnecting connectors across projects

In SIMATIC iMap, you can connect several projects by interconnecting the connectors across projects. This creates interconnections between technological functions that are located in different projects.

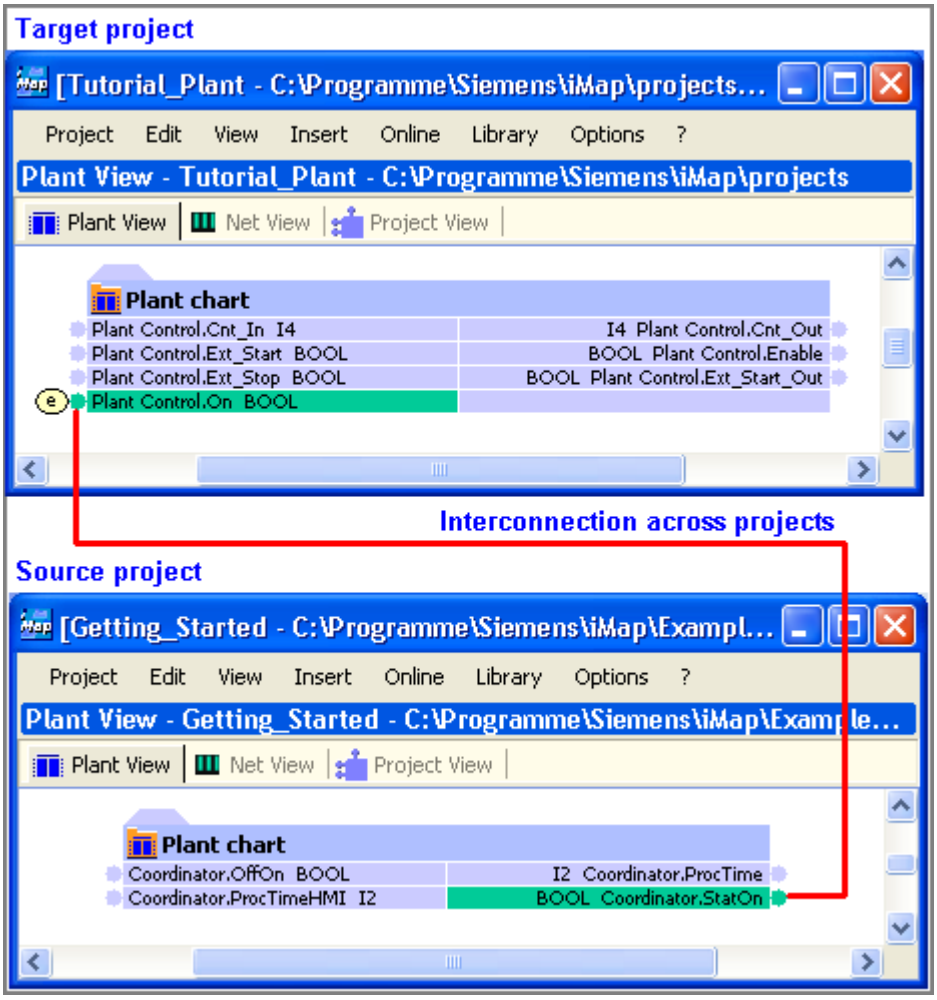


Figure 4-19 Interconnection across projects

The origin of the interconnection is an output in the source project, while the destination is an input in the target project. The interconnection between the two projects is always configured at the input (receiver) in the target project.

Rules for interconnections across projects

Only connectors from the relevant chart interface of the main chart (plant chart) of a project may be interconnected across projects.

Outgoing interconnections across projects are ignored when the device utilization is verified. Only incoming interconnections across projects in the target project are included.

Requirements

- In the source project, the device must have an IP address assigned to the instance to be interconnected across projects. If the source connector is on a PROFIBUS device, then the associated PROFInet device with proxy functionality must have an IP address.
- The connectors to be interconnected across projects must be contained in the chart interface of the main chart (plant chart) of the project concerned.

  For every connector to be interconnected, select the connector and activate the “In chart interface“ option from the context menu. If the connector is located in a subordinate chart, repeat this procedure until the connector is contained in the chart interface of the plant chart.

To create interconnections across projects using drag-and-drop:

1. Start SIMATIC iMap twice.
2. Open the target project and the source project in separate SIMATIC iMap applications. Arrange the windows on the desktop of your PC/PG so that both are visible.
3. In both projects, open the chart interface of the plant chart in the plant view by clicking on the "Open chart one level up" icon.
4. In the source project, highlight the output to be interconnected, hold down the left mouse button and drag an interconnection to the input in the target project.

Result: The input is identified as interconnected across projects.

To create interconnections across projects using menu commands:

1. In SIMATIC iMap, open the target project containing the input to be interconnected across projects.
2. Open the chart interface of the plant chart in the plant view by clicking on the "Open chart one level up" icon.
3. In the chart interface, highlight the input to be interconnected across projects and select the **Interconnect externally** command from the context menu.
4. In the "Properties – External interconnection" dialog box, enter the following data from the source project in the "From" box (see example below):
   - the IP address,
   - the name of the PROFInet device,
   - the name of the technological function,
   - the name of the output to be interconnected from.
5. Define the transfer parameters of the interconnection in the "Transfer parameters" box. You can either accept the defaults or modify the parameters.
6. In the "Substitute value" box, enter a substitute value for the interconnection.
7. Click on the "OK" or "Apply" button.

   Result: The interconnection data is assigned to the input and the connector is identified as interconnected across projects.

8. Highlight the device or the technological function whose input you have interconnected across projects.
9. Download the interconnection to the device using the **Download Selected Device > Interconnections only** command.

   Result: The interconnection is downloaded and the communication link is established to the partner device in the source project. You can then monitor online in SIMATIC iMap the modified online values at the connectors interconnected across projects in the source project and in the target project.

Example: Interconnection across projects

The following diagram shows the data of the connector in the source project that you must enter using the **Edit > Interconnect externally** menu command when you create the interconnection across projects.

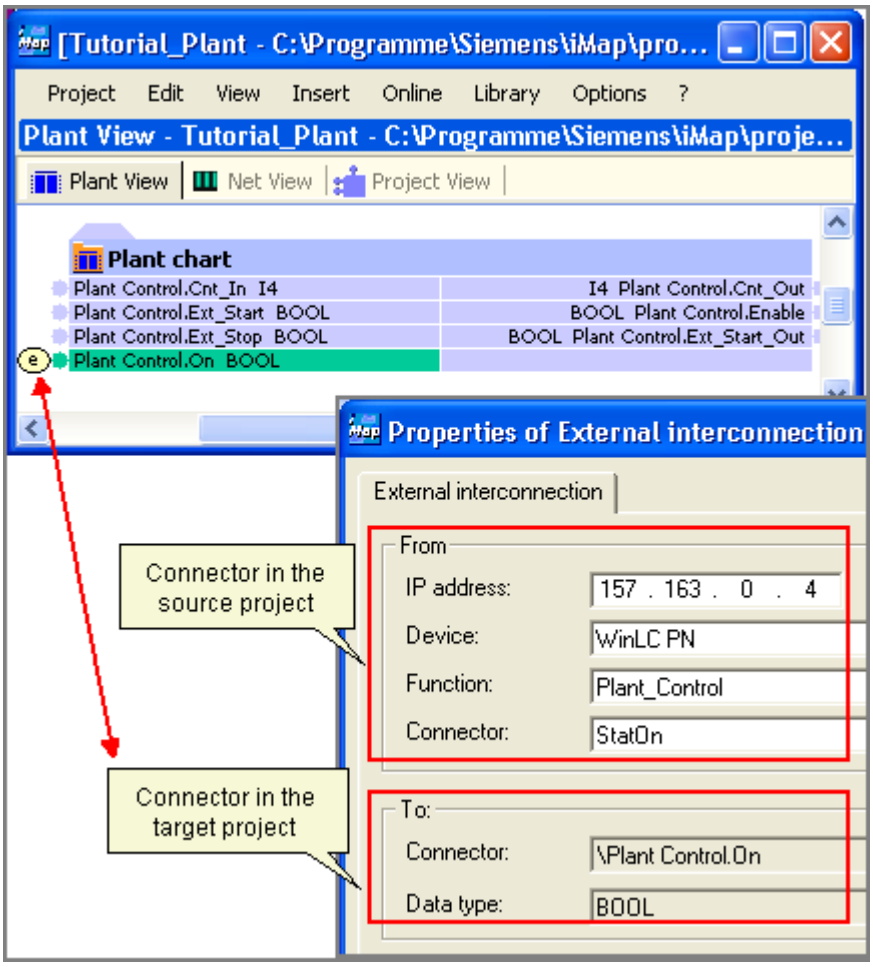


Figure 4-20 Configuring an interconnection across projects

4.7 Working with modified PROFInet components

4.7.1 Upgrading PROFInet components

You can re-edit PROFInet components directly via a SIMATIC iMap library. This creates a copy of the component project in the directory defined under **Options > Customize**. You can edit the copy using the vendor-specific configuration and programming tool and then use it as the basic project for creating the re-edited PROFInet component.

The copy of the component project is uniquely identified by the ID and version of the original PROFInet component.

To re-edit a PROFInet component in SIMATIC iMap

1. Highlight the PROFInet component to be modified in the library.
2. Select the **Re-edit** command from the context menu.
3. In the "Re-edit PROFInet component" dialog, select the directory in which you want to create a copy of the component project. Click on the "Browse" button to search the file system for the directory.
4. Click on the "OK" button.

   If you do not yet have a copy of the component project, a copy is created and is opened for editing in the vendor-specific configuration and programming tool.

   If the selected directory already contains a copy of the component project, you are asked whether you want to overwrite this copy. Result:

   - Click on "Yes" to create a copy of the current component project in the specified directory and open it for editing in the vendor-specific configuration and programming tool. The existing copy is overwritten.
   - Click on "No" to open the existing copy of the component project for editing in the vendor-specific configuration and programming tool.
5. Make the necessary changes to the copy of the component project.
6. Create a new version of the PROFInet component and import the newly created PROFInet component into a SIMATIC iMap library. You can then use the component in SIMATIC iMap projects.
7. If necessary, replace any instances of the earlier version of the PROFInet component with instances of the modified component (see "Replacing instances").

Note

The uniquely defined storage location for the modified component project makes it easier to make changes to PROFInet component. The next time you edit the PROFInet component, you will be reminded that an earlier copy already exists (if appropriate).

4.7.2 Replacing instances

In SIMATIC iMap, you can easily replace the instance of a PROFInet component with the instance of another PROFInet component. In this way, you can quickly incorporate changes to PROFInet components into existing SIMATIC iMap projects.

Rules for replacing instances

The instances selected for replacement must originate from the same source component.

The devices of the source component and target component must have **bus ports of the same type**. For example, a PROFInet device with Ethernet connector cannot be replaced with a PROFIBUS device (DP slave).

What happens when you replace instances?

The configured properties of the old instance, such as the name and addresses are transferred to the new instances.

When you replace instances, interconnections are accepted if the technological function of the target component contains connectors of the same type (input or output), name and data type. Any configured substitute values and transfer properties of the interconnections are also accepted.

Notice

If the source component and the target component have different technological functions, the instances will still be replaced.

When you replace the instances, interconnections can be lost if the technological function of the target component does not contain all the connectors of the technological function of the source component.

Requirement

The target component must be located in the project library. If necessary, you should import the target component into the project library.

To replace the instance of a PROFInet component:

1. Select either:
   - the original component from the project view or
   - the instance or instances to be replaced. You can do this both in the project tree and in the plant view, net view or project view.
2. Select **Replace** from the context menu. The "Replace instances" dialog box opens.
3. Define the target component. You can either accept the suggested target component and its version or select one from the drop-down list.
4. If necessary, change the instances selected for replacement. Highlight the required instances in the "Available instances" or "Instances selected for replacement" box and click on the ">" or "<" button to move to the other box.
5. Click on the "Replace" button.

   Result: The selected instances of the original component are replaced by instances of the selected target component.

   The interconnections are transferred to the new instances in conformity with the connectors.
6. Check the replaced instances:
   - to ensure that all the necessary interconnections are present and
   - to ensure that the substitute values and transfer properties of the interconnections are configured correctly.
7. Check the configuration of the replaced instances using the **Edit > Verify utilization** menu command (optional).
8. Generate the project using the **Project > Generate > Changes only** menu command.
9. Use the **Download Selected Device > All** menu command to download all the programming and configuration data to the target system.

Hint: Replace with drag-and-drop

To replace an individual instance: Select the target component from the library, hold down the "Alt" button and drag it onto the instance to be replaced within the project. Answer "Yes" when you are asked whether you really want to replace the instance. Then carry out steps 6 to 9 as described above.

4.7.3 Moving interconnections

Definition

In SIMATIC iMap, the end point of an interconnection can be moved onto a connector of another technological function.

Rules for moving interconnections

The target connector to which the end point of an interconnection is to be moved must fulfil a number of conditions. These conditions depend on the number of end points to be moved.

- Some or all of the end points of the interconnections of a technological function can only be moved onto connectors of the same type (input or output), same name and same data type of another technological function.
- There are two ways to move the interconnection at an individual end point:
  - at a connector of the same type (input or output) and same data type (in which case the I/O names do not have to be the same) or
  - at a different technological function. In this case, the technological function selected as the target must contain a connector of the same type (input or output), same name and same data type.
- If the end point is an input, it can only be moved to an **unconnected** input. An output can be moved onto an already interconnected output.
- Interconnections cannot be moved across the boundaries of a chart; the source and target must be in the same chart.
- The configured substitute values are accepted for the interconnections.
- Interconnections with configured substitute values cannot be moved from a PROFInet device to a PROFIBUS device if the configured substitute values are not equal to the default values.

To move several interconnections:

1. Select:
   - the entire technological function if you wish to move all the interconnections or
   - just the connectors whose interconnections are to be moved.
2. Select the **Move Interconnections** command from the context menu. The technological functions to which the selected interconnections can be moved are highlighted in color when the mouse pointer moves over them.
3. Click on the technological function to which the interconnections are to be moved.
4. You are prompted to confirm that you want to move the interconnections. Click on "Yes" to confirm.

   Result: the interconnections are moved to suitable connectors in the new technological function.

Interconnections for which no suitable targets are found are not moved. They remain at the original technological function.

To move an individual interconnection:

1. Select the connector whose interconnection is to be moved.
2. Select the **Move Interconnections** command from the context menu. The possible target connectors or technological functions to which the interconnection can be moved are highlighted in color when the mouse pointer moves over them.
3. Click on the target connector to which the interconnection is to be moved.

   Result: the end point of the interconnection is moved to the target connector.

4.8 Editing in the vendor-specific programming and configuration tool

SIMATIC iMap allows you to call applications from the vendor-specific programming and configuration tool directly at an instance within the project. You can then look up or edit the device-specific data, for example. The device-specific diagnostic information that can be looked up in this way is particularly important.

Accessing the vendor-specific programming and configuration tool

You can call the vendor-specific programming and configuration tool from SIMATIC iMap in the following ways:

- Modify a technological function in the plant view
- Modify a device in the net view

Depending on which object you have selected, you can open different applications in the vendor-specific engineering tool in order to edit parts of the PROFInet component.

Requirement

The SIMATIC iMap project has been generated.

To edit objects in the vendor-specific programming and configuration tool:

1. Select the object to be edited:
   - The technological function in the plant view or project window
   - The device in the net view or project window.
2. Select **Edit > Special** using one of the available commands. These commands are device-specific. The menu is grayed out if there is nothing to edit or if nothing has been generated yet.
3. Save the changes and download them to the target system.

Caution

When you are editing with the vendor-specific configuration and programming tool, you must make sure that no inconsistencies or other errors occur in the edited component project or shadow project

In the event of an error, you may find that you have to generate the SIMATIC iMap project again.

Caution

If you regenerate the iMap project using the **Project > Generate > Control unit > All** menu command, any changes you have made using the vendor-specific configuration and programming tool will be lost. A copy of the old shadow project is created, however.

Changes you make using the vendor-specific configuration and programming tool cannot be undone in SIMATIC iMap.

Commissioning and online mode

5

5.1 Basic procedure for commissioning

Requirements

The following requirements must be fulfilled before you can commission a plant:

- The device-specific configuration and programming tools, e.g. STEP 7, are installed on your PC/PG. Depending on the type of device, this software is needed in order to carry out certain actions, e.g. to download programs.
- The project has been generated without errors in SIMATIC iMap.
- All the device configuration data has been prepared (generated) for downloading.
- The devices are connected via Ethernet or PROFIBUS.
- The devices are switched on.
- The PC/PG running SIMATIC iMap is connected to the devices in the plant via Ethernet.

Basic procedure

1. Start SIMATIC iMap
2. Open the project.
3. Download programs and interconnections to the devices.

You can then use the following test and diagnostic functions (optional):

- Perform online monitoring and diagnostics for the plant
- Test and control with the variable table
- Display and set online values
- Run online device analysis
- Checking the accessiblity of the devices
- Compare online and offline data for programs and interconnections
- Run device-specific diagnostics

5.2 Overview of the online functions

Requirement

SIMATIC iMap must be connected to the plant via Ethernet in order to monitor the devices online. Both PROFInet and PROFIBUS devices (via a PROFInet device with proxy functionality) can be accessed via the online connection.

SIMATIC iMap in the online and offline views

By default, SIMATIC iMap is in the offline view (no connections established to the devices).

Online mode may be switched on and off for individual SIMATIC iMap views.

- Variable table - by clicking on the "Monitor variables online" icon or using the **Online > Variable table > Monitor variables** menu command.
- All the other views (e.g. the plant view, net view or the "Functions" and "Devices" tabs in the diagnostic window) by clicking on the "Online connection" icon or using the **Online > Monitor** menu command.

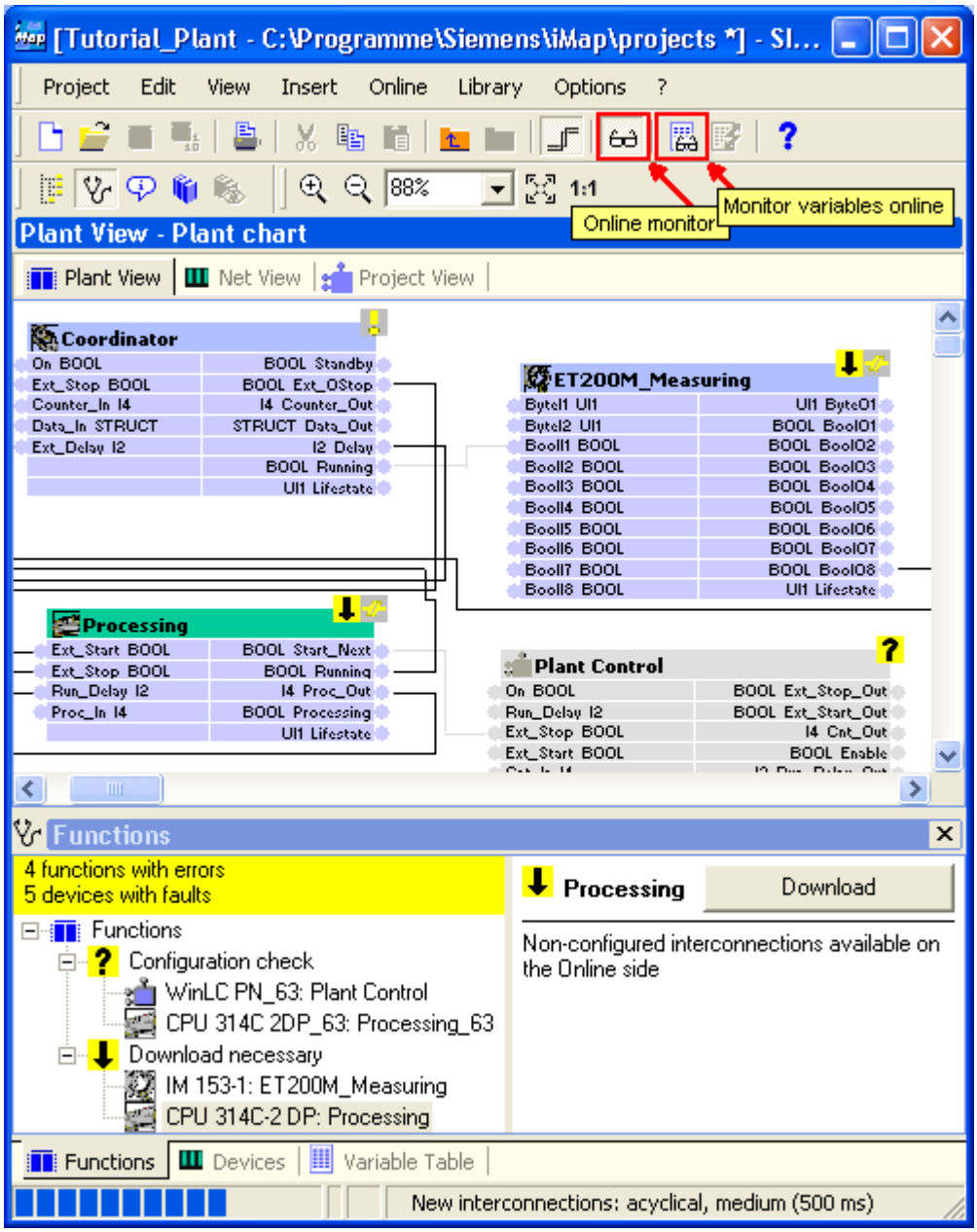


Figure 5-1 SIMATIC iMap in the online view

Note

A plant may only be monitored online with just one SIMATIC iMap application.

Switching on the online view for a plant in several SIMATIC iMap applications increases the processor load in the target devices of the plant.

Online functions

SIMATIC iMap offers the following functions for starting and for controlling and monitoring the plant during operation:

Online monitoring activated

- Diagnosis for devices, functions and interconnections
- Downloading interconnections to the devices of a plant
- Displaying and setting online values
- Displaying the module status (depending on the device type)
- Displaying the operating status (depending on the device type)
- Downloading interconnections

Online monitoring deactivated

- Comparison between the online and offline interconnection and program data
- Downloading the programs and interconnections to the devices of a plant.
- Checking the accessiblity of the devices

Separately from the online view:

- Device-specific diagnostics via the vendor-specific configuration and programming tool.
- Online device analysis

Possible actions in the online view

If **Online connection** is switched on, certain actions that modify the project, such as copying, pasting, deleting and interconnecting, are disabled. Generating, documenting and archiving/retrieving are also unavailable in the online view.

Actions such as viewing (not changing) properties, printing the current window and calling the **Edit > Special...** menu command are also not possible in the online view.

5.3 Downloading Programs and Interconnections

Download options

The term "downloading" means loading data from SIMATIC iMap onto a programmable controller or field device. You can download the following data to the devices of the plant from SIMATIC iMap:

- Program

  Downloading of the user program including all the device-specific data, such as the hardware configuration and network configuration. The vendor-specific configuration and programming tool, for example STEP 7, is required for the program download.

- Interconnections

  Downloading of the interconnection information into the corresponding devices of the plant. Interconnections may be downloaded from SIMATIC iMap without the vendor-specific configuration tool.

- All

  Loads the program and interconnections onto the devices of the plant. The vendor-specific configuration and programming tool is also required.

The following downloads are possible, depending on which objects are selected:

Selection	Possible download	Menu command
Not selected	for the complete project • All • Program only • Interconnections only	Main menu **Online > Download all instances > All** **> Program only** **> Interconnections only**
One or more instances	for the select instances • All • Program only • Interconnections only	Main menu **Online > Download all instances > All** **> Program only** **> Interconnections only** Context menu **Download selected instances > All** **> Program only** **> Interconnections only**

Note

Make sure that the program and interconnections are downloaded to device from only **one** instance of SIMATIC iMap at any given time.

The user program may be overwritten in the target system concerned if you use the wrong IP addresses.

Note

Instances of singleton components are not included in the program download. The program download can only be carried out via the vendor-specific configuration tool.

Target for the download

Download...	Selected device to SIMATIC iMap	Target device for the downloads in the plant
Program	PROFInet device	Corresponding PROFInet device
	PROFIBUS device	Corresponding PROFIBUS device
Interconnections	PROFInet device	Corresponding PROFInet device
	PROFIBUS device	Associated PROFInet device with proxy functionality

Note

Additional steps may be needed to permanently store the downloaded data to the device, depending on the device type.

When is a download required?

- Program download

  You can determine whether a program download is necessary by carrying out an online-offline comparison.

  A program download is needed in the following situations:

  - When a device is commissioned
  - After coupling or decoupling PROFIBUS devices

    In this case, a program download to the associated PROFInet device with proxy functionality and to all intelligent PROFIBUS devices associated with the proxy system is required.
  - After replacing instances

    Attention: When you replace a PROFIBUS device, a program download is required both to the associated PROFInet device with proxy functionality and to the target device of the replaced instance.
- Interconnections can be downloaded to the target devices later if required, e.g. in order to test the PROFInet communication between the components.

The instances for which interconnections have to be downloaded are identified by a vertical arrow and are listed on the "Functions" tab in the diagnostic window (see diagram).

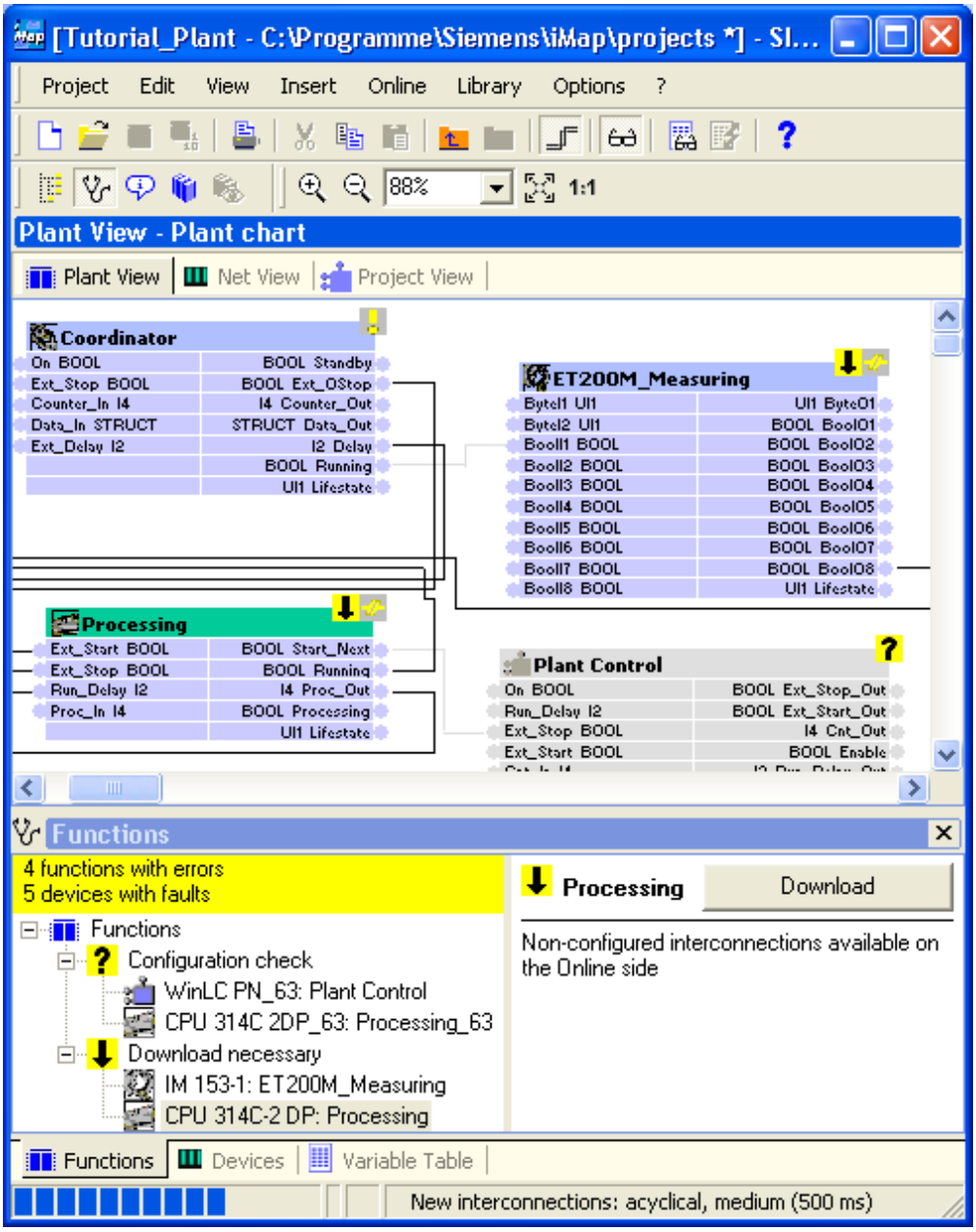


Figure 5-2 Download required

Requirements for the download

For program and interconnection download:

- Your PC/programming device must be connected to the plant via the Ethernet.
- The devices must be accessible.

Plus for program download only:

- All instances of the PROFInet components for which the program download is required must have the generation status "generated" in their properties. You may have to generate the SIMATIC iMap project.
- Online monitoring must be switched off in SIMATIC iMap.

Note

Recommendation: Before downloading, check the device utilization (with the **Edit > Verify utilization** menu command) to ensure that the plant runs error-free.

To download to all the instances:

Select one of the following commands from the main menu in the project net or plant view:

- **Online > Download all Instances > Program only** to download the programs to all the devices of the plant
- **Online > Download all Instances > Interconnections only** to download the interconnections to all the devices of the plant
- **Online > Download all Instances > All** to download both programs and interconnections to all the devices of the plant.

Result: The desired data is downloaded to all the devices of the plant. Information on the progress and completion of the action and any error messages are displayed in the information window.

To download to selected instances:

1. Select the instances of the PROFInet component(s) for which a download is to be carried out. The options are as follows:
   - One or more technological functions in the plant view or project tree.
   - One or more devices in the net view or project tree.
   - One or more instances in the project view.
2. Select one of the following commands from the context menu:
   - **Online > Download selected instances > Program only** to download only the program to the devices
   - **Online > Download selected instances > Interconnections only** to download only the interconnections to the devices
   - **Online > Download selected instances > All** to download both the program and the interconnections to the devices.

Result: The desired data is downloaded to those devices of the plant which are assigned to the selected objects. Information on the progress and completion of the action and any error messages are displayed on the "General" tab in the information window.

Downloading to PROFIBUS devices

The interconnections of PROFIBUS devices are downloaded to the associated PROFInet device with proxy functionality, where they are stored.

When the program is downloaded, part of the configuration data for the coupled PROFIBUS devices is stored on the associated PROFInet device with proxy functionality. When you download programs to select instances, you must therefore first download the program to the PROFInet device with proxy functionality, and then download the program to the coupled PROFIBUS devices.

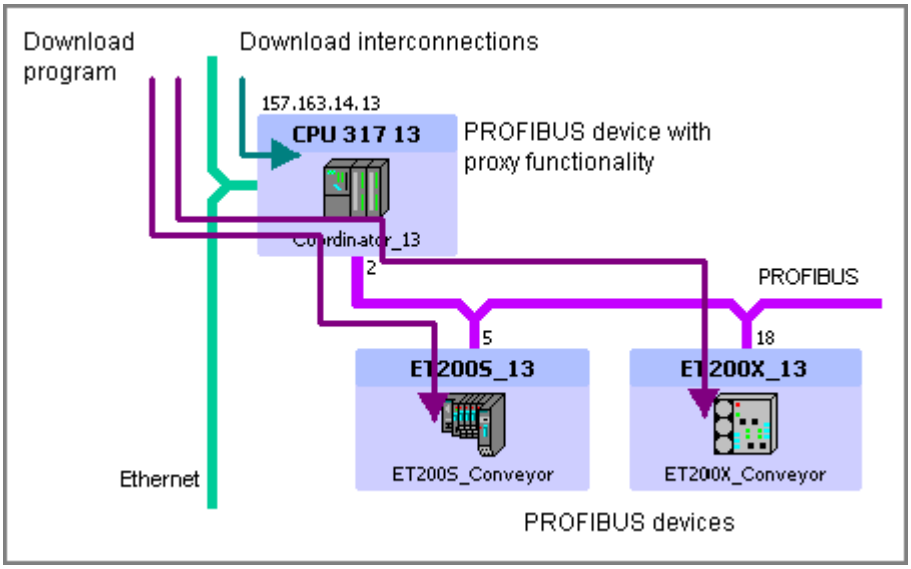


Figure 5-3 Downloading to PROFIBUS devices

Notice

When you download the program to a PROFInet device, both the interconnections of the actual PROFInet device and the interconnections of any coupled PROFIBUS devices are deleted.

You will then have to download the interconnections to all devices of the DP master system.

Downloading interconnections

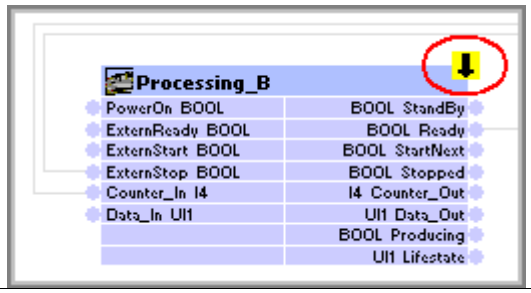
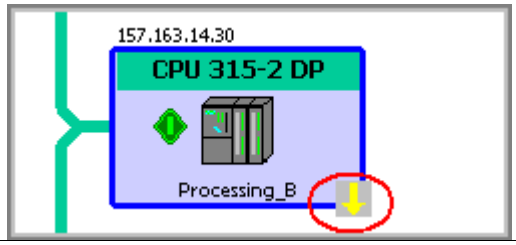
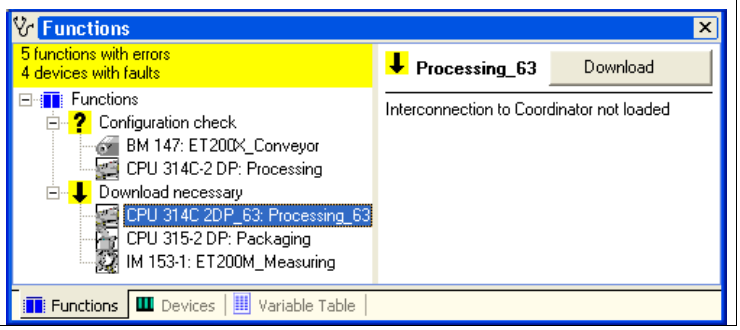
Caution

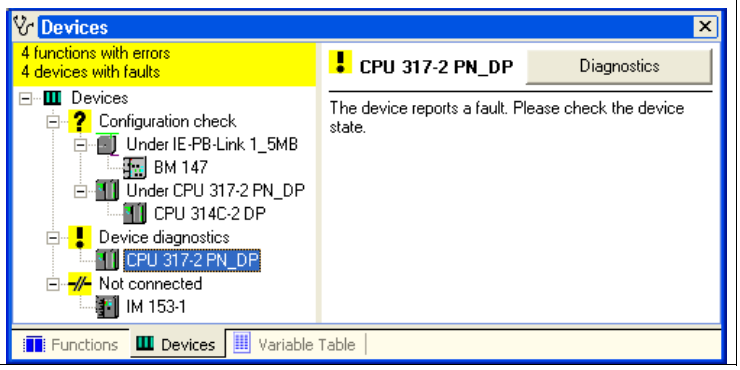
The interconnections are downloaded to the target system regardless of the operating status or level of protection on the target system. Existing interconnections will be deleted. To guarantee the security of your plant, make sure that all the settings, such as function names and IP addresses, have been entered correctly. This also applies to the "Download" button in the diagnostic window.

Select the **Online > Online-offline comparison >**... menu command to determine the differences between the SIMATIC iMap project (offline) and the plant (online).

Examples

Table 5-1 Examples: Download required

Example	Display
Function, interconnection download required	
Device, interconnection download required	
List of functions with faults	

Example	Display
List of devices with faults	

5.4 Diagnostic information in the online view

Introduction

When the online view is switched on in SIMATIC iMap, it provides information in graphical format about

- the availability and status of the PROFInet stations,
- the status of the interconnections and online values, and
- The operating status of the devices (depending on the device type)

Online-offline comparison

SIMATIC iMap allows you to compare the online and offline interconnection and program data. The result of an online-offline comparison is displayed:

- in text format in the information window and diagnostic window, and
- as graphical information in the plant and net views, and in the diagnostic window. Graphical information means:
  - Icons, e.g. "Interconnection download required", or
  - Object colors, e.g. grayed-out devices are not accessible.

Status of the PROFInet communication nodes

From the viewpoint of PROFInet communication the nodes have certain states which are indicated in SIMATIC iMap by icons and diagnostic messages, e.g.:

- whether the devices are accessible online (configuration error),
- whether there is a diagnostic messages for the devices,
- whether an interconnection download is required,
- whether diagnostic information is available at all,
- whether interconnections are functioning correctly,
- whether a PROFIBUS device is connected to the associated PROFInet device with proxy functionality.

In the plant view, there is also an indication of whether online values are valid or not.

In the net view, the operating statuses of the devices are also displayed.

Table 5-2 Diagnostic icons

Icon	Error message	Meaning
	Configuration check	The connection to the device cannot (yet) be established, the device is not (yet) accessible or the function is not available on the target device.
	Device diagnostics or fault	• On devices in the net view: Device-specific diagnostics available. You can click on the "Diagnostics" button in the right-hand part of the diagnostic window to look up diagnostic information. • On a subordinate chart in the plant view: There is a fault in one or more functions within the chart.
	Not connected	The PROFIBUS device is not connected to the PROFInet device with proxy functionality, is not switched on the state is STOP.
	No information available	The device can be accessed, but its state cannot be determined. (This can happen to a DP slave, for example, if the DP master state is STOP).
	Download required	Interconnection download required.
	Interconnection failed	At least one interconnection to the device has failed.
No icon		The device or function is OK (blue)

Normal representation and inverse video

The symbols in both the plant view and the net view are displayed normally or inverted.

- The normal representation (black symbol on a yellow background applies to the instance displayed, e.g. device in the net view or technological function in the plant view).
- The inverted representation (yellow symbol on a gray background): Diagnostic symbols for the technological functions (e.g. "Interconnection failed") are displayed inverted on the devices in the net view, while diagnostic symbols for the devices are displayed inverted on the technological functions .

In the project view, the diagnostic symbols are displayed normally on the device or on the technological function.

Device operating statuses

The current operating state of a device is displayed as a symbol in the SIMATIC iMap online net view.

Icon	Operating state
	RUN
	STOP
	STARTUP
	DEFECTIVE

For PROFIBUS devices it is also indicated whether the device is connected to the PROFIBUS master:

Icon	State
	Connected to the PROFInet device with proxy functionality
	Not connected

Status of the interconnections

The status is indicated by the color of the interconnection line:

Color of the interconnection line	Meaning
Black	the interconnection is OK
Green	The interconnection has been selected
Red	The interconnection has failed (the failure generally occurs at the output from the technological function of the sending device)
Gray	There is no information about the interconnection (e.g. if the device is unavailable or a download is required)

Diagnostic messages in the Diagnostic window

If the SIMATIC iMap online view is switched on, current messages are displayed on the "Functions" and "Devices" tabs in the diagnostic window.

- The "Functions" tab displays diagnostic messages on the faulty technological functions and interconnections, such as a list of the functions for which the interconnections will have to be downloaded.
- The "Devices" tab displays diagnostic messages on the devices, such as a list of faulty or unavailable devices.

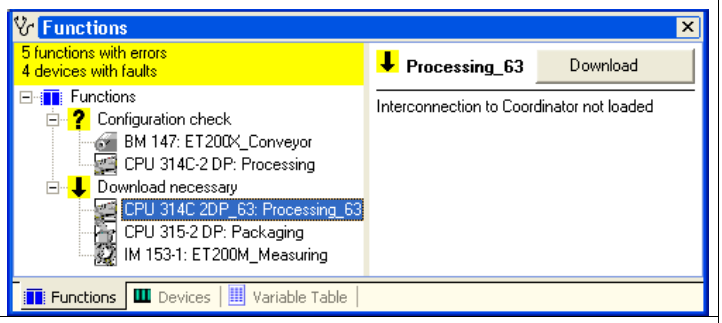
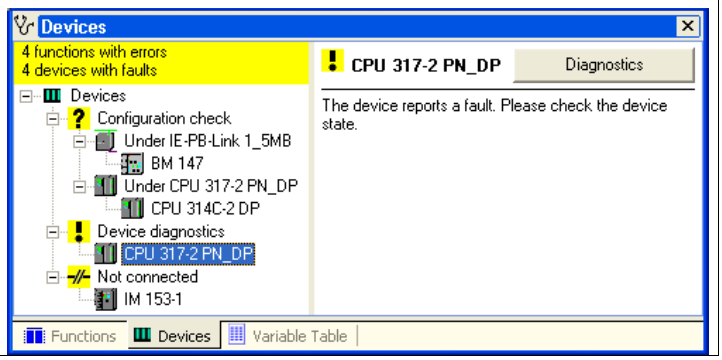
The left-hand window contains the faulty devices or functions, sorted by type of fault. The inaccessible devices are displayed hierarchically by DP master system so that all the DP slaves assigned to a DP master can be recognized readily.

The right-hand window contains detailed information about the highlighted faulty instance and provides download, device-specific diagnostics and help buttons according to the type of fault.

Note

When a PROFInet device with proxy functionality (DP master) fails or is not accessible, then no detailed diagnostic messages are displayed for the coupled PROFIBUS devices.

Examples

Example	Display
Diagnostic window, "Functions" tab	
Diagnostic window, "Devices" tab	

5.5 Diagnosing PROFInet components

Basic diagnostic procedure

To diagnose PROFInet components in SIMATIC iMap, you can either follow the basic sequence described below or carry out specific individual actions.

1. Switch on the online view using the "Online connection" icon, for example.
2. Open the "Devices" tab in the diagnostic window.

   Result: The left-hand window displays diagnostic information about the devices dynamically in the form of a tree structure.

   If no diagnostic information is available, then there are no faults in the devices of the plant. Then continue from step 4.
3. If there is diagnostic information available on the "Devices" tab, process this information by selecting the device and following the detailed information and troubleshooting options in the right-hand window. Eliminate any faults. Click on any available buttons to call up device-specific diagnostics, for example.

   Order: First process the devices in the "Configuration check" category. If the configuration check for a device cannot be carried out successfully, it will not be possible to run PROFInet diagnostics for that device. You can then process the remaining devices in any order.
4. Check the entries on the "Functions" tab. If there are no faulty functions listed, then there are no faults in the plant.
5. If there is diagnostic information available on the "Functions" tab, process this information by selecting the function and following the detailed information and troubleshooting options in the right-hand window. Eliminate any faults. Click on any available buttons in order to download the interconnections, for example.

   Order: First process the functions in the "Configuration check" category. If the configuration check for a function cannot be carried out successfully, it will not be possible to run PROFInet diagnostics for that function. You can then process the remaining functions in any order.

The following tables contain a summary of the common diagnostic scenarios for devices and functions, and the troubleshooting options.

Diagnostic scenarios for devices

The individual diagnostic scenarios for devices are described in the following table.

Diagnostic scenario	Possible Causes	Possible Remedies
 Configuration check	• Communication fault, for example, cable break, cable not connected • The device is switched off • The device has not been started or has not been initialized completely • The device is not a PROFInet device • Error in the hardware configuration (different configuration) • The program has not been loaded yet • Wrong device or function downloaded	• Check the communication links • Eliminate the fault • Switch on or start device • Check the IP addresses and subnet masks • Check the PROFIBUS addresses • Check the hardware configuration • Download program to the device
 Device diagnostics	• Error in the program • The device has STOPped	• Call device-specific diagnostics by clicking on the "Diagnostics" button, if necessary • Eliminate the error • Download program to the device
 Not connected	• PROFIBUS cable not connected or defective • PROFIBUS device not switched on or STOP status	• Check the PROFIBUS cable • Switch on the PROFIBUS device • Switch the PROFIBUS device to RUN
 No information available	• The associated PROFInet device with proxy functionality is faulty or status is STOP. • The program has not been downloaded to the PROFIBUS device	• Switch on PROFInet device or switch to RUN • Rectify fault on PROFInet device, if necessary • Download program to the PROFIBUS device

Notice

When you switch on the online view, all configured devices are first assigned to the "configuration check" category, and remain present until the first check is completed. If this test does not identify any differences between the configured device and the data in the plant, then the device is removed from the category. The time required for this operation will differ according to the plant size and PC.

Diagnostic scenarios for technological functions

The individual diagnostic scenarios for technological functions are described in the following table.

Diagnostic scenario	Possible Causes	Possible Remedies
 Configuration check	• The device is switched off • The device has not been started or has not been initialized completely • The program has not been loaded yet • Target system contains no or a different technological function	• Check the communication links • Rectify the fault, if necessary • Switch on or start device • Download program to the device
 on the subordinate chart in the plant view	• The chart contains at least one faulty function	• Open the chart and check the individual functions.
 Download required	• The interconnection data is different in SIMATIC iMap and in the device.	• Download interconnections into the device Click on the "Download" button
 Interconnection failed	• Communication partner of the device has a fault or is not available. • Incompatible transfer properties for interconnections (transfer mode or transfer frequency)	• Check the communication connections • Check the properties of the interconnection and correct, if necessary • Run an online-offline comparison of the interconnections and • Eliminate the fault

5.6 Checking the accessiblity of the devices

Requirement

Your PG/PC must be connected to the plant via Ethernet in order to check the accessibility of the devices.

Accessible device

A device of the plant must be accessible via PROFInet communication mechanisms in order to download the interconnections or monitor variables.

SIMATIC iMap provides a number of ways of checking whether a PROFInet device is accessible online.

- If Online connection is switched on:
  - In the net view and plant view, the accessiblity of the devices is represented graphically: Accessible devices are shown in blue, while inaccessible devices are gray and are shown with a diagnostic symbol.
  - On the "Devices" tab in the diagnostic window, the inaccessible devices are listed.
- If Online connection is switched off, the accessiblity of individual devices can be looked up using menu commands.

Check accessibility

To look up the online accessiblity of a device:

1. Switch off the "Online connection" option, using the **Online > Monitor** menu command, for example.
2. Select the device from the net view or the technological function from the plant view that you wish to check. You can also select multiple objects.
3. Select:
   - **Check Accessibility** from the context menu or
   - the **Online > Check Accessibility** menu command.

Result: The online accessiblity of the devices is checked, and the result are displayed on the "General" tab in the information window.

Possible messages

Message	Possible Causes	Remedy
No node is accessible at IP address <IP_address>.	• The physical connection to the device has failed or is not available. • The device is not switched on • For PROFIBUS devices: The associated PROFInet device with proxy functionality is not accessible or its status is STOP. If the device is a PROFInet device with proxy functionality, then any PROFIBUS devices coupled to it will also be inaccessible.	• Check connection or cable • Switch on the device • Check the PROFInet device with proxy functionality (DP master)
The PROFInet access to the device <IP_address> is not accessible	The device is physically connected, but it is not ready for use (e.g. status is STOP)	Switch the device to RUN
The logical device <device name> (proxy at <IP address>) is accessible, but the physical device is not.	For PROFIBUS devices only: • The PROFInet configuration data for the device can be found on the associated PROFInet device with proxy functionality, but the connection between the DP master and DP slave has failed, or • the PROFInet configuration data has not been downloaded.	• Check the PROFIBUS connection between the DP master and DP slave. • Download the program
The device <Device name> is accessible		

Logical device

The logical device is part of the runtime software that is responsible for the PROFInet communication of a device. It is addressed during online monitoring by SIMATIC iMap. The PROFInet configuration data for a component downloaded to the device is assigned to this logical device.

Note

The logical device of a PROFIBUS device can be found on the associated PROFInet device with proxy functionality.

If the logical device of a PROFIBUS device is signalled as accessible, although the device is represented as inaccessible in the online view, this can mean the following:

The PROFInet configuration for the PROFIBUS device is OK, but the physical device of the DP slaves is inaccessible because the connection to the DP master (associated PROFInet device with proxy functionality) has failed, for example.

Examples: Accessiblity

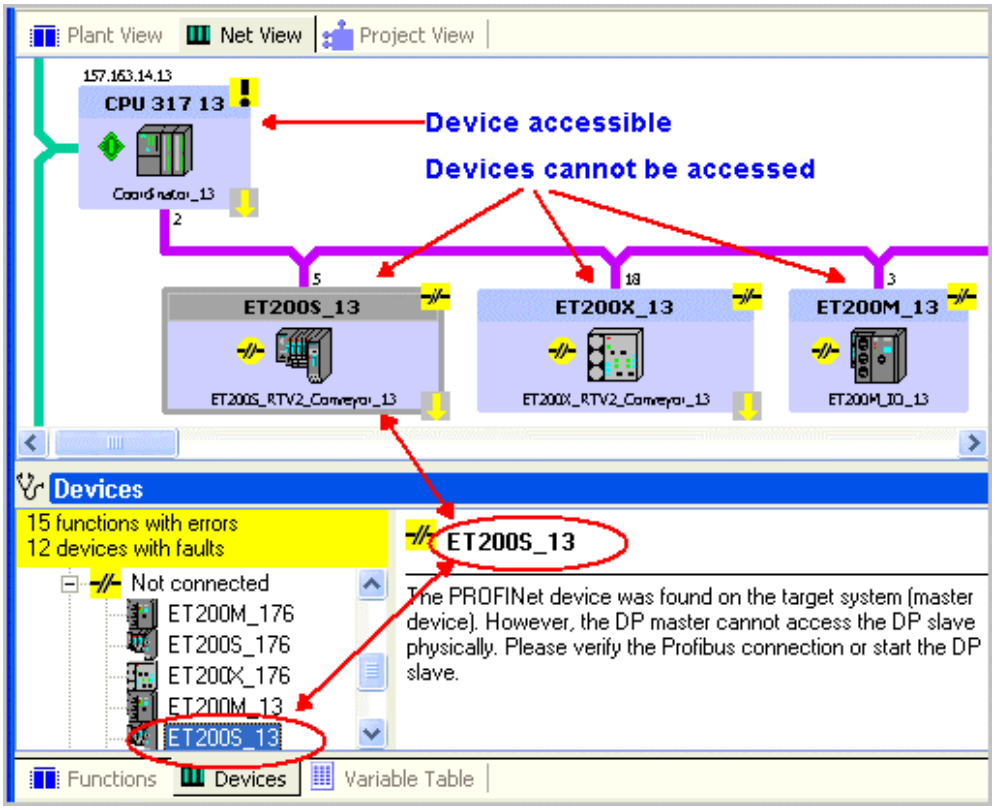


Figure 5-4 Representation in the net view

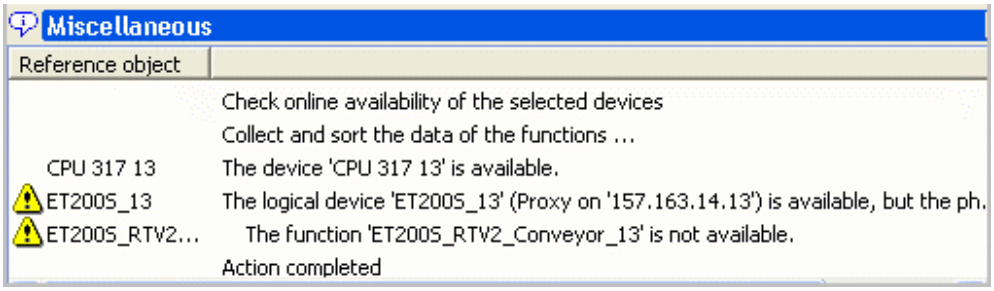


Figure 5-5 Message in the information window

5.7 Comparing online and offline data

Comparison options

If SIMATIC iMap is linked to a device of the plant via Ethernet, it is possible to run an online-offline comparison for one or more instances. This compares the online data in the plant with the offline data in the SIMATIC iMap project. You can compare the following data in SIMATIC iMap:

- Interconnections only – connectors and interconnections of the technological functions
- Program only – all the blocks in the user program, including all device-specific data such as the hardware and network configurations.

Online-offline comparison of interconnections

In an online-offline comparison of the interconnections, the online and offline data for the technological functions and their interconnections are compared. The following are tested:

- Added or removed interconnections
- Different transfer properties, e.g. transfer mode and transfer frequency.
- Inputs and outputs added or removed from the technological function
- Different connector data types

Note

Before interconnections are downloaded, the online-offline comparison of the interconnections is not carried out automatically since this would lead to longer run times. For safety reasons, we therefore urgently recommend that you run a comparison before downloading in order to avoid possible errors at runtime.

Requirements

- Your PC/programming device must be connected to the plant via the Ethernet.
- The SIMATIC iMap project must have been generated before you can run the Online-offline comparison for programs.
- Online monitoring must be switched off in SIMATIC iMap.

To compare programs:

1. Select
   - the required devices from the net view or
   - the required technological functions from the plant view.
2. Select **Online-offline comparison > Program only** from the context menu.

The result of the comparison is displayed on the "Online-offline comparison" tab in the information window.

Example: Comparing programs

Comparison of the program and configuration information before online monitoring. Devices in which differences were found are identified by a STOP symbol.

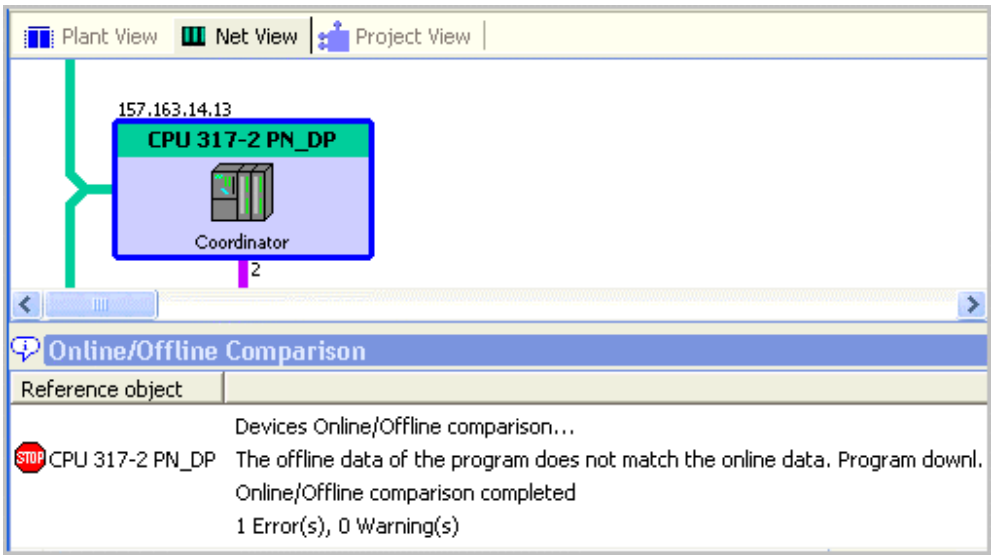


Figure 5-6 Online-offline comparison of programs

To compare interconnections:

1. Select
   - the required devices from the net view or
   - the required technological functions from the plant view.
2. Select **Online-offline comparison > Interconnections only** from the context menu .

The result of the comparison is displayed on the "Online-offline comparison" tab in the information window.

Additional error messages may be displayed on the "Functions" tab in the diagnostic window for failed interconnections.

Example: Comparing interconnections

In the following diagram, the comparison shows that an interconnection download is required since the interconnection partners are different.

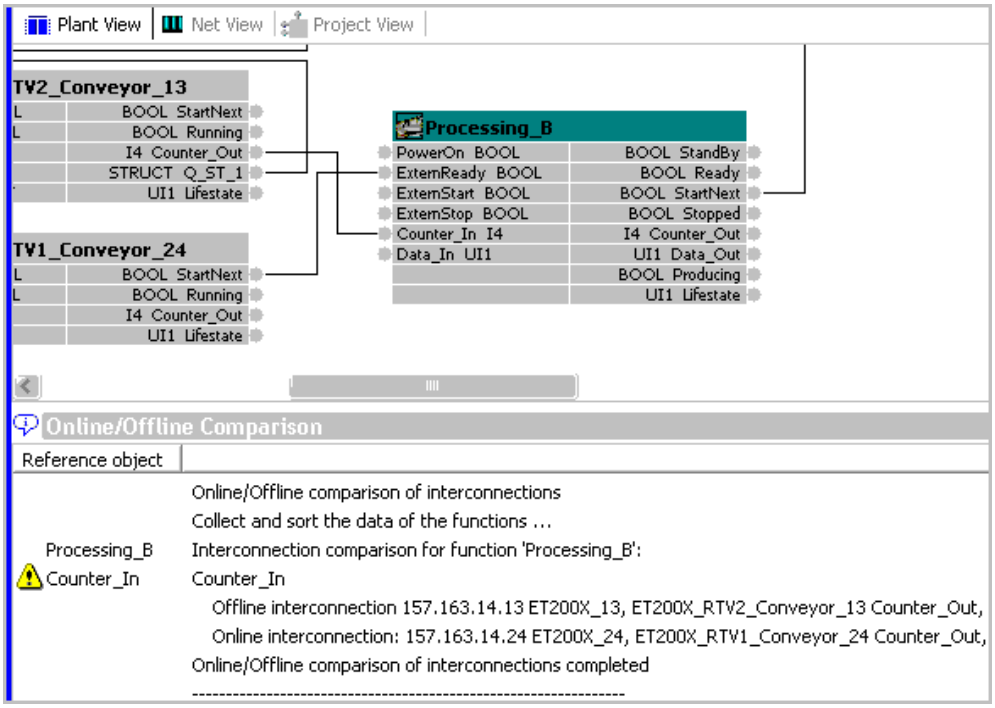


Figure 5-7 Online-offline comparison of interconnections

5.8 Displaying and setting online values in the plant view

Online values of PROFInet variables

The online values of PROFInet variables are current values at the connectors of technological functions.

In the Online view of SIMATIC iMap you can:

- monitor selected online values at the connectors of technological functions,
- set online values of individual inputs once in order to test a PROFInet component in the commissioning phase, for example,
- monitor and set online values in the variable table (see section entitled "Online testing with the variable table).

The procedure for displaying and setting online values in the plant view is described below.

Requirements

SIMATIC iMap must be connected to the plant online ("Online connection" button pressed).

To display online values:

1. Select the required connectors of the technological function(s) from the plant view.
2. Select the **Online > Display Online Values** menu command or **Display Online Values** from the context menu.

Result: The online values of the connectors are displayed in the plant view.

The online values are updated dynamically.

Caution

Network load on the Industrial Ethernet and in the devices of the plant.

Additional communication functions for monitoring connectors are performed on the Industrial Ethernet.

You should note, however, that the network load can be affected both by the number of connectors to be monitored and by the frequency with which the values change.

Remedy: Individually select the connectors whose values you wish to monitor online.

Note

The display of online values of the type array and struct is limited. No more than 16 elements can be displayed via Tooltips. Larger arrays and structures must be displayed via the variable table.

Validity of online values

The validity of displayed online values is indicated by different colors.

Color of the online value	Significance: the value ...
Black	is valid
Red	is invalid (e.g. due to a fault or immediately after setting, if the online value has not yet been confirmed in the target system)
Red with question mark	has not yet been confirmed or the device is not (yet) accessible
Red with exclamation mark	cannot be monitored because there are no free resources on the device
Gray	is uncertain (the validity cannot be determined)
Gray italic	is a substitute value

Example: Displaying online values

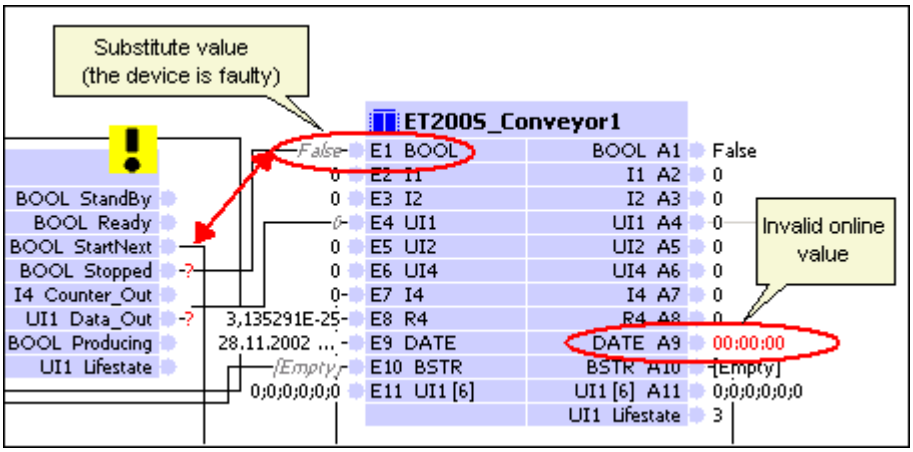


Figure 5-8 Displaying online values

To set an online value:

1. Select the desired input of a technological function in the plant view.
2. Select the **Online > Display Online Value** menu command.

   Result: The online value of the connector is displayed.
3. Click on the value or select the **Online > Set Online Values** menu command.

   Result: Depending on the data type of the connector either
   - A selection box with the permitted values, e.g. True and False for the data type BOOL, or
   - An edit box for all other data types is displayed.
4. Select the required value or enter it in the edit box and press Enter to confirm.

Result: The entered value must be confirmed by the device in the plant. It can then change to black, red or gray (see above "Validity of the Online Values").

If the device cannot be accessed online or if a fault has occurred, the set value is not confirmed. In this case, the last known value is displayed as red or as a red question mark.

The value remains constant as long as this input is not interconnected or modified by the user program of the technological function. If the input is interconnected via SIMATIC iMap, the online value can be modified via the interconnection.

Note

Online values of the data type Array and Struct cannot be set. You should use the variable table for these values.

Hint: You can also interconnect inputs to constant values for testing purposes.

Example: Setting an online value

Setting an input of the type DATE.

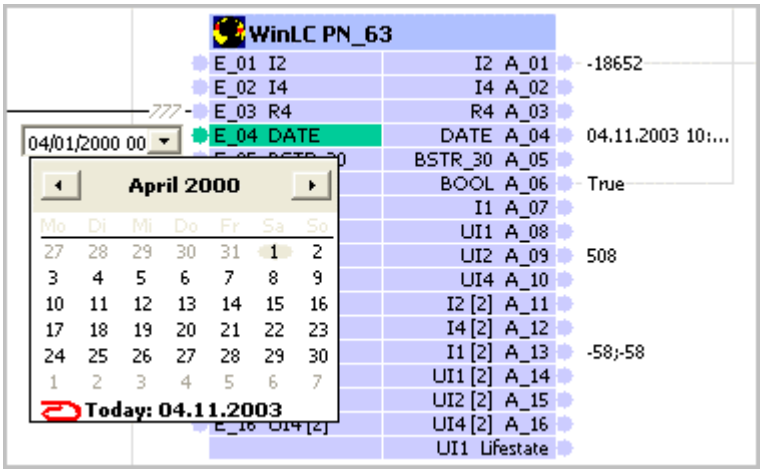


Figure 5-9 Setting online values

5.9 Online testing with the variable table

5.9.1 Creating a variable table

Structure of the variable table

The variable table contains the variables of the connectors to be tested online.

Table 5-3 Structure of the variable table

Column	Meaning
No.	Line number
	Automatically displays whether the entry is deactivated, connected online or inaccessible.
Device	Here you can enter the device name or select it from a list.
Function	Here you can enter the function name or select it from a list.
Connector	Here you can enter the connector name or select it from a list.
Type	The data type of the connector is displayed here.
Format	Here you can select the display format for the online value. <Automatic> means the default format, e.g. decimal for I1, I2, UI1, R4 or True/False for BOOL.
Online value	Displays the online value when the variable is connected online.
Control value	Here you can enter control values for inputs. You can transfer these values to the plant at any time to set the relevant online values.
Comment	A comment is entered here.

Select the **Columns** command from the context menu to show or hide individual columns.

To insert entries:

1. Open the "Variable table" tab in the diagnostic window.
2. Select the required connectors or technological functions from the plant view and drag them into the variable table.

Result: An entry is completed in the variable table for every inserted connector. For arrays and structures, you can expand and shrink the lines that make them up.

Other options:

- Enter data directly into the "Function" and "Connector" boxes or
- Select the function and connector from the drop-down list.

The other fields are filled in automatically.

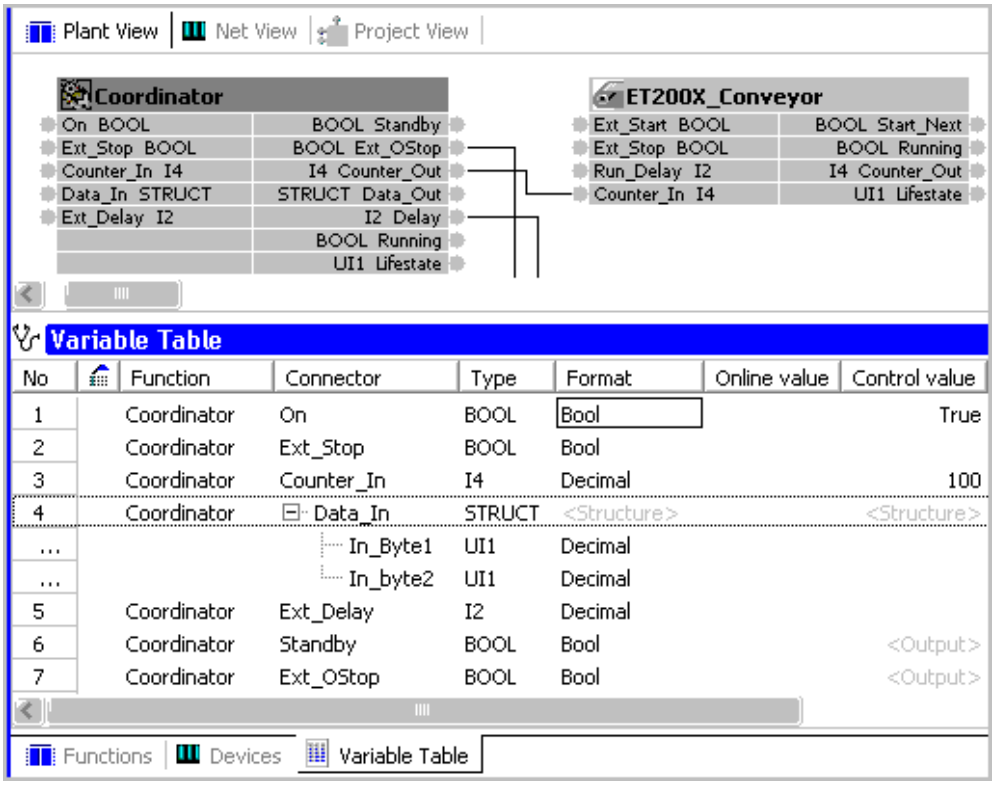
Rule

The variable table can contain up to 50 entries.

Invalid entries (e.g. unknown name for functions or connectors) are displayed in red. Variables with invalid fields cannot be monitored.

Example: Variable table

The following variable table contains the connectors for the "Coordinator" function.



Moving, copying, cutting and deleting entries

Move

You can move selected entries within the variable table using drag-and-drop

Copy, cut and delete

Select the appropriate commands from the context menu to copy, cut or delete selected entries.

To sort the entries:

You can sort the entries by clicking on the required column header.

To save the variable table:

The variable table is always saved together with the SIMATIC iMap project. If you wish to save a variable table within the file system, to test another project, for example, then you will have to export it.

To export the variable table:

1. Select the **Options > Export Variable table** menu command.
2. In the "Export Variable table" dialog, select a directory from the "Search in" box.
3. In the "File name" box, enter a file name or select a name from the list.
4. Click on the "Save" button.

Result: The current variable table is stored in the file system. The file name always has the extension .CBV

To import a variable table:

By importing, you can copy a variable table from the file system into the currently opened SIMATIC iMap project.

Note

The existing entries are overwritten when you import the variable table. We recommend that you use the **Options > Export Variable table** menu command to back up the current variable table, if necessary, before importing.

Proceed as follows:

1. Select the **Options > Import Variable table** menu command.
2. Select the required variable table from the "Import variable table" dialog. Look for a file name with the extension .CBV.
3. Click on the "Open" button.

Result: The entries in the imported variable table are copied to the variable table for the project.

Default storage location for variable tables

Use the **Options > Customize** menu command on the "Directories" tab to define a directory for storing variable tables. This directory will be suggested when you import and export variable tables.

5.9.2 Perform online monitoring and diagnostics of variables

Overview

You can use the variable table to test the plant by:

- monitoring selected variables online and
- assigning control values to selected variables during the testing phase.

Only variables whose entries are activated in the variable table can be monitored. You can exclude selected variables from the monitoring by deactivating the associated entries in the variable table.

With the variable table, you can monitor variables online, regardless of whether **Online connection** is switched on in the plant view or net view. You can monitor just selected variables or all active variables in the variable table.

You can enter control values for selected input variables. You can then assign these control values to the variables for testing purposes, and thus replace their current online values.

Deactivating and reactivating entries

Newly inserted entries are active. You must explicitly deactivate entries to exclude them from the monitoring. To deactivate entries:

1. Open the "Variable table" tab in the diagnostic window.
2. Select the entries. Press the CTRL or Shift key at the same time to select several entries.
3. Select the **Deactivate** command from the context menu.

Result: The selected entries are identified with a cross symbol. The associated variables can no longer be monitored.

To be able to monitor these variables again, you must first reactivate the entries. To do this, select the **Reactivate** command from the context menu.

In the following example, entries no. 1 and 2 are deactivated.

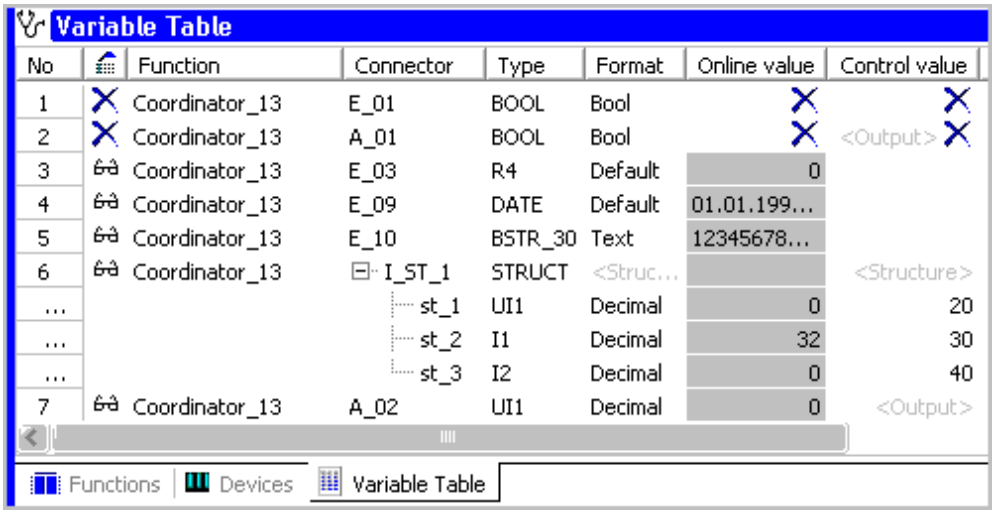


Figure 5-10 Example: Deactivating entries in the variable table

Requirement

Your PG/PC must be connected to the plant via Ethernet in order to monitor variables and set online values.

To start monitoring with the variable table:

1. Open the "Variable table" tab in the diagnostic window.
2. Select:
   - the **Online > Variable table > Monitor all variables** menu command or click on the "Monitor variables online" icon to monitor all the active variables, or
   - select the required entries and then select the command **Monitor** from the context menu to monitor just selected variables.

Result: All or the selected entries are identified with a "Monitor" symbol (glasses) in the second column and the current online values of the variables are displayed in the "Online value" column. The online values are displayed in the defined format. "<Automatic>" means the default display format, e.g. decimal for I1, I2, I4, UI1, UI2, UI4, R4 or True/False for BOOL.

No online values are displayed for deactivated entries.

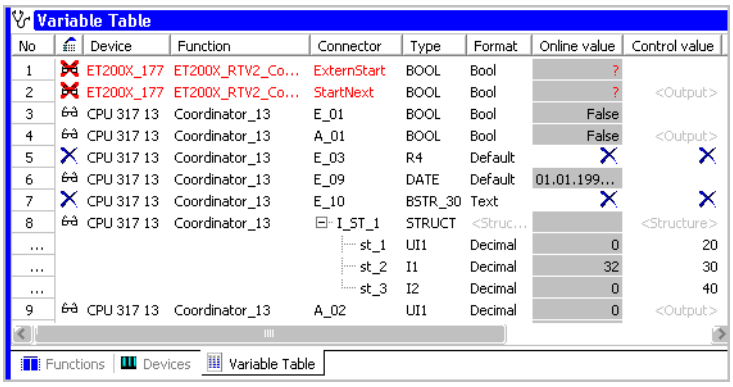
Variables of inaccessible devices are identified by a separate symbol (glasses with a cross).

The validity of the displayed online values is represented by different colors, as with the online values in the plant view (see "Diagnostic information in the online view").

Example - Online variable table

The diagram shows:

- Variables no. 1 and 2 cannot be monitored because the associated device is inaccessible.
- Variables no. 5 and 7 are deactivated.
- All other variables are monitored.



To end monitoring:

- Select the **Online > Variable table > Monitor all variables** menu command again or click on the "Monitor variables online" icon again in order to stop monitoring all variables.
- Select the required entries from the variable table and then select the **Stop Monitoring** command from the context menu to end monitoring of the selected variables.

To transfer control values:

For input variables, you can enter control values to be set as online values for testing purposes. Online values cannot be set at outputs.

Proceed as follows:

1. Open the "Variable table" tab in the diagnostic window.
2. Enter the control values in the boxes in the "Control value" column. Make sure that the values can be interpreted in the display format, for example, if hexadecimal is set for a variable in the "Format" box, then you must also enter the control value in hexadecimal format.
3. Select the variables whose online values you wish to set.
4. Select the **Monitor** command from the context menu to start monitoring these variables.
5. Select the **Transfer control value** command from the context menu or click on the "Transfer control value" icon.

Result: The control values are transferred to the plant and appear in the boxes in the "Online value" column.

No online values are set for deactivated entries and variables of inaccessible devices.

Note

If there are more variables selected than there are for transferring the control values, then the process will stop with an error message, and no control values will be transferred.

To copy the online value of a variable:

Select the **Copy online value** command from the context menu to copy the online value of a variable.

Result: The online value is copied to the clipboard.

Tips

You can enter control values regardless of whether the monitoring of variables is switched on or off in the variable table. No input is possible for deactivated and invalid entries.

Control values that have already been transferred are displayed in gray.

5.10 Online device analysis

Content of the online device analysis

If SIMATIC iMap is connected to the devices of the plant via Industrial Ethernet, you can look up specific online information about the devices for testing and diagnostic purposes. The online device analysis returns the following information:

- Performance parameters for the device (see "Performance parameters of PROFInet devices")
- Configuration data for the device and the associated technological function (if present)
- For PROFInet devices with proxy functionality only: the configuration data for the coupled PROFIBUS devices (devices and technological functions).
- Diagnostic information, e.g. error statistics and timeouts

The online device analysis can only be run for one PROFInet device. The online data for the PROFIBUS devices is recorded together with the data for the associated PROFInet device with proxy functionality.

Storing the online device analysis

The information from the online device analysis is stored in HTML format in a separate folder. Using the **Options > Customize** menu command you can define a default path on the "Directories" tab.

Requirement

SIMATIC iMap must be connected to the target device via Industrial Ethernet.

To look up the online data for a device:

1. Highlight a device in the net view.
2. Select the **Online > Online device analysis...** menu command.
3. The IP address of the device is displayed in the "IP address" box in the "Online device analysis" dialog. If this is not the case, enter the IP address of the device to be analyzed.
4. If necessary, click on the "Modify" button and change the path.
5. Confirm by clicking on the "OK" button.

Result: The current version of the online device data is stored in the folder in the form of several HTML files.

Note

The information is updated for the specified IP address whenever you call the **Online > Online device analysis...** menu command.

You can display stored versions of the online device analysis by opening the HTML files directly in an HTML browser.

5.11 Accessing information variables

5.11.1 Creating OPC symbol files

OPC symbol file

In SIMATIC iMap, you can create an OPC symbol file for the current project that can be analyzed using client programs on the SIMATIC NET PN OPC server. The OPC symbol file is created for the entire SIMATIC iMap project and is stored in any folder of your choice.

Requirement

The SIMATIC iMap project must have been generated. If the project contains objects that do not have the generation status "generated", you will not be able to create an OPC symbol file.

To create the OPC symbol file for the project

1. Select the **Options > Create OPC symbol file** menu command. The "Create OPC symbol file" dialog opens.
2. Optional: Enter any character string in the "Prefix" box. You will need the prefix to provide OPC information variables with unique identification across multiple projects. Any changes to the prefix are stored in the project.
3. The current path of the OPC symbol file appears in the "Save As" box. Accept the settings or click on the "Modify" button to change the path. You can select another directory, if necessary, or enter a different file name.

Result: The OPC symbol file with the extension .sti is saved to the selected folder.

Note

Use the **Options > Customize** menu command to define a directory for storing OPC symbol files. This directory will be suggested whenever you look up the storage location.

Select the **Project > Properties** menu command, "Special" tab to define the OPC prefix.

The created OPC symbol files can be integrated into the SIMATIC NET PN OPC server configuration.

Caution

Network load on the Industrial Ethernet and in the devices of the plant.

Additional communication functions for monitoring connectors– including via OPC – are performed on the Industrial Ethernet.
You should note, however, that the network load can be affected both by the number of connectors to be monitored and by the frequency with which the values change.

5.11.2 OPC information variables in SIMATIC iMap

Syntax

At the OPC interface, process variables are identified by a unique name - the OPC item ID. The OPC item ID is made up of the following:

<Protocol ID>:[<Connector name>]<Variable name>

The individual components have the following significance for PROFInet:

- The protocol ID specifies the protocol used to access the process variable. The protocol ID "PN" is used for the PROFInet protocol.
- The connector name specifies the connector or the device via which the variable can be reached.
- The variable name is the symbolic name of the variable.

Accessing variables via symbols

In the browser (e.g. the SIMATIC NET symbol file wizard), the process variable symbols are displayed in the following hierarchical order:

[<Project_prefix>] [<Chart>] <Function> <Variable>

Where:

Element	Explanation
<Project_prefix>	Project-wide user-defined identification
<Chart>	Subordinate chart Subordinate charts are optional and may have multiple levels.
<Function>	Name of the technological function
<Variable>	Name of the input or output

Variable types for PROFInet

In PROFInet, we distinguish between the following three types of variable:

- Process variables
- System variables
- Device-specific information variables

Process variables

Process variables are assigned to the inputs and outputs of technological functions. The OPC item ID of a process variable has the following structure:

PN:[aaa.bbb.ccc.ddd|<devicename>|<funcname>]<variable>

Designation	Explanation
aaa.bbb.ccc.ddd	• For PROFInet devices - the IP address of the device • For PROFIBUS devices - the IP address of the master (proxy)
< devicename >	Name of the configured device in iMap
< funcname >	Name of the technological function in iMap
<variable>	Name of the input or output of the technological function

Access rights to process variables

Process variables for inputs can both be written and read.

Process variables for output can only be read.

Example - Process variables

Representation of process variables in the SIMATIC NET symbol file wizard

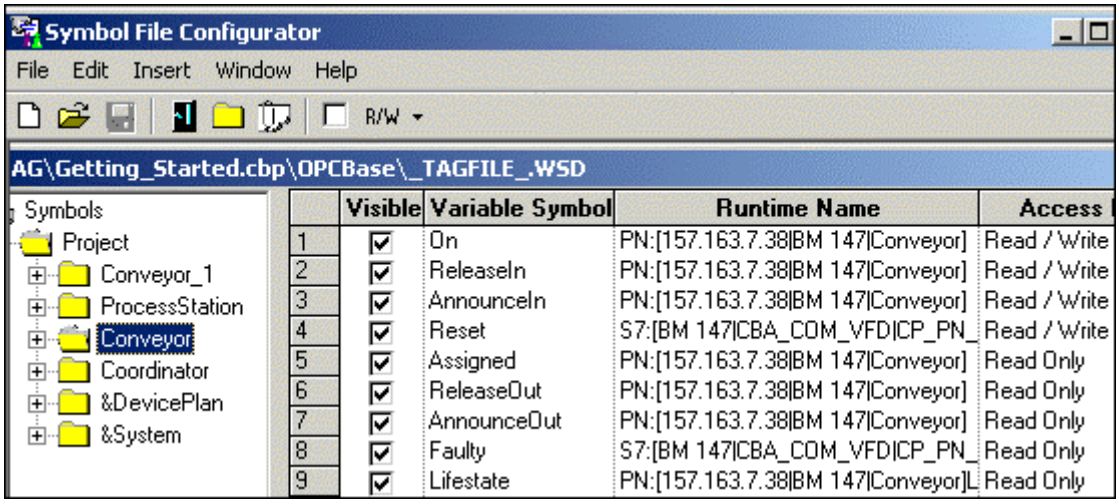


Figure 5-11 Example - Process variables

System variables

These information variables are located in the browser's "&System" folder. They apply to the entire plant.

Variable icon	OPC item ID	Meaning
&localhost	PN:[SYSTEM]&localhost()	Designation of the host computer
&version	PN:[SYSTEM]&version()	Version of the PROFInet core server

Example - System variables

Representation of system variables in the SIMATIC NET symbol file wizard

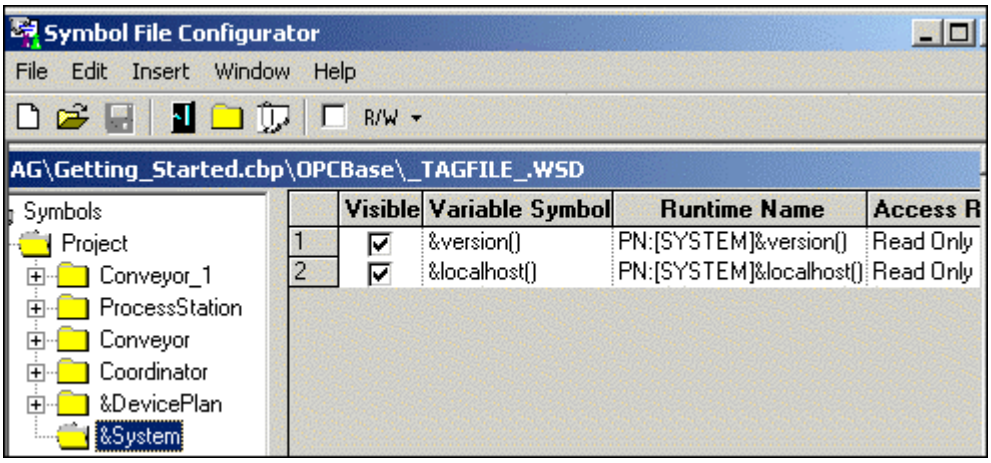


Figure 5-12 Example - System variables

Device-specific information variables

These information variables are located in the "&DevicePlan" folder and are assigned to the individual devices.

Variable icon	OPC item ID	Meaning
&statepath	PN:[aaa.bbb.ccc.ddd|<devicename>]&statepath()	Status of the connection as a string
&statepathval	PN:[aaa.bbb.ccc.ddd|<devicename>]&statepathval()	Status of the connection as a value

&statepath()

Returns the state of a communication link to a partner device as a string.

Returned values:

- DOWN - Connection not established
- UP - Connection established
- RECOVERY - Establishing connection
- ESTABLISH (reserved for future upgrades)

Data types:

OLE data type	Visual Basic type
VT_BSTR	STRING

&statepathval()

Returns the state of a communication link to a partner device.

Returned values:

1 - Connection not established

2 - Connection established

3 - Establishing connection

4 (reserved for future upgrades)

Data types:

OLE data type	Visual Basic type
VT_UI1	BYTE

Example - Device-specific information variables

Representation of device-specific variables in the SIMATIC NET symbol file wizard

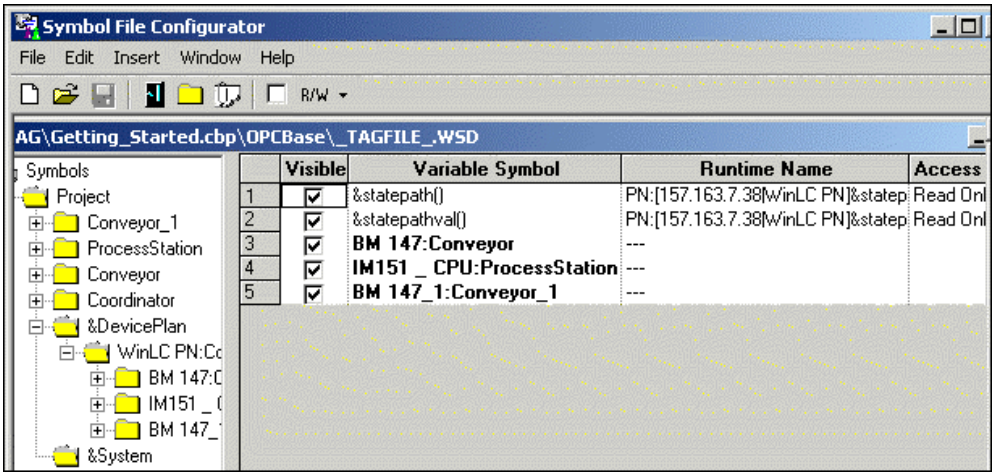


Figure 5-13 Example - Device-specific information variables

5.12 Plants with SIMATIC Devices

5.12.1 Special features of plants with SIMATIC devices

SIMATIC devices in SIMATIC iMap projects

Please note the following points when you use SIMATIC devices as PROFInet devices in a project:

- When you commission the plant, certain software requirements must be fulfilled, and certain settings must be made in STEP 7.
- STEP 7 contains a number of options especially designed for editing PROFInet components of SIMATIC devices.
- The SIMATIC iMap online view contains device-specific online and diagnostic functions.
- You must configure the OPC server in order to monitor variables via OPC.

Requirements for commissioning the plant

- STEP 7 is needed on your PG/PC in order to:
  - Generate the project
  - Download device-specific data (programs) to the devices
  - Edit the PROFInet components in the SIMATIC iMap project using STEP 7
  - Compare the online and offline data of the programs
- The associated optional packages for configuring and programming specific to the devices used must be installed.
- SIMATIC NET Softnet IE PG is needed in order to run online functions with SIMATIC iMap via Ethernet – e.g. download, monitor or online-offline comparison.
- The devices of the plant must have been assembled, wired, networked, and started up correctly. All the necessary addresses, such as the IP address, subnet mask, router address and PROFIBUS address, must have been assigned using the device-specific resources, e.g. using STEP 7 via MPI. You will find the necessary information in the associated product documentation.
- To access target systems from SIMATIC iMap, configure a PG/PC and then assign your created system to the configured PG/PC. In this way, you can transfer default settings to the installed interfaces of your created system during the configuration process. (In this situation, interfaces are module parameter settings on the PG/PC). The steps are as follows:
  - Set the PG/PC interface
  - Assigning the PG/PC

Data storage - the STEP 7 shadow project

When you generate a SIMATIC iMap project with PROFInet components of SIMATIC devices for the first time, a common STEP 7 project is formed from all the component projects (control units) in the shadow project. The STEP 7 shadow project is located in the SIMATIC iMap project directory under **Step7\Shadow**. It contains a station for each component with programmable functionality in the SIMATIC iMap project. PROFIBUS devices with fixed functionality are assigned to the station of the DP master system concerned.

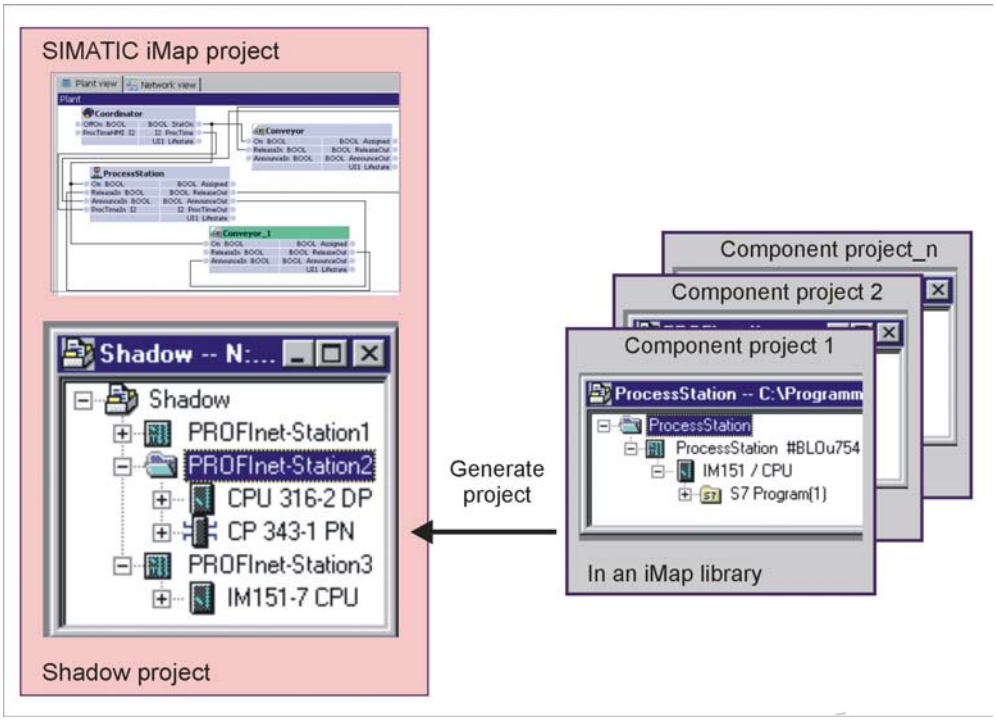


Figure 5-14 Data storage with STEP 7 projects

All changes to PROFInet components, e.g. IP addresses or PROFIBUS addresses, are transferred to the STEP 7 shadow project whenever the SIMATIC iMap project is regenerated.

The shadow project is automatically opened for editing in SIMATIC iMap whenever the **Edit > Special > SIMATIC Manager** menu command is called for a technological function or device.

Caution

The shadow project may not be modified directly under STEP 7.

Changes to the shadow project may lead to inconsistent data in the SIMATIC iMap project, preventing any further program downloads.

Possible remedies

- Regenerating a project
- **Edit > Re-edit component** menu command from the modified shadow project to create a new PROFInet component

---

Caution

Changes that you make to the shadow project in STEP 7 are ignored when you generate with SIMATIC iMap, and may therefore be overwritten.

Regenerating a project

The **Project > Generate > Control unit > Changes only** menu command only generates the changes. If this is not possible because the S7 program or the hardware or network configuration contains incorrect or inconsistent data, for example, then the STEP 7 shadow project must be fully regenerated.

When you select the **Project > Generate > Control unit > All** menu command a new STEP7 project is created, and all the stations of the associated component projects from the library are added to the library once more.

Caution

Any changes you have made to the shadow project using STEP 7 will be overwritten by the newly generated shadow project. A copy is made of the old shadow project. You can use this to copy any changes in the new shadow project.

The new shadow project is always called "Shadow". An extension is appended to the name of the copy of the old shadow project.

Hint: Check the consistency

Use the **Edit > Check Consistency** menu command to run a consistency check and identify any differences between the blocks of the station in the shadow project and the blocks of the corresponding component project.

5.12.2 Using SIMATIC devices in online mode

Special features of SIMATIC devices

The following online functions are provided for SIMATIC devices:

- Online/offline comparison of STEP 7 data
- Device-specific diagnostics with STEP 7

Online-offline comparison of the Programs

The Online-offline comparison of the program data for SIMATIC device compares the blocks of the associated STEP 7 shadow project with the online blocks. The result of the comparison is displayed is displayed on the "Info" tab in the diagnostic window.

Device-specific diagnostics

You can call the device-specific diagnostics as follows:

- If there is a diagnostic message for a device, you can click on the "Diagnostics" button in the right-hand part of the diagnostic window to call up device-specific diagnostics.
- You can use the **Edit > Special >** menu command to call up the available device-specific diagnostic functions, e.g. "Module state" or "Diagnose hardware", in STEP 7.

Program download

Notice

Program downloads can only be carried out when the devices are in the STOP operating state.

The devices must be in the STOP operating state while the program is downloaded. If this is not the case, the devices attempt to switch to STOP when one of the following menu commands is called:

- **Download all Instances > All / > Program only**
- **Download selected instances > All / > Program only**

Before the program is downloaded, you are asked whether the device should be switched to STOP. You may also have to press the operating mode switch, and possibly enter a password, depending on the type of device, and the currently set level of protection.

Once the program has been downloaded to a device, you are asked whether you wish to switch the device to RUN. If you click on "Yes" to confirm, this occurs automatically. If you click on the "No" button, the device remains set to STOP, and can subsequently be switched to RUN.

Hint: Permanently storing the downloaded data

With some devices in SIMATIC iMap, once you have downloaded the program you must call the **Special > Copy RAM to ROM** menu command in order to transfer the data to the ROM area of a device. This means that the data is retained even after the power is switched off.

PROFIBUS device inputs

When a PROFInet device acting as a PROFIBUS master is switched to the STOP operating state, the inputs of the technological functions of the associated PROFIBUS devices are set to zero (safe state).

5.12.3 Editing instances with STEP 7

Introduction

If you have created a PROFInet component using STEP 7, you can call certain STEP 7 applications from SIMATIC iMap, e.g. SIMATIC Manager or HW Config, in order to modify the S7 program or parameter settings for a module. In this case, you will edit the STEP 7 shadow project that belongs to the instance of the PROFInet component.

Caution

When you edit the STEP 7 shadow project, you must make sure that no inconsistencies occur in it since this can lead to inconsistencies in the SIMATIC iMap project and to communication faults in the plant.

In SIMATIC iMap you can edit PROFInet components using STEP 7 in the following ways:

- Modify a technological function in the SIMATIC iMap project.
- Modify a PROFInet device in the SIMATIC iMap project.

The available editing functions are device-specific, i.e. different menu commands can be called for each type of device. The following descriptions contain the generally accessible editing functions.

Special editing functions for SIMATIC devices

Table 5-4 Editing technological functions in the plant view

Edit > Special > menu command	Meaning
SIMATIC Manager	Opens the shadow project in SIMATIC Manager.
Monitor variable	Opens variable table VAT1 for the station in the shadow project. You can enter the variables of the technological function (from the interface DB) to be monitored in the variable table, for example. If a variable table called VAT1 already existed when you created the PROFInet component, it is opened at the first call, otherwise the VAT1 table in the shadow project is originally empty.
Program	Opens the program folder for the associated module in SIMATIC Manager. You can open the blocks, sources and symbol table for editing.
Compare blocks	Runs an online-offline comparison of the program blocks, i.e. compares the blocks in the target system (online) with the blocks in the SIMATIC iMap shadow project (offline).

Table 5-5 Editing devices in the net view

Edit > Special > menu command	Meaning
SIMATIC Manager	Opens the shadow project in SIMATIC Manager.
Configuration	Opens the station's hardware configuration (offline, on the PC/PG).
Network configuration	Opens the network configuration (Netpro) for the station
Module state	Displays the current state of the module. The "Module State" tab opens in the online view.
Diagnose hardware	Opens the hardware setup for the station that can be accessed online in diagnostic mode.
Clear / Reset	Clears / Resets the device.
Operating state	Displays the current operating state of the module. You can then modify the module's operating state in the "Operating state" dialog.
Assigning the PG/PC	Opens the "Assign PG/PC" dialog box.
Copy RAM to ROM	Copies the content of the RAM memory of the current module to the ROM area (only for modules that support this functionality).
Download user program to memory card	Downloads the generated user program to the CPU's memory card (only for modules that support a memory card).
Set Time of Day	Allows you to set the time on the module.

Requirements

The following software must be installed on your computer in order to edit PROFInet components using STEP 7:

- STEP 7 basic package with the necessary optional packages
- SIMATIC iMap STEP 7 Add-on

The project must have been saved and generated in SIMATIC iMap (**Project > Generate >** menu command).

To edit a technological function or device

1. Select the technological function or device in the SIMATIC iMap project.
2. Select **Edit > Special >**from the context menu using one of the available commands.
3. Save any changes and close STEP 7.
4. Select the device from the net view.
5. Select the menu command **Download selected instances > Program only** menu command to download the program to the target system.

Note

If you modify the interface DB and download it to the device from STEP 7, you must make sure that all associated PROFInet blocks with the attribute **CBA_**... are downloaded as well, otherwise run-time errors may occur in the program.

Caution

The shadow project is overwritten when you regenerate the SIMATIC iMap project using the **Project > Generate > Control unit > All** menu command. A copy of the previous shadow project is saved in the same directory. You can use this copy to update any changes that you made in the shadow project using special editing functions.

Tips

Re-edit PROFInet component

To ensure that you do not lose changes you have made to the shadow project, we recommend that you create a copy of the component project using the **Edit > Re-edit component** menu command, and then accept the changes in this copy and create a new version of the PROFInet component.

Program download from STEP 7

Alternatively, you can run the program download after a special editing function from STEP 7. This is a good idea, particularly if you have only modified blocks, for which you do not have to switch the device to STOP.

5.12.4 Set the PG/PC interface

Application

You must establish a connection from STEP 7 to the Ethernet in order to download programs or use certain online functions on the SIMATIC devices in the plant. In STEP 7, you must set up the PG-PC interface as follows:

- To TCP/IP if all remote devices in the plant can be accessed via Ethernet or
- To "PC internal" (local computer) if a WinLC PN is installed there.

In this way you can access all the SIMATIC devices, whether they are on the Ethernet or PROFIBUS or are on a local PC/PG, e.g. a WinLC PN.

Setting the PG/PC interface to TCP/IP

Proceed as follows:

1. Select **Start > SIMATIC > STEP 7 > Set PG-PC interface**.
2. On the "Access path" tab in the "Set PG-PC interface“ dialog, select **S7ONLINE (STEP 7)** from the "Application access point" box.
3. In the "Interface parameter settings used" box, select "TCP/IP..." with the associated network adapter.
4. Click on "OK" to confirm your settings.

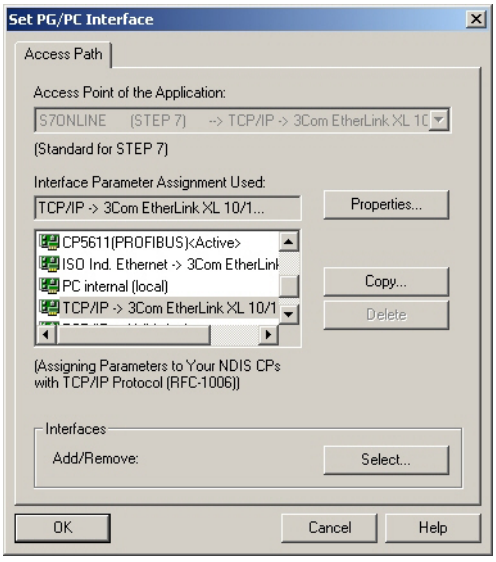


Figure 5-15 Set the PG/PC Interface to TCP/IP

Setting the PG/PC interface to local computer

If a WinLC PN representing part of the SIMATIC iMap project is installed on the local computer, this WinLC PN takes over communication with the PROFInet communication partners. The procedure is as follows:

1. Select **Start > SIMATIC > STEP 7 > Set PG-PC interface**.
2. On the "Access path" tab in the "Set PG-PC interface“ dialog, select **S7ONLINE (STEP 7)** from the "Application access point" box.
3. Select "PC internal (local) from the "Interface parameters settings used" box.
4. Click on "OK" to confirm your settings.

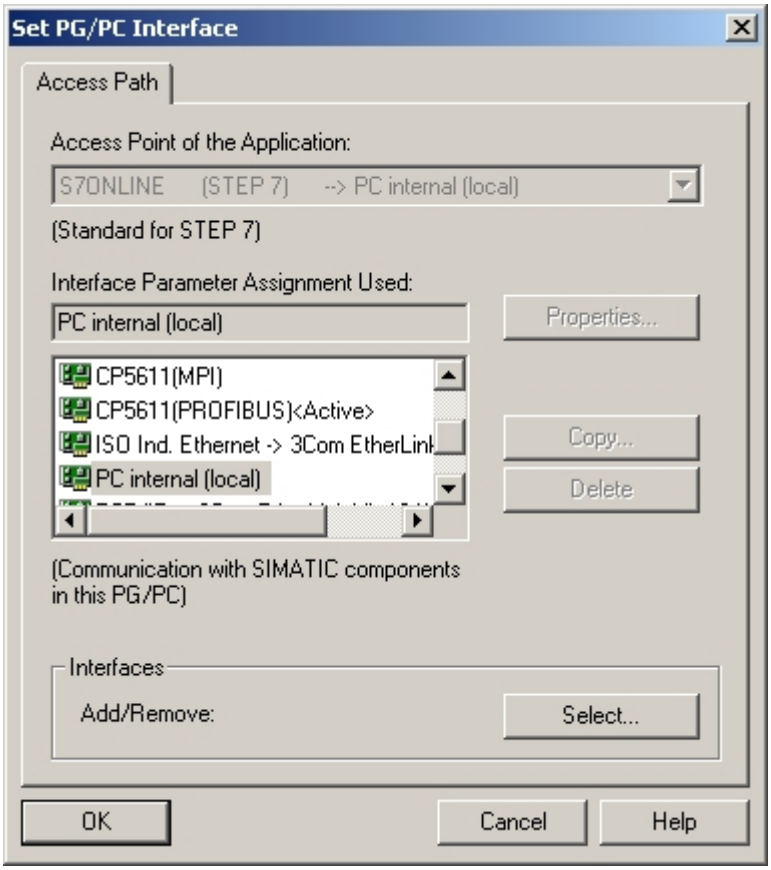


Figure 5-16 Setting the PG/PC interface to local computer

5.12.5 Assigning the PG/PC

Note

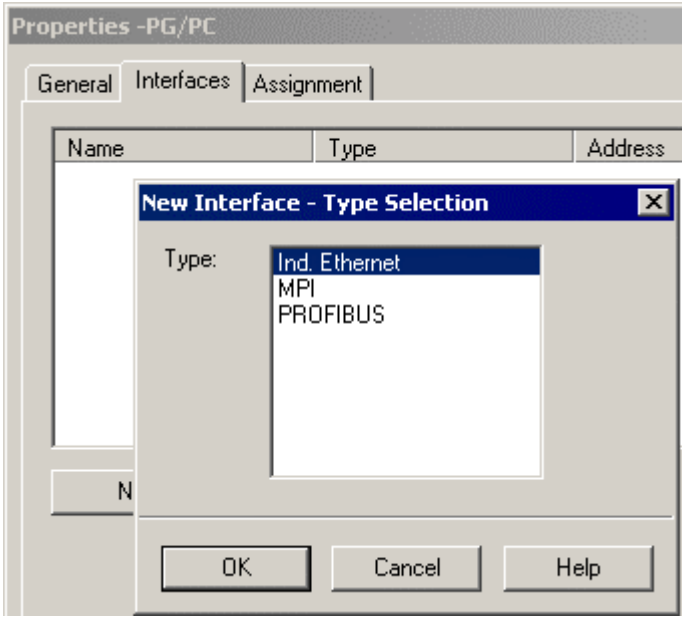
The PG/PC assignment in SIMATIC iMap is automatically performed during the initial generation and anytime the project is newly generated. In special cases it may not be possible to automatically assign the PG/PC, for example:

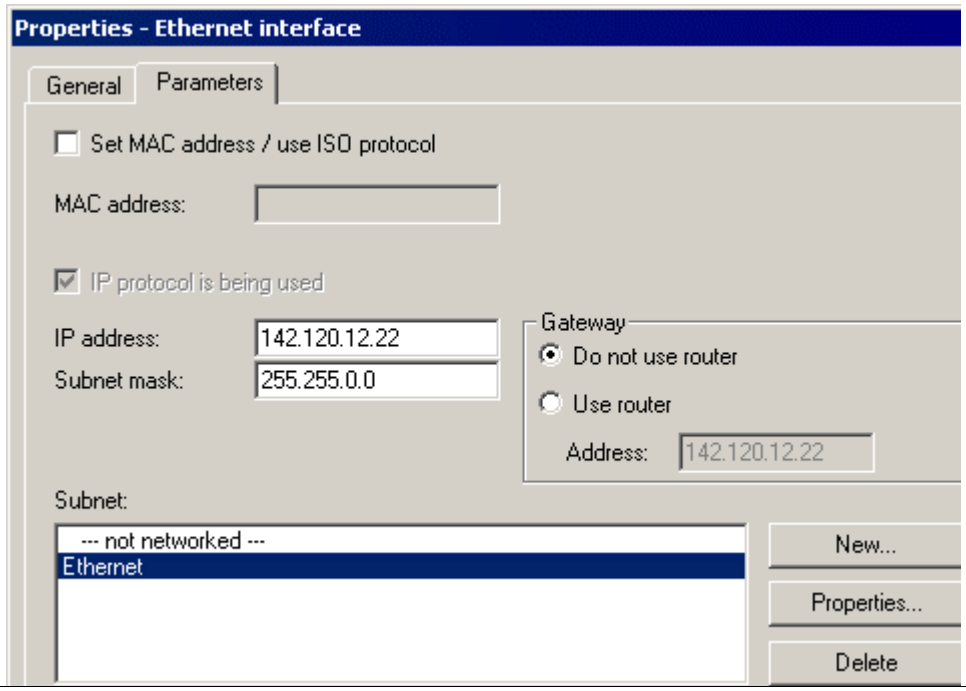
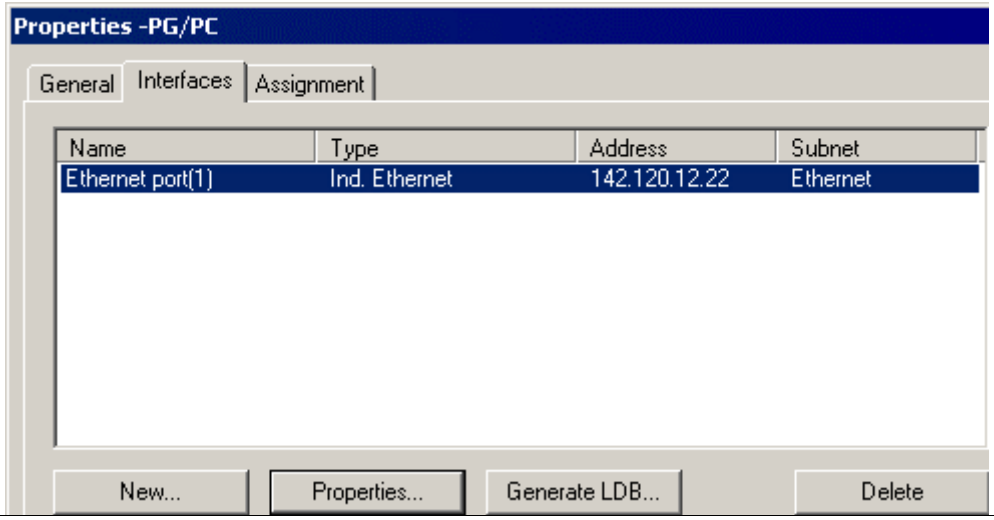
- When several network cards are installed in the PG/PC or
- When the PG/PC interface S7ONLINE (STEP 7) is not set to TCP/IP

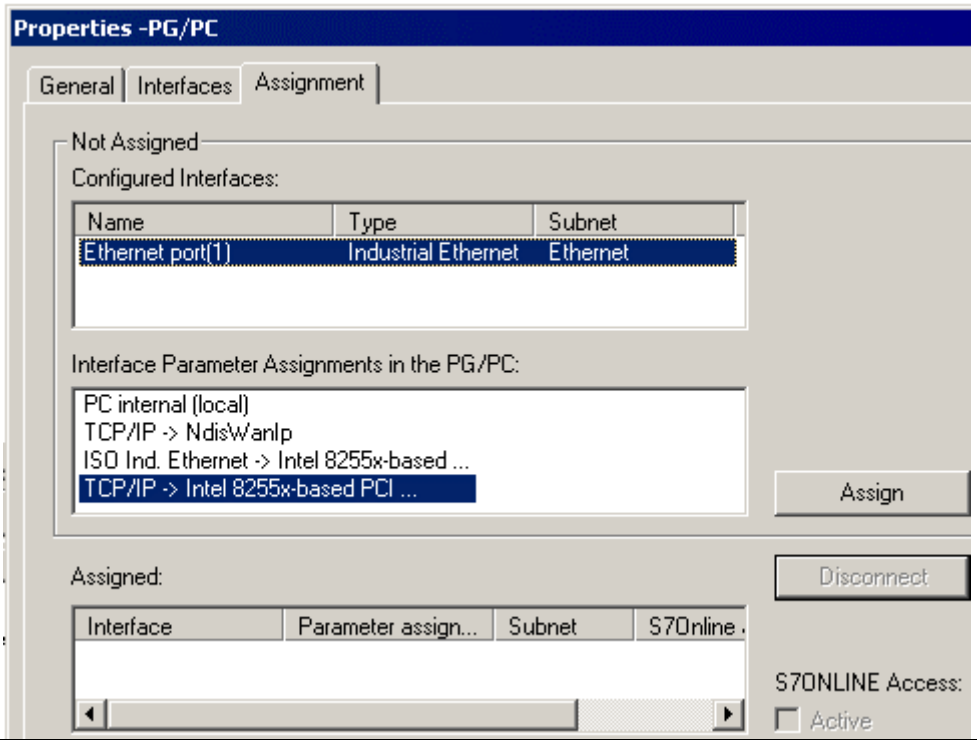
In such situations an error is reported during generation and you must perform the PG/PC assignment as described in the following.

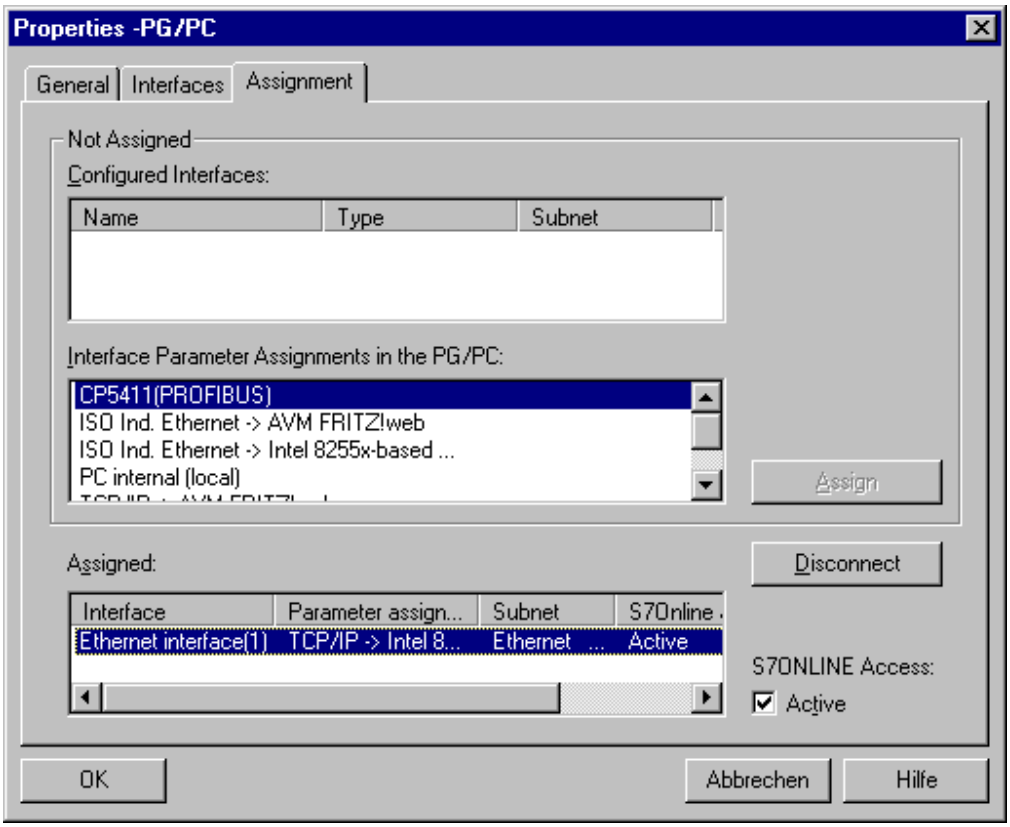
The PG/PC assignment is not necessary when you are using a local WinLC PN which contains a network card in its configuration.

How to assign the PG/PC interface to the SIMATIC iMap project

Task	Procedure
1.	Open the SIMATIC iMap project. Select any device from the SIMATIC iMap net view, then select **Special > Assign PG/PC** from the context menu. This is necessary to be able to perform the program download to the intelligent PROFIBUS devices.
2.	In the "Interfaces" tab of the "PG/PC Interface" dialog, press the "New" button and select "Industrial Ethernet" from the list.  Click on the "OK" button to confirm your entry.

Task	Procedure
3.	In the "Properties - Ethernet Interface" dialog, enter the IP address and the subnet mask of the local computer and select the Ethernet subnet. 
4.	Click on the "OK" button to confirm your entry. Result: The newly configured interface is displayed in the "Interfaces" tab. 

Task	Procedure
5.	In the "Assignment" tab, mark the Ethernet interface you have just configured in the "Configured interfaces:" selection field below "Not assigned". In the "Interface parameter settings on the PG/PC:" select **TCP/IP -> <network card used>** 

Task	Procedure
6.	Confirm by clicking on the "Assign" button. Result: The assigned interface is displayed in the "Assigned" field. Activate the option "S7ONLINE access".  The assignment becomes effective by clicking on "OK".

5.12.6 Set up OPC server

OPC symbol file

Create the OPC symbol file for the plant in SIMATIC iMap using the **Options > Create OPC symbol file** menu command. The following OPC symbol files are created and are stored in a directory of your choice:

- _TAGFILE_.SSD
- _TAGFILE_.WSD

Setting up the OPC server

To set up the OPC server:

1. Run the following command: **Start > SIMATIC > SIMATIC NET > Settings > Set PC station**. The configuration console opens. This is used to make your new OPC symbol file known to a SIMATIC NET OPC server.
2. In the "Structure" window, open the "Applications > OPC settings" folder.
3. Open the OPC protocol selection dialog box and select the following protocols:.
   - PROFInet – always
   - S7 – for non-connectable connectors of programmable PROFIBUS devices (intelligent DP slaves) only. The non-connectable connectors are highlighted in the interface DB with the attribute CBA_transfer_type = s7extended.
4. Click on the "Accept" button.
5. Open the "Symbols" folder. Select the "Use symbol file" option and enter the path of the _TAGFILE_.SSD symbol file under "File name" (see above).

   Click on the "Browse" button to search for the file.
6. Click on the "Extended symbols" button and select the module for the TCP/IP protocol on your PG/PC from the "PROFInet" box.
7. Click on the "Accept" button.

The OPC server is now set up on your PG/PC, and you can visualize process data with reference to the OPC symbol data using an OPC client such as the OPC Scout.

Special PROFInet components 6

6.1 Special PROFInet components - Overview

PROFInet component types

The current version of SIMATIC iMap supports the following PROFInet component types:

- Standard PROFInet components – as described above
- Singleton components

  In SIMATIC iMap, the device-specific configuration and programming data for these PROFInet component is held and edited in the STEP 7 basic project, rather than in the common shadow project. This component type allows you to incorporate hardware configurations with SIMATIC devices that were previously not supported into PROFInet communication.
- PROFInet components with HMI units – this component type is used to incorporate special HMI devices into the PROFInet communication. You will also need WinCC Flexible V1.0 in order to create these PROFInet components and edit them in SIMATIC iMap.

The special features of working with these special component types are described below.

6.2 Singleton components

6.2.1 Properties of singleton components

What are singleton components?

Singleton components are PROFInet components for which the device-specific data is stored and handled separately. The device-specific configuration information and program data is located in the STEP 7 basic project for the PROFInet component, rather than in the common shadow project.

Advantages in use

The use of singleton components has the following advantages:

- Special hardware configurations with SIMATIC device that were not supported in PROFInet components in the past can now be incorporated into PROFInet communication as singleton components.
- The device-specific configuration and program data is stored separately, so singleton components in SIMATIC iMap are excluded from certain time-consuming functions such as generation or program downloads, and thus do not affect the processing time of the overall project.
- Singleton components may have default names and addresses. Thus, these properties do not have to be configured for instances of singleton components in SIMATIC iMap.

Rule

Singleton components can only be created for PROFInet devices without proxy functionality. Thus, singleton components have only one bus connector on the Industrial Ethernet.

Special hardware configurations

The singleton concept allows previously unsupported hardware configurations with SIMATIC devices to be incorporated into PROFInet communication, such as:

- S7-400 automation systems
- Fail-safe systems – Distributed Safety – S7-300F
- Micromaster-type drives
- Integration of process diagnostics
- Functional modules (FM)
- Integration of PROFInet I/O

6.2.2 Using singleton components in the SIMATIC iMap project

Use in the SIMATIC iMap project

You can insert singleton components into a SIMATIC iMap project one or more times depending on the project settings:

To set the project properties:

Select the **Project > Properties** menu command and, in the "Use of singletons" box on the "Special" tab, select the

- Once option if you only want one instance per project, or
- Multiple option if several instances per project are to be permitted.

Editing in SIMATIC iMap

In SIMATIC iMap, you can carry out all the same actions on singleton components as on standard components, with the following exceptions:

- Changing the properties of the instance when more than one instance is permitted in the SIMATIC iMap project. If only one instance is permitted in the project, you cannot change the name and address(es) of the instance.
- Generating and downloading the program

  Instances of singleton components are excluded from the generation of the SIMATIC iMap project (**Project > Generate >** menu command) and from the program download (**Online > Download... > All/Program Only** menu command).
- Editing in the vendor-specific programming and configuration tool (see below).

Note

If an action is not supported for singleton components, the corresponding menu commands are not available (grayed out). Otherwise a message will appear in the information window or in a separate message window.

Modifying properties

The following properties of the instance cannot be modified for singleton components that may only have one instance in a SIMATIC iMap project:

- Name of the technological function
- Name of the device
- IP address and subnet mask

For the instance, the properties are taken from the basic project of the singleton component. To modify these properties, you will have to recreate the singleton component and insert it into the SIMATIC iMap project, e.g. by replacing the old instance.

Editing in the vendor-specific tool

Use the **Edit > Special >** menu command to directly call up the vendor-specific configuration and programming tool, e.g.SIMATIC Manager, from SIMATIC iMap. Some functions, such as "Diagnose hardware", are not available using the **Edit > Special >** command. These have to be called up from inside the tool.

Notes on editing with STEP 7

The following actions must be carried out directly in the STEP 7 basic project for the singleton component:

- Open the STEP 7 basic project – using the **File > Open** menu command in SIMATIC Manager.
- Modify the hardware configuration – in HW Config
- Modify the S7 program – in the relevant block editor.
- Compile configuration information – in HW Config using the **Station > Save and Compile** menu command.
- Download the program – in SIMATIC Manager using the **Target system > Download station to PG** menu command.
- Look up device-specific diagnostic information – in SIMATIC Manager using the **Target system > Diagnostics/Settings >** menu command.

Note

Notes on the program download

When you create the singleton component from the basic project in STEP 7, the system data blocks (SDB) for PROFInet communication are created as well.

Once you have created the singleton components, you must download the blocks from the program folder to the device. In SIMATIC Manager, this is done using the **Target system > Download station to PG** menu command.

6.3 PROFInet components with HMI units

This section provides an overview of the use of PROFInet components with HMI units in SIMATIC iMap. A detailed description can be found in the user documentation for WinCC Flexible V1.0.

Requirement

WinCC Flexible is needed in order to create, configure, generate and download PROFInet components with HMI units.

To create:

PROFInet components with HMI units are created using the WinCC Flexible Component Merger function.

Use in SIMATIC iMap

PROFInet components with HMI units are used just like standard components in SIMATIC iMap. They first have to be imported into a SIMATIC iMap library, and can then be inserted into projects.

The HMI units of a PROFInet component are handled in a special way in SIMATIC iMap:

- Generate – using the **Project > Generate > HMI units** menu command.
- Edit – using the **Edit > Special** menu command.

Representation of HMI units

The properties of the PROFInet component in the library will show whether a PROFInet component has HMI units. The HMI parts are listed on the tab of the "Properties" dialog and on the "HMI" tab in the preview window.

The HMI units of the instances are represented in the project tree and in the project view (see example in the diagram below).

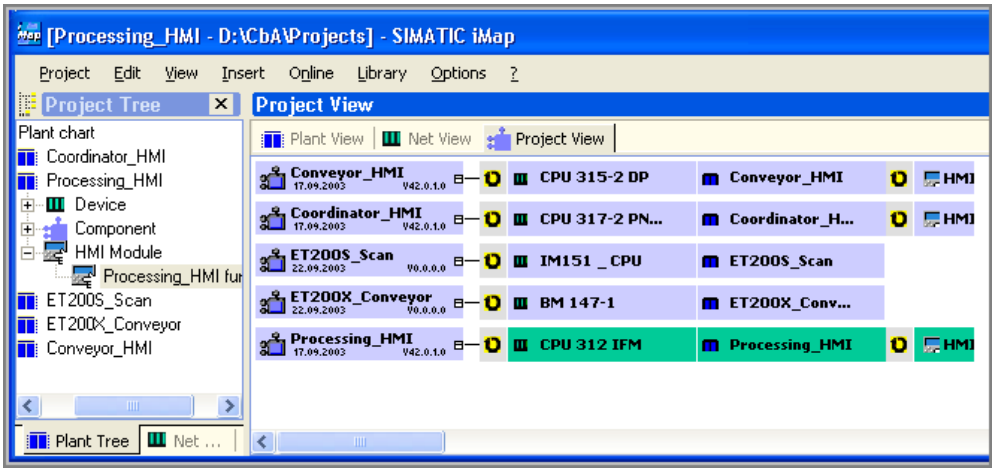


Figure 6-1 Representation of the HMI units in the project view and project tree

To generate the HMI units of the project:

To be able to download the configuration data for the HMI units to the target system, this data must first be generated.

- Changes to the HMI units are generated using the **Generate > HMI units > Changes only** menu command.
- The HMI units of all instances are generated using the **Generate > HMI units > All** menu command.

The generated data is stored in a separate shadow project.

It is then possible to download the configured HMI units.

Note

The link to WinCC Flexible is needed in order to generate and download the configuration data for the HMI units in SIMATIC iMap.

6.4 Off-the-shelf PROFInet components

6.4.1 IE/PB Link, network transition Industrial Ethernet - PROFIBUS DP

Off-the-shelf PROFInet components

SIMATIC iMap is supplied with off-the-shelf PROFInet components for the IE/PB Link for different transmission speeds.

The off-the-shelf PROFInet components are located in the **\iMap\components** directory. You will have to import them into a SIMATIC iMap library (**Library > Import Component** menu command) before they can be used in SIMATIC iMap.

Application

The IE/PB Link is a network transition that interconnects the two types of network: Industrial Ethernet (factory level) and PROFIBUS (cell level).

Function in the PROFInet environment

IE/PB Link is a PROFInet device, and is represented accordingly in the SIMATIC iMap net view.

The IE/PB Link acts as a DP master on the PROFIBUS interface. The IE/PB Link provides the connection to coupled PROFIBUS devices for the PROFInet devices connected to the Ethernet. For the coupled PROFIBUS devices, the IE/PB-Link is a DP master with proxy functionality.

Representation in SIMATIC iMap

The PROFInet component of the IE/PB Link has fixed functionality, but has no technological function. It is supplied ready for use in the SIMATIC iMap system library. It is not necessary to create a component in STEP 7 for the IE/PB Link.

- Net view in SIMATIC iMap

  In the net view, the IE/PB Link is represented as a component that links the Ethernet and PROFIBUS. The IE/PB Link can be selected and configured from this view.

- Plant view in SIMATIC iMap

  The IE/PB Link is not shown in the plant view.

Bus ports

The PROFInet component of the IE/PB Link has two bus ports:

- A connector to PROFIBUS as the DP master and
- A connector to the Industrial Ethernet

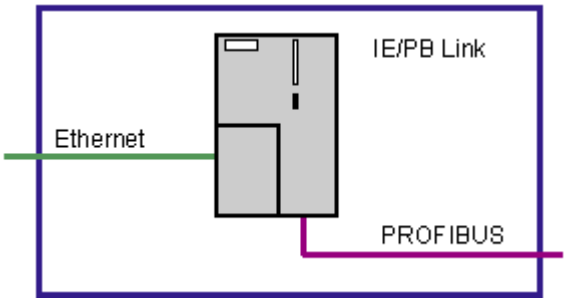


Figure 6-2 Bus ports of the IE/PB Link

Special features

- Range of functions as a DP master

  The IE/PB Link supports operation with DP standard slaves (DP V0). Acyclical services (reading and writing records) are not supported.

- Substitute values for DP slaves under PROFInet

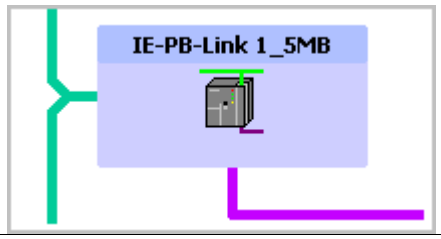
  When it acts as a DP master under PROFInet, the IE/PB Link is configured to apply substitute values.

  If the IE/PB Link detects that a connected (interconnected in PROFInet) DP slave has failed, it sets the inputs interconnected with this DP slave to the substitute value "0".

  Lifestate monitoring allows this PROFInet component to detect if the input values supplied are substitute values.

Example

Table 6-1 PROFInet component of the IE/PB Link, representation in SIMATIC iMap

Technological function	PROFInet device
None	

Appendix 7

7.1 Menu commands

Overview

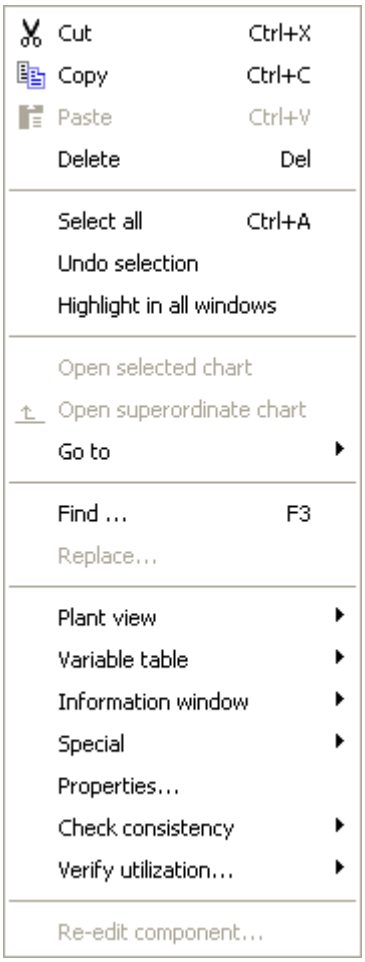
Menu commands can be used to create and edit selected objects (e.g.charts, functions and libraries). They are accessed via the menu bar, in the context menu or as an icon on the toolbar.

The menus on the menu bar of the SIMATIC iMap user interface are explained briefly below. This description may differ slightly from the actual application, but any differences will be updated in the next version.

Project menu

Menu command	Description
New	Creates a new project. Before it is opened, the currently open project is closed.
Open...	Opens an existing project. Before a new project is opened, the currently open project is automatically closed.
Save	Saves the current project.
Save As...	Saves the current project under a new name.
Archive...	Archives a project.
Retrieve...	Retrieves an archived project.
Import...	Imports from a project description into a new project.
Generate > Control unit > Changes only	Saves the current project and generates the changes to the control units, i.e. the modified data is synchronized with the shadow project. This is required in order to use the online functionality (download and diagnostics).
Generate > Control unit > All	Saves the current project and generates the control units from scratch, i.e. the shadow project is recreated from the PROFInet components in the library.
Generate > HMI units > Changes only	Saves the current project and generates the changes to the HMI units.
Generate > HMI units > All	Saves the current project and generates HMI units from scratch.
Page setup...	Defines the page margins and other layout options.
Headers and footers...	Displays the settings for the header and footer of a printout.
Print > Active window	Prints the current plant or net view.
Print > All charts	Prints the net view and all charts in the plant view.
Documentation	Creates the documentation for the current project.
Properties...	Opens a dialog box containing the individual parts of the project. You can enter a password in order to protect the project against unauthorized access.
Recent projects	Lists the recently opened projects.
Exit	Exits SIMATIC iMap. If the edited project has not yet been saved, you are prompted to save it.

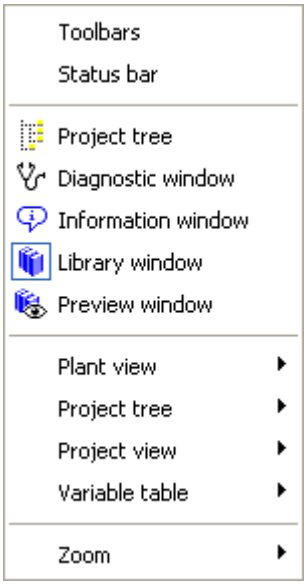
Edit menu



Menu command	Description
Cut	Removes the highlighted objects and saves them to the clipboard.
Copy	Copies the highlighted objects to the clipboard.
Paste	Inserts the clipboard contents
Delete	Removes the highlighted objects.
Select all	Highlights all the objects in the current window.
Undo selection	Deselects the selected objects.
Highlight in all windows	Transfers the current selection to all other windows.
Open selected chart	Opens the selected chart.
Open superordinate chart	Opens the chart one level up.
Go to >	Used to navigate in the various windows.
Find...	Searches for components, instances, devices and functions containing the search text.
Replace...	Replaces selected instances with the instances of a target component.

Menu command	Description
Plant view > In chart interface	Transfers the selected connectors to the chart interface.
Plant view > Interconnect constants	Sets a constant value at the input.
Plant view > Move interconnections	Moves the interconnections of the technological function.
Plant view > Interconnect externally	Interconnects the input with an external output.
Plant view > Interconnections	Selects all the interconnections in the open chart.
Variable table > Deactivate	Deactivates monitoring of the selected variables.
Variable table > Reactivate	Reactivates monitoring of the selected variables.
Variable table > Complete structure	Lists all the structure elements up to the selected connector.
Information window > Copy all	Copies all the messages in text format to the clipboard.
Information window > Delete all	Deletes all the messages in the information window.
Special >	Calls up functions or dialogs associated with the vendor-specific programming / configuration tool, e.g. SIMATIC Manager, module status.
Properties...	Displays the properties of the selected object.
Check consistency > All instances/Selected instances	Compares the shadow project and component project for all or just the selected instances.
Verify utilization > Standard	Checks the configuration with respect to the performance requirements of the selected devices
Verify utilization > Detailed	Compares the configuration performance requirements with the performance parameters of the selected devices.
Re-edit component...	Defines where the copy of the component project is to be stored. Opens SIMATIC Manager in order to re-edit the PROFInet component.

View menu

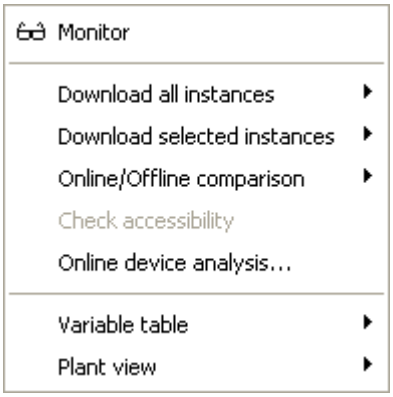


Menu commands	Description
Toolbars	Shows or hides the toolbar.
Status bar	Shows or hides the status bar.
Project tree	Shows/hides the window with the plant and net tree.
Diagnostic window	Shows or hides the diagnostic window.
Information window	Shows or hides the information window.
Library window	Shows or hides the library window.
Preview window	Shows or hides the component preview window.
Plant view >Page margins	Shows or hides the page margins for printing in the plant or net view.
Plant view > Dot screen	Shows or hides the dot screen in the plant view.
Plant view > Recalculate interconnection lines	Refreshes the interconnection lines.
Plant view > Display interconnection lines	Shows or hides the interconnection lines.
Project tree > Plant tree >	Displays additional information, such as the associated devices, component type or HMI modules.
Project tree > Net tree >	Displays additional information, such as the associated functions, component type, HMI modules or bus system.
Project tree > Show levels	Displays all the levels beneath the selected object.
Project tree > Hide levels	Hides all the levels beneath the selected object.
Project view > Show instances	Shows all the instances of the component.
Project view > Hide instances	Hides all the instances of the components.
Variable table >	Shows / hides the columns in the variable table.
Zoom >	Allows you to change the size of the view of the projects in the plant view, project view or net view.

Insert menu

Menu commands	Description
New chart	Inserts a new chart into the project and moves selected objects into this chart, if necessary.
New Ethernet node	Inserts a new Ethernet node.

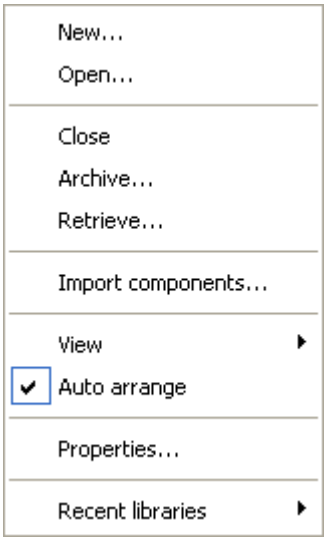
Online menu



Menu commands	Description
Monitor	Activates / deactivates the online connection between SIMATIC iMap and the devices of the plant. Activating the online connection does not result in a download. “Monitor“ must be activated for the diagnostics.
Download all Instances > All	Downloads the interconnections and programs to all the devices of the plant.
Download all Instances > Program only	Downloads the programs to all the devices of the plant.
Download all Instances > Interconnections only	Downloads the interconnections to all the devices of the plant.
Download selected instances > All	Downloads the programs and interconnections to the selected devices.
Download selected instances > Program only	Downloads only the programs to the selected devices.
Download selected instances > Interconnections only	Downloads only the interconnections to the selected devices.

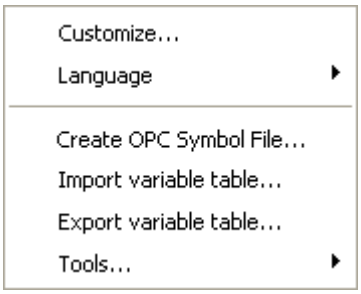
Menu commands	Description
Online / Offline comparison > All	Runs an online-offline comparison for the programs and interconnections of the selected devices. The result appears in the information window.
Online / Offline comparison > Program only	Runs an online-offline comparison for the programs of the selected objects. The result appears in the information window.
Online / Offline comparison > Interconnections only	Runs an online-offline comparison for the interconnections of the selected objects. The result appears in the information window.
Check accessibility	Checks the online accessiblity of the associated devices. The result appears in the information window.
Online device analysis	Returns online device information for an IP address as an HTML file.
Variable table > Monitor all variables	Activates online monitoring with the variable table. The result appears in the diagnostic window.
Variable table > Monitor selected variables	Activates online monitoring of the selected variables. The result appears in the diagnostic window.
Variable table > Stop monitoring selected variables	Deactivates online monitoring of the selected variables.
Variable table > Transfer selected control values	Transfers the control values of the selected variables to the plant.
Variable table > Copy online value	Copies the online value of the select variables to the clipboard. The value can be entered as a control value, for example, via the **Paste** context menu.
Plant view > Display online values	Shows / hides the current values of the selected connectors.
Plant view > Set online values	Changes the current value of the selected connector.

Library menu



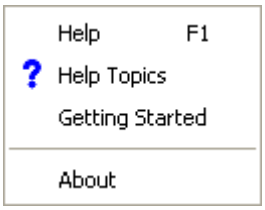
Menu commands	Description
New...	Opens a dialog box for Creating a new library, e.g. for a new project or new operations.
Open...	Opens a dialog box for selecting an existing library.
Close	Closes the current library.
Archive...	Opens a dialog box for archiving the current library and specifying the path.
Retrieve...	Opens a dialog box for selecting a library from an archive.
Import components...	Imports an existing PROFInet component from a directory to a library.
View >	Changes the view of the PROFInet components in the selected library.
Auto arrange	Automatically arranges the representation in the library window.
Properties...	Opens the Properties dialog box for the selected library.
Recent libraries	Lists the most recently opened libraries.

Options menu



Menu commands	Description
Customize ...	Modifies the general settings in SIMATIC iMap.
Language >	Changes the language of the SIMATIC iMap user interface.
Create OPC symbol file...	Creates an OPC symbol file for the entire project.
Import variable table...	Imports a saved variable table into the diagnostic window.
Export variable table...	Saves a variable table as a cbv file.
Tools...	Opens the programs defined under “Customize“.

? menu



Menu commands	Description
Help F1	Opens the online help for the current window
Help topics	Opens the online help for "Component based Automation and SIMATIC iMap".
Getting Started	Opens the Introduction to SIMATIC iMap.
About	Provides information on the current software version and copyright.

7.2 Toolbar

Icons on the toolbar

The icons on the toolbar are specially designed for working with SIMATIC iMap. They correspond to the following menu commands:

Table 7-1 Icons on the SIMATIC iMap toolbar

Icon	Description	Menu command
	New project	Project > New
	Open Project	Project > Open...
	Saving a Project	Project > Save
	Generating the Project	Project > Generate >Control unit > Changes only
	Print	Project > Print > All Charts
	Cut	Edit > Cut
	Copy	Edit > Copy
	Paste	Edit > Paste
	Open Chart One Level Up	Edit > Open Chart One Level Up
	Insert chart	Insert > New chart
	Interconnection lines on/off	View > Plant view > Display Interconnection Lines
	Online connection	Online > Monitor
	Monitor variables online	Online > Variable table > Monitor all variables
	Transfer control value	Online > Variable table > Transfer control value
	Open Help	Help > Help Topics
	Project Window	View > Project window.
	Diagnostic window	View > Diagnostic window
	Information window	View > Information window
	Library window	View > Library window
	Preview window	View > Preview window
	Zoom in	View > Zoom > Zoom in
	Zoom out	View > Zoom > Zoom out
	Entire content	View > Zoom > Entire content
	Normal	View > Zoom > 100%

7.3 Actions

Which actions do you want to carry out?

The following table lists, in alphabetical order, the actions that you can carry out with SIMATIC iMap and describes where and how these actions can be used.

As a rule, the objects to be processed must be selected first.

Table 7-2 Actions in SIMATIC iMap

Which object?	Which action?	In which window?	How?
Addresses	Assign	Plant view, Net view, Project view, Project tree	Edit > Properties > Address tab
Utilization	Verify	Net view	Edit > Verify utilization
Library	Create	Library	Library > New
	Archive		Library > Archive
	Retrieve		Library > Retrieve
	Close	Library	Library > Close
	Open	Library	Library > Open
Library window	Display	SIMATIC iMap	View > Library window.
Diagnostic window	Display	SIMATIC iMap	View > Diagnostic window
Download	Run	SIMATIC iMap	Online > Download...
Documentation for PROFInet components	Open	Preview window	Info tab > Documentation
Documentation for SIMATIC iMap	Open	Desktop	Start / Programs / Component based Automation / Documentation
Inputs / Outputs	Interconnect	Plant view	Click on the input that you wish to interconnect, and then on the corresponding output.
Properties	Display / modify	Plant view, Net view, Project view, Project tree	Edit > Properties... Project > Properties
Error	Diagnose	Diagnostic window	Online > Monitor
Device	Rename	All views	Edit > Properties > Address tab
Information window	Display		View > Information window
Instance	Replace	Plant view, Net view, Project view, Project tree	Edit > Replace
IP address	Assign	Plant view, Net view, Project view, Project tree	Edit > Properties > Address tab
Consistency	Verify	Plant view, Net view	Edit > Check Consistency
Chart	Print	Net view	Project > Print
	Zoom	Net view	View > Zoom
Subordinate chart	Create	Plant view	Insert > New chart
Online device analysis	Run	SIMATIC iMap	Online > Online device analysis

Which object?	Which action?	In which window?	How?
Online value	Display	Plant view	Online > Monitor Online > Plant view > Display Online Values
	Set	Plant view / Variable table	Select connector Online > Plant view > Set Online Values
	Copy	Variable table	Online > Variable table > Copy online value
	Insert	Variable table	Edit > Paste
PROFIBUS address	Assign	Plant view, Net view, Project view, Project tree	Edit > Properties > Address tab
PROFInet component	Import into a library	Library	Library > Import components
	Paste Into Project	Library	Drag&Drop Edit > Paste
	Create	SIMATIC Manager	Edit > Create PROFInet component
	Rename	Library	Not possible.
	Re-edit	Library, Project view	Edit > Re-edit component...
	Move	From library to library	Drag&Drop Edit > Copy / Edit > Paste
Project	Archive	SIMATIC iMap	Project > Archive
	Retrieve		Project > Retrieve
	Document		Project > Document
	Print		Project > Print (Keyboard: Ctrl + P)
	Generate		Project > Generate
	Open		Project > Open (Keyboard: Ctrl + O)
	Save		Project > Save / Project > Save As (Keyboard: Ctrl + S)
	Delete	Windows Explorer	Entf/Del key
Project tree	Display	SIMATIC iMap	View > Project tree
Technological function	Rename	All views	Edit > Properties > Address tab
Variable table	Display	SIMATIC iMap	View > Diagnostic window > Variable table tab
	Monitor	SIMATIC iMap	Online > Variable table > Monitor variables
	Import / Export	SIMATIC iMap	Options > Import / Export variable table
Interconnections	Create	Plant view	Click on the input that you wish to interconnect, and then on the corresponding output.

Which object?	Which action?	In which window?	How?
	Delete	Plant view	Highlight the line and press the Del key.
	Move	Plant view	Select connector Edit > Plant view > Move Interconnections Left-click on the new connector
Preview window	Display	SIMATIC iMap	If library is open: View > Preview window
Tools	Insert	SIMATIC iMap	Options > Customize > Tools tab
	Use	SIMATIC iMap	Options > Tools...

7.4 Naming conventions

7.4.1 Naming conventions in SIMATIC iMap

The following rules must be followed when you assign names:

File names and paths

- A file name must not contain any of the following characters:
  \ / :„?“ * < > |
- A path name must not contain any of the following characters:
  / :„?“ * < > |

Object names

The following rules apply to the names of SIMATIC iMap projects, libraries, technological functions, devices and charts.

- The name may not be left blank.
- Illegal characters

The name must not contain characters with the following ISO 8859-1 codes: 0 to 31, 33, 34, 38, 42 to 44, 46, 47, 58 to 63, 91 to 94, 96, 124, 127 to 159, 180.

The characters that are not permitted are thus:

- all non-printing characters (with ISO 8859-1 codes 0 to 31, 127 to 159)
- AND !„ “ & * + ‘ . , / : ; < = > ? [\ ] ^ ` | ´

- Spaces are not permitted at the start and end of the name.
- Name length: Object names must not in exceed 32 characters in length in SIMATIC iMap.
- The names of functions, devices and subordinate charts must be unique within a SIMATIC iMap project.

7.4.2 Naming conventions for PROFInet components

The following rules must be followed when you assign names:

File names and paths

- A file name must not contain any of the following characters:
  \ / :„?“ * < > |
- A path name must not contain any of the following characters:
  / :„?“ * < > |

Names of PROFInet components

- The name may not be left blank.
- Illegal characters

  The name must not contain characters with the following ISO 8859-1 codes: 0 to 31, 33, 34, 38, 42 to 44, 46, 47, 58 to 63, 91 to 94, 96, 124, 127 to 159, 180.

  The characters that are not permitted are thus:

  - all non-printing characters (with ISO 8859-1 codes 0 to 31, 127 to 159)
  - AND !„ “ & * + ‘ . , / : ; < = > ? [\ ] ^ ` | ´
- Spaces are not permitted at the start and end of the name.
- The first character must not be an underscore.
- The name of a PROFInet component created in STEP 7 must not be more than 24 characters long.

Names of connectors

- The names of connectors may only contain the following characters (ISO 10646-1):

  Letters A to Z and a to z, digits 0 to 9, and the underscore character "_".
- The first characters of a connector name must be a letter (not underscore or a number).
- The name of a connector must not exceed 24 characters in length.

7.5 Data Types of Connectors

Data types, data lengths and ranges of values for connectors

A PROFInet data type conforming to Microsoft OLE 2.0 is assigned to every S7 data type . The following table shows the assignment, data lengths and ranges of values.

Table 7-3 Data types, data lengths and ranges of values for connectors

PROFInet data type	S7 data type	Data length in bytes	Range of values
BOOL	BOOL	2	TRUE / FALSE
I1	CHAR	1	-128 to +127
UI1	BYTE	1	0 to 255
R4	REAL	4	3.4E +/- 38
I2	INT	2	-32,768 to +32,767
UI2	WORD	2	0 to 65,535
I4	DINT	4	- 2.147.483.648 to +2.147.483.647
UI4	DWORD	4	0 to 4.294.967.295
DATE	DT (DATE_AND_TIME)	8	01.01.1900 00:00:00 to 31.12.9999 23:59:59*)
BSTR	STRING	4 + 2 * number of characters	Character string
ARRAY	ARRAY	Number * data type length	One-dimensional, from simple data types**)
STRUCT	STRUCT	Sum of the data type lengths	Made up from simple data types**)

*) There may be restrictions in the range of values, depending on the type of device. For example, for SIMATIC devices this would be: 01.01.1990 00:00:00 to 31.12.2089 23:59:59.

**) Simple data types are all the listed data types, apart from ARRAY and STRUCT. The maximum length depends on the amount of memory in the device.

Data types supported in PROFInet runtime version V2.0.0.0 or later

The following data types are supported by PROFInet devices from runtime version V2.0.0.0 onwards:

- Data type STRUCT with all simple data types, including STRING
- Data type ARRAY with the data types BOOL, REAL, DATE_AND_TIME, STRING

Earlier runtime versions do not support these data types.

7.6 File types

Overview of the file types in SIMATIC iMap

The following table shows the file name extensions for the file types used in SIMATIC iMap.

File type	Extension	Created with the menu command...*	In ...
Project	CBP	**Project > Save** or **Project > Save As**	the project folder of the same name
Library	CBL	**Library > New** or **Library > Create New Library**	the library folder of the same name
Project library	CPL	is automatically created and opened with the project	the \projlib subfolder of the project folder
Archived project	ARP	**Project > Archive**	any folder in the file system
Archived library	ARL	**Library > Archive**	any folder in the file system
PROFInet component	XML	**Edit > Create PROFInet component** in the device-specific configuration and programming tool, e.g. STEP 7	the component folder - in the file system or - in a library
Variable table	CBV	**Options > Export Variable table**	any folder in the file system
Project documentation	HTML	**Project > Document**	any folder in the file system
Online device analysis information	HTML	**Online > Online device analysis**	any folder in the file system
OPC symbol file	STI	**Options > Create OPC symbol file**	any folder in the file system
Project description	CBI	**Project > Import**	any folder in the file system

- Menu command in SIMATIC iMap, unless otherwise specified.
-

Note

In SIMATIC iMap you can use the menu command **Options > Customize**, "Directories" tab, to define a directory for every file type that will always be suggested when you create, save and select this file type.

7.7 The "lifestate" connector in SIMATIC devices

The technological functions of the PROFInet components that were created in STEP 7 receive an additional output of the type UI1,called "Lifestate". This output allows the PROFInet components to be monitored by the user program of a PROFInet communication partner. The "Lifestate" output may be interconnected as required for diagnostic purposes.

Lifestate values

The lifestate output can return the following values which describe the current state of the device:

Value	Designation of the state	General significance
0x00	NonExistent	The device is not powered and is thus unable to communicate. This operating state cannot be transferred via the interconnection since no communication is possible. It is only listed for the sake of completeness. This value is also the default substitute value.
0x01	Initializing	The device is initializing, e.g. after a power off or reset.
0x02	Ready	The device is ready for use, but the component is not active. The device outputs are in the safe state. This state corresponds to the STOP operating state of a CPU, for example.
0x03	Operating	The device is operating normally. This state corresponds to the RUN operating state of a CPU, for example.
0x04	Defect	There is an error in the device that cannot be rectified without further intervention. Typical examples include hardware or firmware errors. The device can only be restarted by switching the power off and on again. Only limited communication is possible with the device, depending on the type of error.

The value is 1 byte long.

Abbreviations

8

Abbreviations

Abbreviation	Explanation
CbA	**C**omponent **b**ased **A**utomation
COM	**C**omponent **O**bject **M**odel
DCOM	**D**istributed **C**omponent **O**bject **M**odel
GUID	**G**lobal **U**nique **ID**entifier
HMI	**H**uman **M**achine **I**nterface
MES	**M**anufacturing **E**ngineering **S**ystem
MAC	**M**edium **A**ccess **C**ontrol
PN	**P**ROFI**N**et
PNO	**P**ROFIBUS **N**utzer**O**rganisation e.V. (PROFIBUS User Organization)
SRT	**S**oft **R**eal-**T**ime
TIA	**T**otally **I**ntegrated **A**utomation
UNC	**U**niform **N**aming **C**onvention
URL	**U**niform **R**esource **L**ocator
XML	E**X**tended **M**arkup **L**anguage

Glossary

9

Term	Description
Basic project	Project folder in the vendor-specific configuration tool from which a PROFInet component is created. Example: STEP 7 basic project
Chart	In SIMATIC iMap: Folder that contains the technological function and their interconnections. The chart is used to structure the plant. We distinguish between the -> Main chart and -> subordinate charts
Chart, subordinate	In SIMATIC iMap: A subordinate chart may be located on any lower hierarchically level in the plant view. It may contain technological functions and further subordinate charts.
Component based Automation	Concept for implementing modular, distributed automation applications based on open standards for data processing and data communications. Component based Automation is an extension of Totally Integrated Automation (TIA).
Component project	A folder containing the vendor-specific project data for the PROFInet component, e.g. in the form of a STEP 7 project.
Continuation connector	Graphical representation of the end point of an interconnection. Interconnections are represented by lines or continuation connectors in SIMATIC iMap.
Device	In Component based Automation, this is part of the PROFInet component that contains the hardware-specific data for the PROFInet component. In SIMATIC iMap, a device is the software representation of the physical device for which the PROFInet component was created. In the SIMATIC iMap net view it is represented as an object with one or more bus ports. We distinguish between -> PROFInet devices and -> PROFIBUS devices according to the communication functions to be performed.
Functionality, fixed	A PROFInet component with fixed functionality does not contain its own user program.
Functionality, programmable	A PROFInet component with programmable functionality contains its own user program.
Global library	A library that can be opened, closed archived and retrieved in SIMATIC iMap using menu commands. The global library contains PROFInet components that can be used in several projects.
Instance	The instance of a PROFInet component is one use of that component type in the SIMATIC iMap project.
Interconnection	General: A logical data link between two objects. In SIMATIC iMap: Interconnection between two technological functions. An output is always connected to an input of the same data type. Interconnections are represented by lines or continuation connectors in SIMATIC iMap.

Term	Description
Interconnections to local communication partners	Interconnections to local communication partners are: • Interconnections between two PROFIBUS devices on the same PROFIBUS • Interconnections between a PROFIBUS device and the associated PROFInet device with proxy functionality.
Interconnections to remote communication partners	Interconnections to remote communication partners are interconnections that run via Industrial Ethernet.
Interface DB	In Component based Automation, this is a data block in STEP 7 that describes the inputs and outputs of the technological function.
Library	In Component based Automation, this is a folder containing reusable PROFInet components. We distinguish between two types: > Project library and > Global library.
Main chart	In SIMATIC iMap: The main chart is the highest level of the hierarchical representation of the plant view. It contains all the technological functions and subordinate charts and their interconnections.
Net view	Representation of the devices and the networks (Ethernet, PROFIBUS) in SIMATIC iMap.
Plant view	Representation of the technological functions of the automation system and its interconnections in SIMATIC iMap. The plant view displays one chart.
PROFIBUS device	In Component based Automation, a PROFIBUS device has just one PROFIBUS connector as a slave. It does not participate directly in PROFInet communication and is integrated via a PROFInet device with proxy functionality.
PROFInet	Standard published by the Profibus User Organization (PNO) to define a cross-vendor communication and engineering model.
PROFInet device	A device on the Ethernet is a PROFInet device. A PROFInet device may also have a PROFIBUS connector as a master (PROFInet device with proxy functionality) for PROFIBUS devices.
PROFInet device with proxy functionality	The PROFInet device with proxy functionality is a proxy of the PROFIBUS devices on the Industrial Ethernet. The proxy functionality allows a PROFIBUS device to communicate with all PROFInet communication partners, as well as with its own DP master. If the device has a local (internal) PROFIBUS, then it is the DP master for the local DP slaves.
PROFInet component	Software representation of a technological module with defined functionality. An automation system is made up of several PROFInet components. A PROFInet component essentially consists of a technological function and the associated device.
Project tree	In Component based Automation: Hierarchic representation of the SIMATIC iMap project. There are two parts to this representation: The plant tree contains the technological functions. This part may be structured hierarchically using subordinate charts. The plant part always contains the main chart and may contain any number of nested subordinate charts. The net tree contains the devices. The slaves coupled to a PROFIBUS master are represented hierarchically.

Term	Description
Project library	Library which is contained in a SIMATIC iMap project and is opened, closed, archived and retrieved automatically with the project. The project library contains all the PROFInet components whose instances are contained in the project.
Project view	Representation of the assignment between PROFInet components and their instances in the SIMATIC iMap project.
Proxy functionality	see PROFInet device with proxy functionality
Proxy system	A proxy system consists of a PROFInet device with proxy functionality and all the PROFIBUS devices coupled to it.
Scanning frequency	For acyclical transfer, the scanning frequency is the frequency with which the data is polled, e.g. every 200 ms. The scanning frequency is thus the maximum time that elapses before a change in value is transferred.
Shadow project	Folder in which the vendor-specific data of the project is stored during generation in SIMATIC iMap.
SIMATIC iMap	The Siemens engineering tool for Component based Automation. It is used to configure, commission and monitor modular, distributed automation systems based on the PROFInet standard.
SIMATIC iMap - STEP 7 Add-on	Software for the SIMATIC iMap link to STEP 7.
Singleton component	In SIMATIC iMap, PROFInet components whose device-specific configuration and programming data is held and edited in the (STEP 7) basic project, rather than in the common shadow project. This component type allows you to incorporate hardware configurations with SIMATIC devices that were previously not supported into PROFInet communication.
Technological function	General: This is a task or sub-task within a technological process, e.g. measurement, control of motors, positioning. A technological function can be implemented both as hardware - e.g. a functional module - and as software – e.g. a control block. In Component based Automation, the technological function of a PROFInet component comprises the application-specific functionality of a programmable controller or field device and the component interface for communication with other PROFInet components. It is represented as a block with inputs and outputs in the SIMATIC iMap plant view.
Transfer frequency	For cyclical transfer, the transfer frequency is the time after which a data item is transferred again, e.g. every 100 ms.

Index

G

H

I

L

M

N

O

P

Q

R

S

T

U

V

W

X