



**Operating instruction manual**

**Topology Editor**

**Configuring device topology and connections as well as  
properties of device, port and connection**

**V1.0.x**

**Hilscher Gesellschaft für Systemautomation mbH**  
**[www.hilscher.com](http://www.hilscher.com)**

DOC150705OI03EN | Revision 03 | English | 2017-03 | Released | Public

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# 1 Introduction

## 1.1 About this manual

This manual describes the Topology Editor and how to configure a device topology (network structure), the connections between the devices as well as the properties of the device, port and connection.

### 1.1.1 Overview

For the main descriptions of the Topology Editor, see sections:

- *Installation* [► page 10]
- *About the Topology Editor* [► page 11]
- *Starting the Topology Editor* [► page 18]
- *Introduction to the user interface* [► page 19]
- *Configuration of PROFINET IO IRT* [► page 28]

### 1.1.2 List of revisions

Index	Date	Version	Component	Revisions
1	15-10-07	V1.0.x.x	Hilscher.Topology Editor	All sections created.
2	17-01-09	V1.0.x.x	Hilscher.Topology Editor	All sections: language corrections added
3	17-03-22	V1.0.x.x	Hilscher.Topology Editor	Windows® 10 added.

### 1.1.3 Online help

The Topology Editor contains a built-in online help.

- You can access the online help via the **F1** key.

## 1.1.4 Conventions in this manual

Notes, instructions and results of operating steps are marked as follows:

### Notes



---

**Important:**

<important note you must follow to avoid malfunction>

---



---

**Note:**

<general note>

---



---

<note where to find further information>

---

### Instructions

1. Operation purpose
2. Operation purpose
  - Instruction

### Results

↻ Intermediate result

⇒ Final result

### Safety messages

The labeling of safety messages is explained in the chapter Safety.

### 1.1.5 Language conventions for PROFINET

**Note:**

The PROFINET IO specification defines the designations "Controller" instead of "Master" and "Device" instead of "Slave". In this manual "Controller" and "Device" are used with the PROFINET IO device or the DTM. In connection with general questions about the master or the slave functionality, the terms "master" and "slave" are used, as in the network configuration on the master bus line, the "Stand-Alone Slave", the master diagnosis or the master license.

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- Nuclear fusion processes in nuclear power plants;
- Medical devices used for life support and
- Vehicle control systems used in passenger transport

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## 2 Installation

### 2.1 Requirements

#### **Prerequisites for the Topology Editor**

- To install your configuration software with the Topology Editor, Microsoft .NET Framework 4.0 must be installed on your computer.
- Read the installation manual for your configuration software (e.g. SYCON.net) and the operating instruction manual for the DTM you are using (e.g. PROFINET IO-Controller DTM for IRT) to find out which general requirements apply for the installation of these components.

### 2.2 Shipment

The Topology Editor is integrated as part of the DTM in each FDT frame application.

#### **SYCON.net**

If you are using the configuration software SYCON.net, you will receive an installation file *SYCON.net V1.0xxx.xxxxxx.xxxx Setup.exe* which includes the PROFINET IO-Controller DTM for IRT mode inclusively the plug-in for the Topology Editor.

### 2.3 Installing the Topology Editor

Install your configuration software in accordance with the manufacturer's instructions. The Topology Editor is installed along with the master DTM (Example PROFINET IO-Controller DTM for IRT mode).

#### **SYCON.net**

Install the configuration software SYCON.net as described in the software installation user manual of your Hilscher device.

## 3 Description of the Topology Editor

### 3.1 About the Topology Editor

The Hilscher **Topology Editor** supports the configuration of a device topology (network structure) including the connections between devices and the related settings of the related device, port and connection. The Topology Editor can be used for the configuration of different Real-Time Ethernet systems.

The Topology Editor is integrated as a plug-in in a DTM of any network system and can be used in any frame application which supports FDT.

In addition to the device configuration in the DTM, additional device and connection data (for the topology) can be displayed or configured in the Topology Editor. Hidden devices such as switches or media converters can be displayed.

In the topology view (graphical view of the editor with the network structure), the IO devices can be connected to each other. Each link is represented as a line that begins at the port of one device and ends at the port of the other device.

In the property views of the device, port and connection, the settings of the devices, ports and connections can be configured. Using this data, the Topology Editor checks the identity of the existing devices and whether a connection has been established.

The configuration data for the network structure, devices, and connections specified in the Topology Editor is transmitted to the master DTM where it is calculated and stored together with the master device configuration.

### 3.2 Requirements

Prior to the configuration you have to install the hardware.

## 3.3 Use case PROFINET

### 3.3.1 PROFINET IO IRT

PROFINET IO IRT supports a synchronized, i. e. an isochronous real-time communication (IRT communication) within a subnet (domain). The process data is sent in a fixed order, in equidistant (isochronous) time intervals and isochronously to the other nodes. The maximum allowed deviation from the synchronization clock is 1  $\mu$ s (jitter accuracy).

As for IRT communication the cyclic data transmission is deterministic and based on the clock of the network master (sync master).

#### 3.3.1.1 IRT rules



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**Important:**

When configuring devices in the Topology Editor, RT devices are not allowed between IRT devices. After an RT device only RT devices are allowed.

---

The IRT rules for validation used by the Topology Editor [1] are:

1. Only one active sync master is allowed in each sync domain.
2. Only one active controller is allowed in each sync domain. (A controller can also have the functionality of a sync master.)
3. When configuring devices in the Topology Editor, RT devices are not allowed between IRT devices. After an RT device only RT devices are allowed.

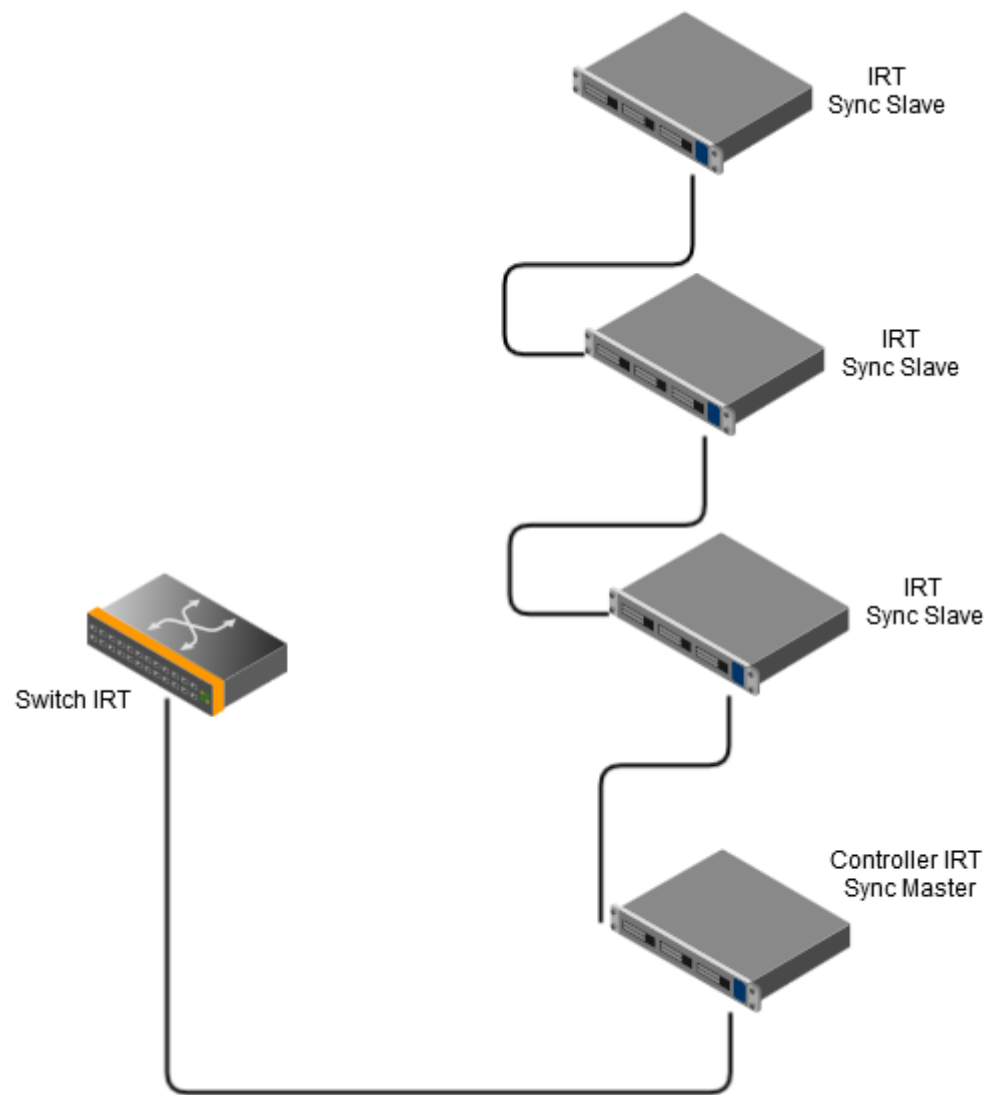
**Rule 1 & rule 2**

Figure 1: Example of IRT rule 1 and 2

Rule 3

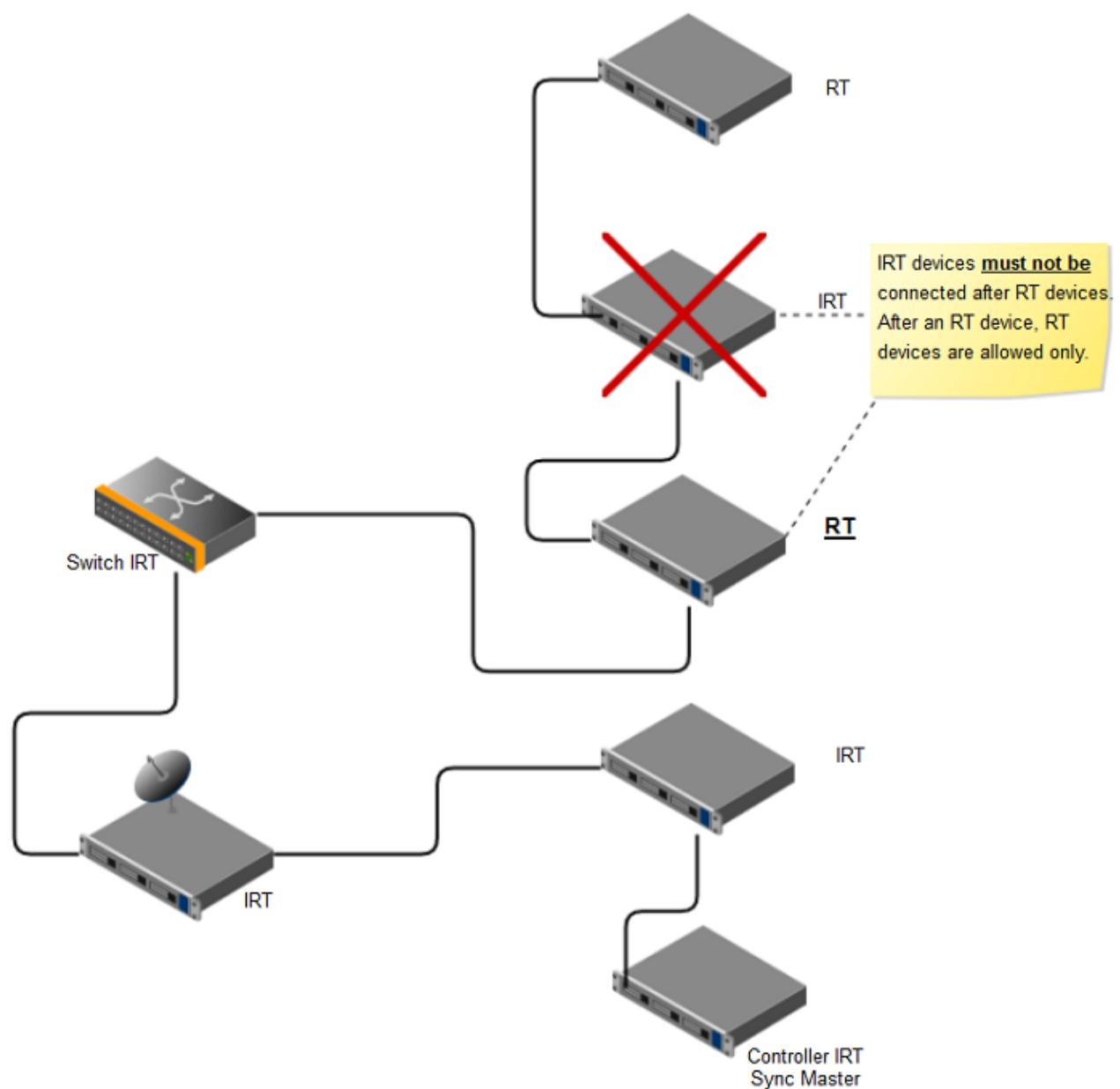


Figure 2: Example of IRT rule 3

### 3.3.1.2 PROFINET IRT in the Topology Editor

Isochronous (synchronized) realtime communication (IRT) requires additional device settings and calculations of parameters compared to non-synchronized realtime communication (RT).

A PROFINET IO-Controller DTM (for IRT) requires also information about the network topology, consisting of information on cable lengths, cable material, switching delays, etc. All settings for the network topology can be made by using the Topology Editor.

The isochronous real-time communication is performed in sync domains. In a sync domain, only one sync master is allowed. The sync master determines the synchronization clock or the clock rate for the data exchange with the sync slaves.

### 3.3.1.3 Basic conditions for IRT

Currently, the following basic conditions for the IRT communication apply for the Hilscher PROFINET IO hardware and the PROFINET IO-Controller DTM.



---

**Note:**

IRT and MRP cannot be used simultaneously.

- If IRT is enabled, MRP cannot be used.
  - If MRP is enabled, IRT cannot be used.
- 

If IRT is set (MRP is disabled):

- A Hilscher PROFINET IO-Controller device must be used in the Topology Editor as a **sync master**.
- A PROFINET IO-Device must be used in the Topology Editor as a **sync slave**.



---

**Note:**

Currently, the Topology Editor supports *one* sync domain (with one sync master) only.

---

### 3.3.2 Media redundancy

In PROFINET both media redundancy protocols (MRP or MRPD) are optional functionalities to support a highly available communication.

#### 3.3.2.1 MRP rules

Each ring topology with RT devices (and controller) requires an MRP manager device. Only one MRP manager device per ring topology is allowed. All devices of the ring topology must be MRP-capable. The MRP manager can be a device, a switch or a controller.

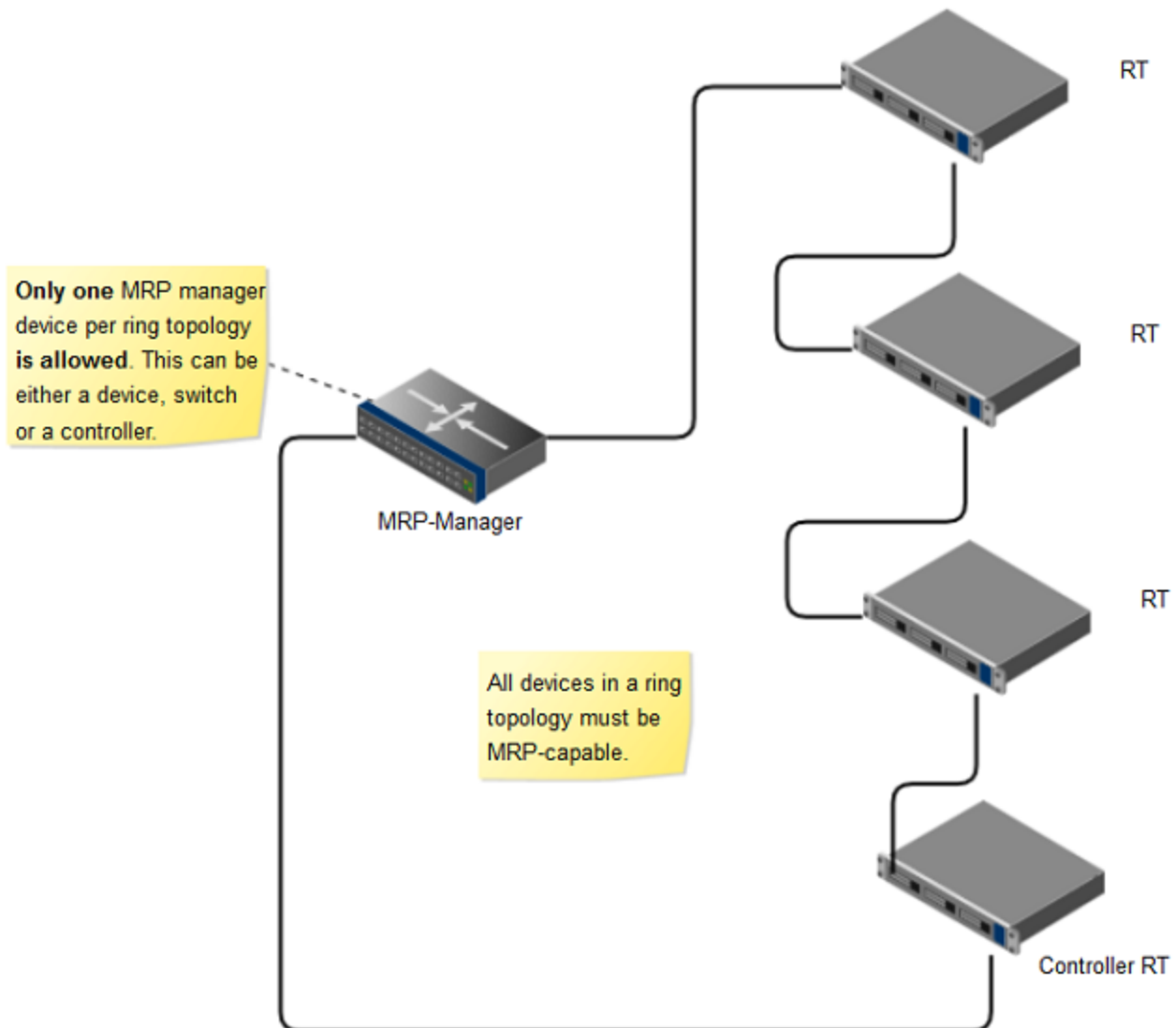


Figure 3: Example of MRP rules



### 3.3.2.2 PROFINET MRP in the Topology Editor

The data for implementing media redundancy (MRP) can be configured in the Topology Editor.

### 3.3.2.3 Basic conditions for MRP

Currently, the following basic conditions for a media-redundant communication (MRP) apply for the Hilscher PROFINET IO hardware and the PROFINET IO-Controller DTM.



---

**Note:**

IRT and MRP cannot be used simultaneously.

- If IRT is enabled, MRP cannot be used.
  - If MRP is enabled, IRT cannot be used.
- 

If MRP is set (IRT is disabled):

- A Hilscher PROFINET IO-Controller device can assume the role of an **MRP manager**.
- A Hilscher PROFINET IO-Controller device can assume the role of an **MRP client** (as an MRP manager for example, a switch may be used).
- A Hilscher PROFINET IO-Device assumes the role of an **MRP client**.
- The Hilscher devices PROFINET IO-Controller, PROFINET IO-Device and PROFINET IO-Controller DTM (for IRT) do not support MRPD.



---

**Note:**

Currently, the Topology Editor supports *one* MRP domain only.

---

- Exactly *one* PROFINET IO-Device assumes the role of the MRP manager.

## 3.4 Starting the Topology Editor

**Note:**

To open the Topology Editor, you need a network project with a master device. If you use a Hilscher PROFINET IO-Controller device for IRT, create a network project in SYCON.net first.

- Open the configuration software.
- In the project view select the master device (e. g. for PROFINET the controller device).
- Open the context menu (in SYCON.net right click on the master device).
- Select **Topology Editor**.

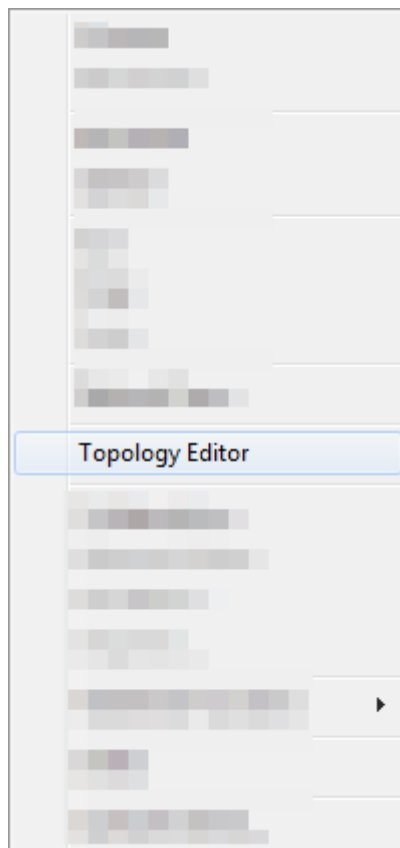


Figure 4: Open the Topology Editor via the context menu

- The topology editor opens and shows the tab **Topology** [name of the master].

## 3.5 Introduction to the user interface

### 3.5.1 Topology Editor view

The Topology Editor view displays

- the **Topology view** (left) and
- the **Property view** (right).

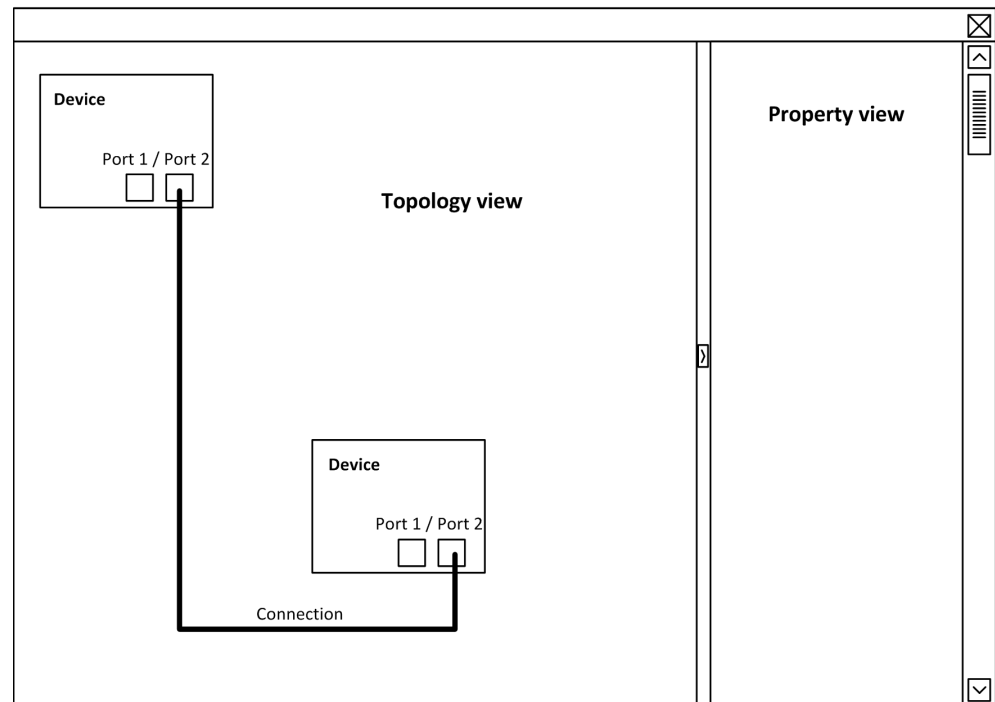


Figure 5: Topology Editor view (structure of the user interface)

### 3.5.2 Topology view

The **Topology view** (on the left side of the Topology Editor view) serves as editor window to display and configure the devices and their connections. The ports of each device are visible. More devices can be added.

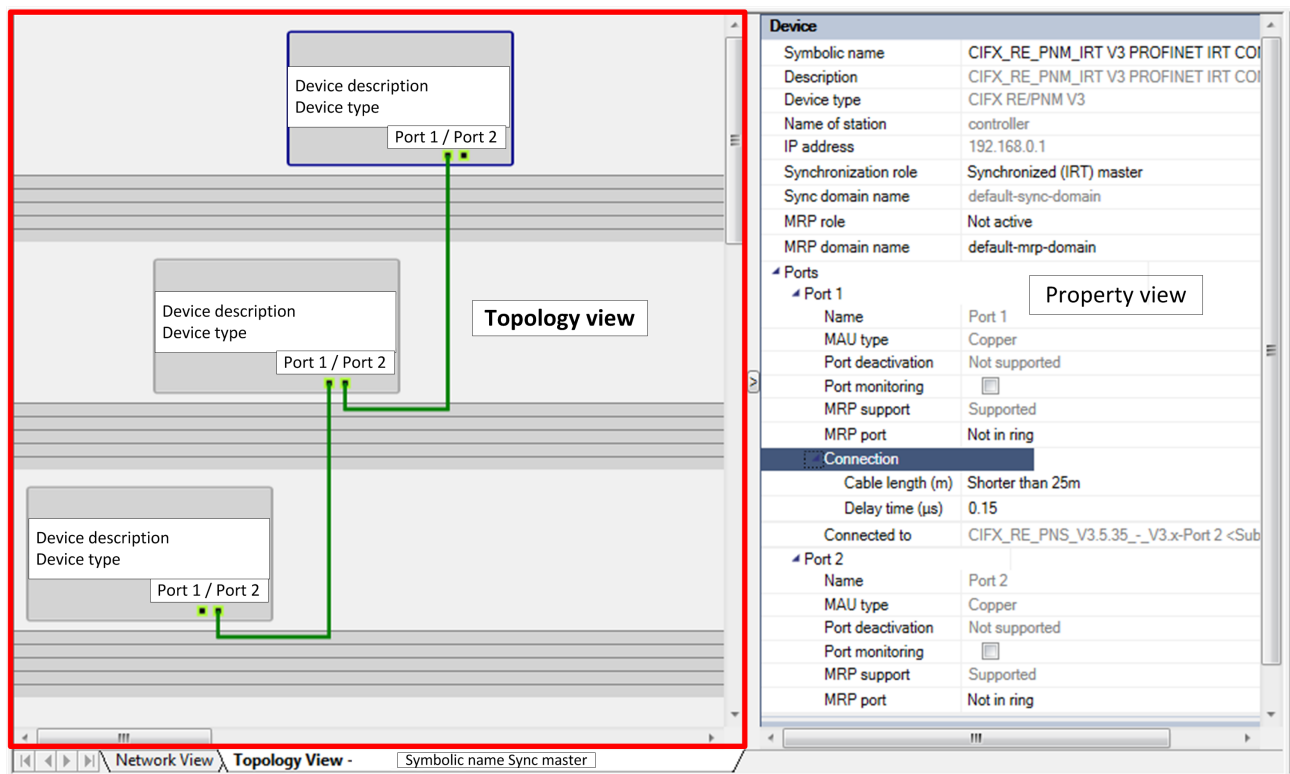


Figure 6: Topology view (left side)

### 3.5.2.1 Zooming or shifting sections

#### Zooming in (scaling up)

- Commands (keyboard and mouse): **Ctrl + mouse wheel forward**

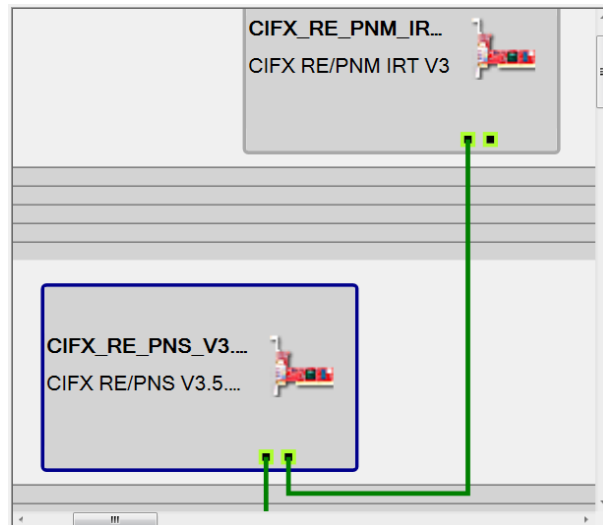


Figure 7: Result of zooming in

#### Zooming out (scaling down)

- Commands (keyboard and mouse): **Ctrl + mouse wheel back**

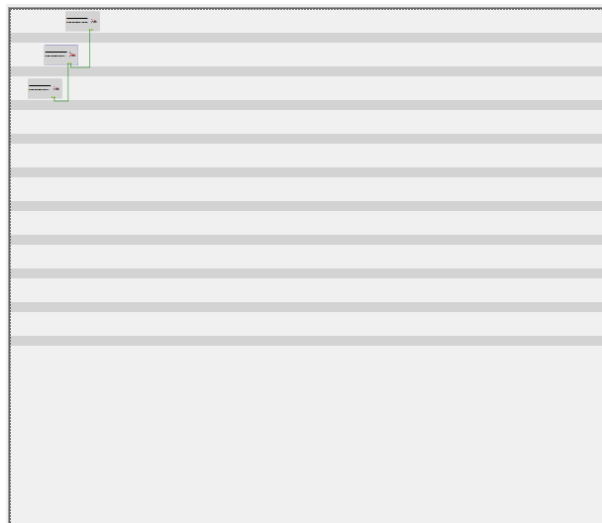


Figure 8: Result of zooming out

### Restoring the 100% view

- Commands (keyboard and mouse): **Ctrl + mouse wheel click**

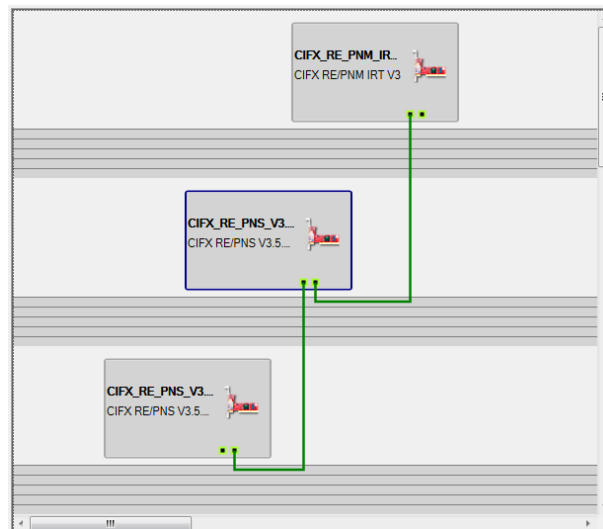


Figure 9: 100% view restored

### Shift section of the window

- Drag the slider to the right/left or up/down to select the required part of the window.

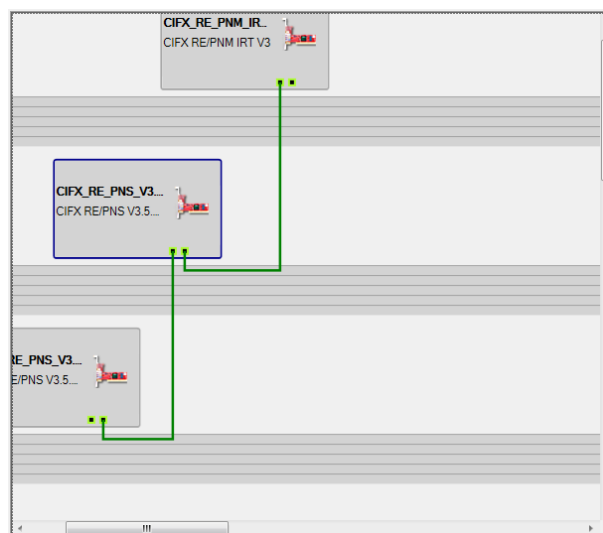


Figure 10: Visible part of the window shifted

### 3.5.2.2 Tooltips

If you move your mouse over an item in the user interface, the item name appears.

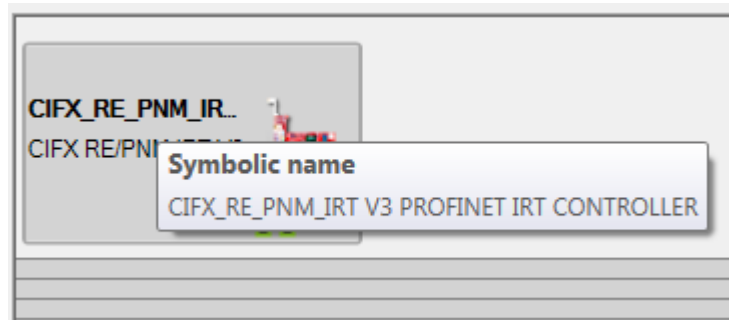


Figure 11: Example tooltip 'Symbolic name' (of the device)



Figure 12: Example tooltip 'Device type'

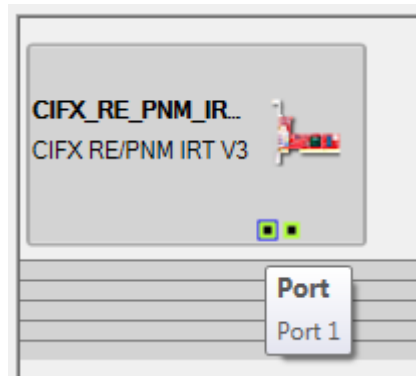


Figure 13: Example tooltip 'Port 1'

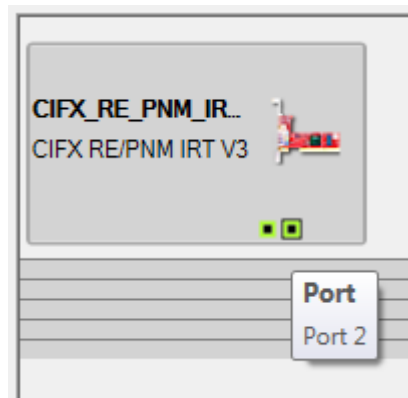


Figure 14: Example tooltip 'Port 2'

### 3.5.3 Property view

The **property view** on the right shows protocol-dependent information on the device, port or connection and allows network-related settings.



**Note:**

The descriptions of properties of devices, ports and connections for the PROFINET IO-Controller DTM (for IRT) used in this manual are only examples for this particular use case. If the Topology Editor is used together with another master DTM, the properties of device, ports and connections show other settings that relate to other networks.

#### Displaying properties

- To display the properties in the topology view, select the device, the port or the connection.

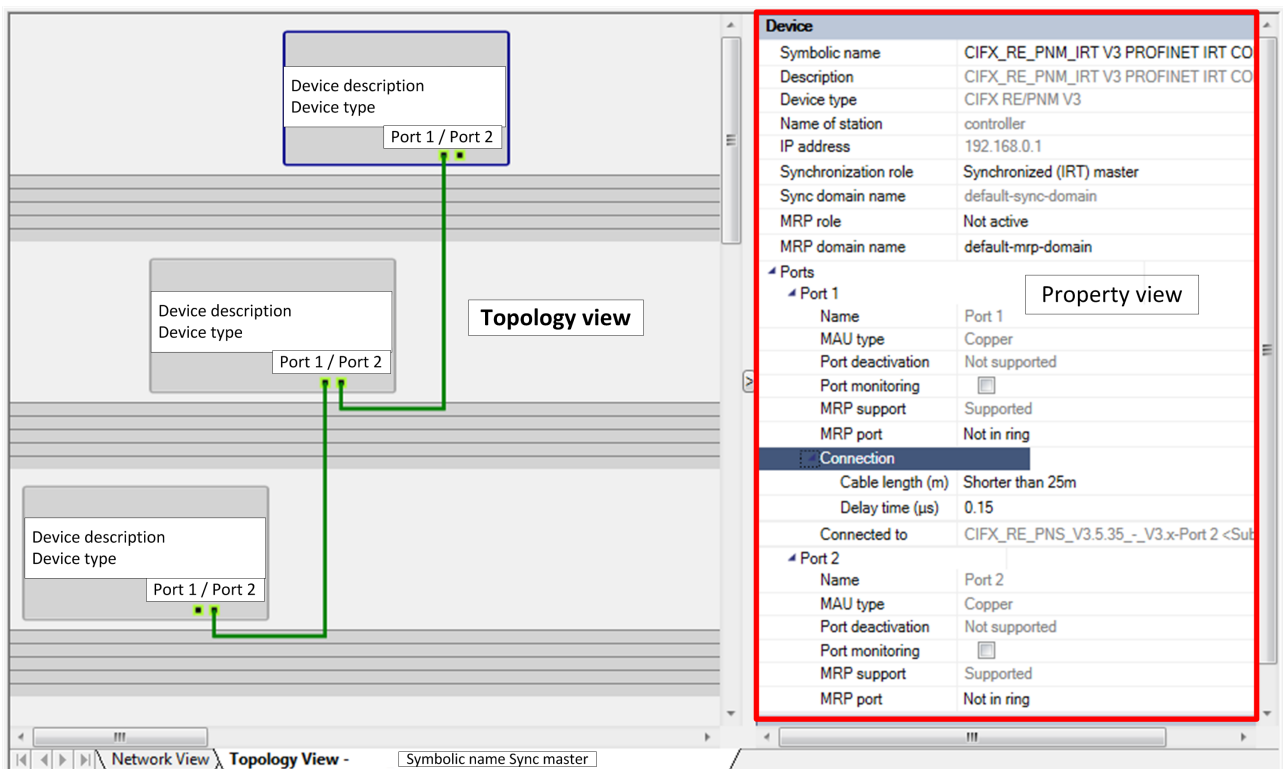


Figure 15: Property view (right side)



### 3.5.3.1 Displaying properties

You can collapse the property view and show it again.

➤ Click .

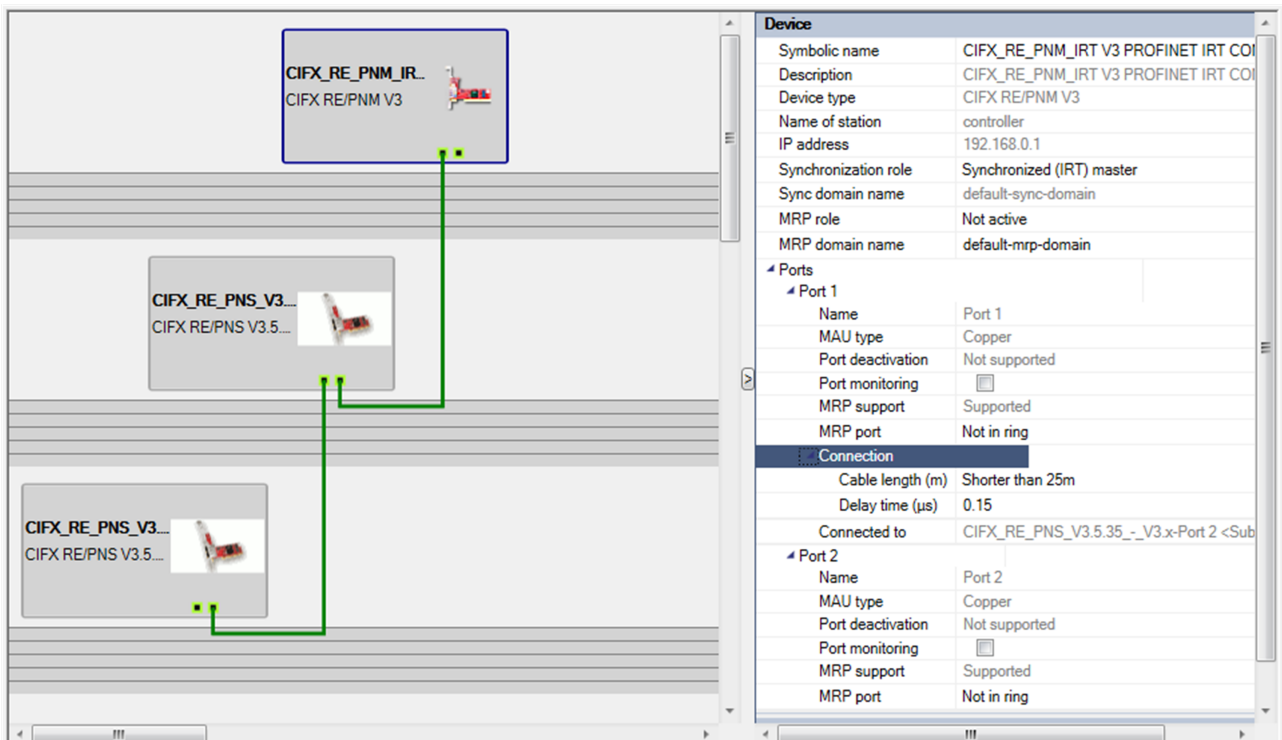


Figure 16: Topologie Editor with topology view (left) and property view (right)

➤ The property view collapses.

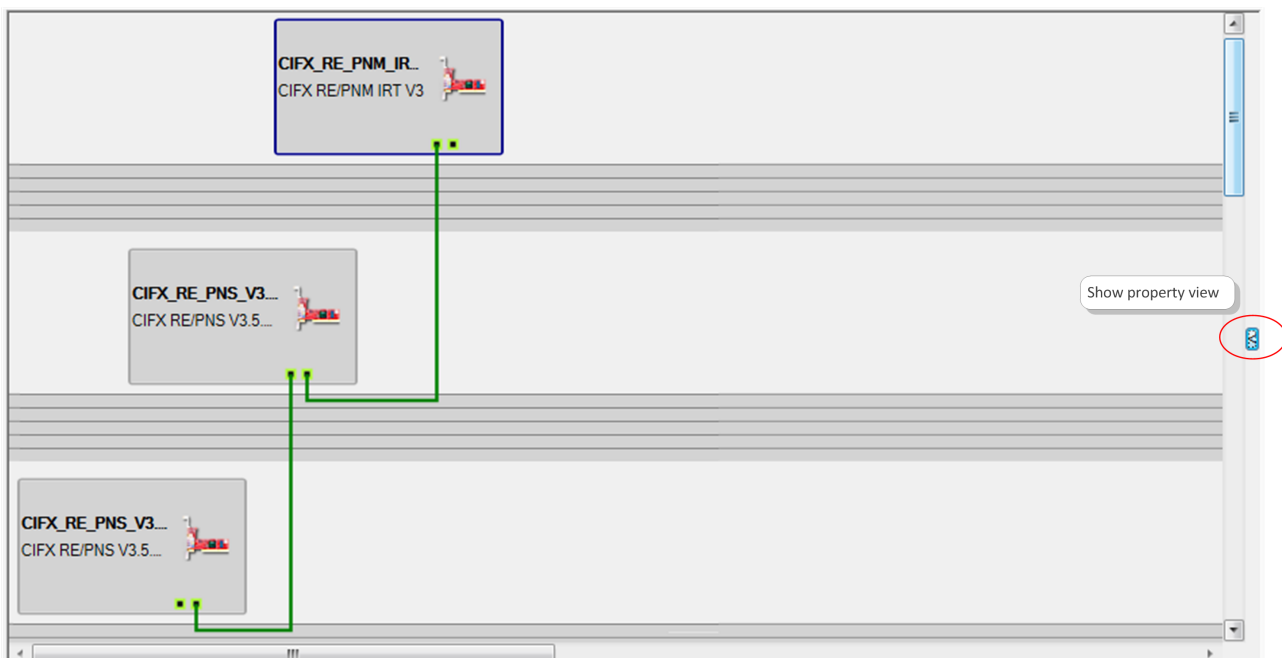


Figure 17: Topologie editor with expanded topology view

➤ Click .

➤ The property view is expanded.

### 3.5.3.2 Editing or selecting properties

Some properties can be set by editing the property value or selecting a value from a list.

#### Editing a value of a property

- To edit properties, place the cursor in the field with the value of the property box (for example 'Symbolic name').

Device	
Symbolic name	CIFX_RE_PNM_IRT V3 PROFINET IRT CONTROLLER
Description	CIFX_RE_PNM_IRT V3 PROFINET IRT CONTROLLER
Device type	CIFX RE/PNM V3
Name of station	controller
IP address	192.168.0.1
Synchronization role	Synchronized (IRT) master ▼
Sync domain name	default-sync-domain
MRP role	Not active ▼
MRP domain name	default-mrp-domain
▶ Ports	

Figure 18: Example - Editing 'Symbolic name' - place the cursor into the field

- Now you can change the 'Symbolic name'.

Device	
Symbolic name	CIFX_RE_PNM_IRT V3 PROFINET IRT CONTROLLER_25
Description	CIFX_RE_PNM_IRT V3 PROFINET IRT CONTROLLER
Device type	CIFX RE/PNM V3
Name of station	controller
IP address	192.168.0.1
Synchronization role	Synchronized (IRT) master ▼
Sync domain name	default-sync-domain
MRP role	Not active ▼
MRP domain name	default-mrp-domain
▶ Ports	

Figure 19: Example - Changing the sample value of the property 'Symbolic name'

### Selecting a property value from a list

- To configure the property value, select a value from the list (for example 'Synchronization role').

Device	
Symbolic name	CIFX_RE_PNM_IRT V3 PROFINET IRT CONTROLLE
Description	CIFX_RE_PNM_IRT V3 PROFINET IRT CONTROLLE
Device type	CIFX RE/PNM V3
Name of station	controller
IP address	192.168.0.1
Synchronization role	Synchronized (IRT) master
Sync domain name	Unsynchronized (RT)
MRP role	Synchronized (IRT) master
MRP domain name	default-mrp-domain
Ports	

Figure 20: Example - Select 'Synchronized (IRT) Master'

Device	
Symbolic name	CIFX_RE_PNM_IRT V3 PROFINET IRT CONTF
Description	CIFX_RE_PNM_IRT V3 PROFINET IRT CONTF
Device type	CIFX RE/PNM V3
Name of station	controller
IP address	192.168.0.1
Synchronization role	Synchronized (IRT) master
Sync domain name	default-sync-domain
MRP role	Not active
MRP domain name	default-mrp-domain
Ports	

Figure 21: Example - 'Synchronized (IRT) Master' selected

## 4 Configuration of PROFINET IO IRT

### 4.1 Example sequence

To configure your network and its topology, proceed as follows:

1. Create the network project with the master device.
2. Start the Topology Editor.
3. In the network view or the Topology Editor insert all devices in the network project and shift them to arrange the required topology
4. Make settings in the Topology Editor:
  - Connect the devices.
  - Configure properties for devices and ports.



---

For more information on the configuration of master and devices, read the corresponding operating instruction manuals.

---

## 4.2 Creating a network project with the master device

Depending on the frame application used, you first need to create your project configuration.

### Preparation: Configure network project with the master device

**Note:**

To open the Topology Editor, you need a network project with a master device. If you use a Hilscher PROFINET IO-Controller device for IRT, create a network project in SYCON.net first.

- Create a network project and configure the master device.
- The tab **Topology** [*name of master*] appears with the Topology Editor's topology and the property view.
- Click the tab **Topology** [*name of the master*].
- The configured master device is displayed in the Topology Editor's topology view.

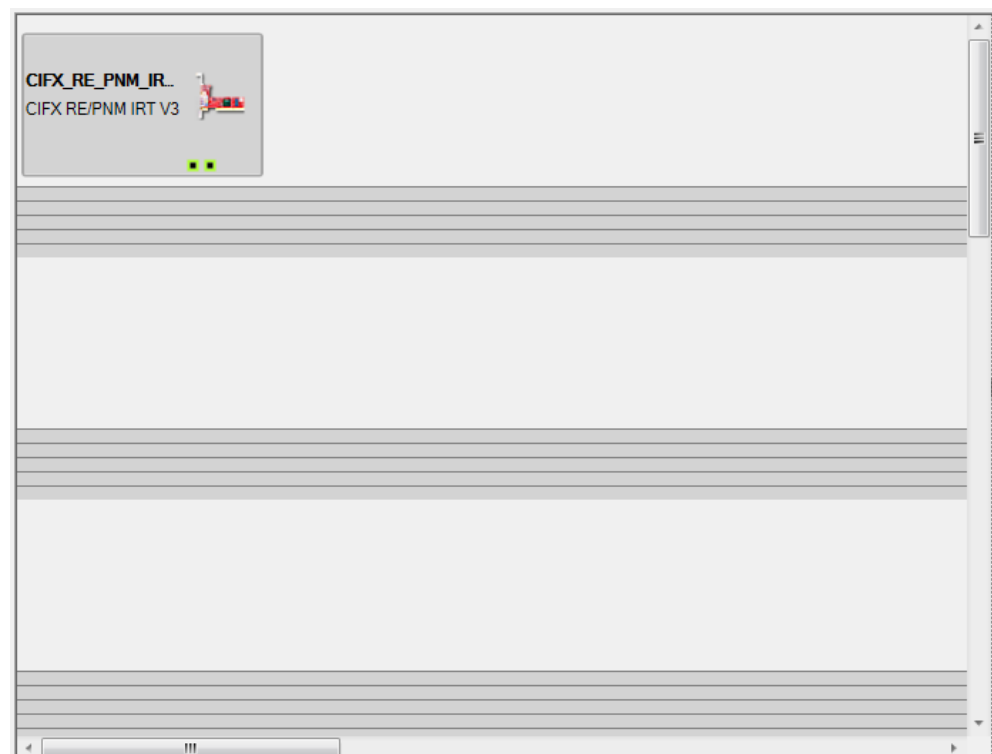


Figure 22: Master device in the topology view of the Topology Editor (e. g. PROFINET IO-Controller for IRT)

Now you can configure the slave devices.

## 4.3 Adding and shifting the device

After you have created a network project with a master device, you can configure the slave devices displayed in the Topology Editor. Depending on your frame application, you can drag all devices required for the configuration from the device catalog and drop them directly into the topology view of the Topology Editor.

### Adding devices into the topology view

- Add further slave devices to your project configuration or shift them directly from the device catalog to the topology view using drag and drop.
- The slave device is displayed in the topology view.

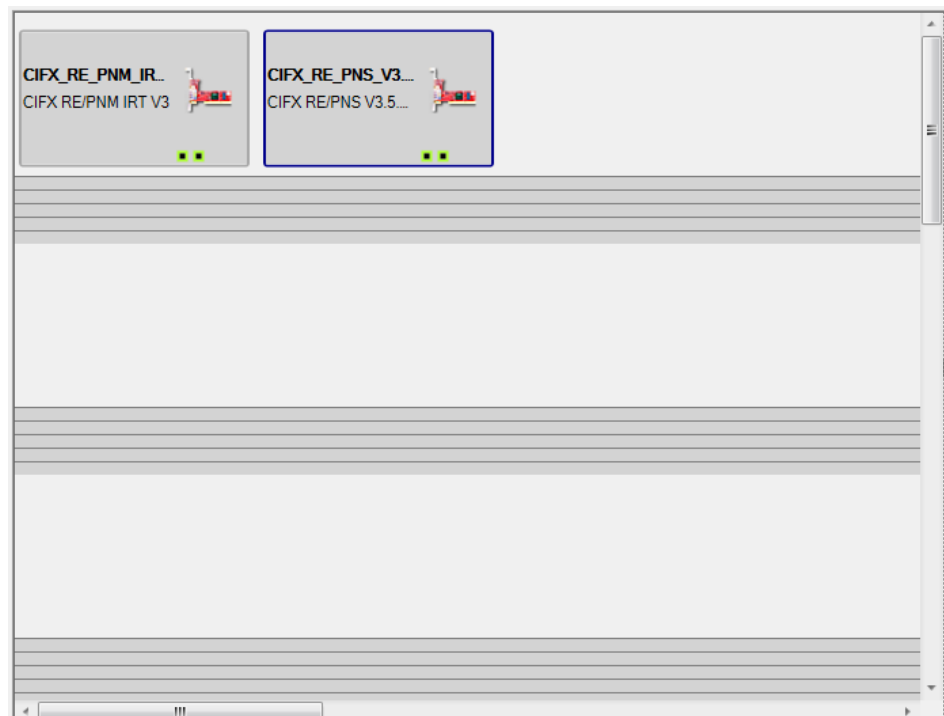


Figure 23: Slave device added to the topology view (e. g. PROFINET IO-Device for IRT)

- If needed, add further slaves into the project configuration and shift them to the topology view using drag and drop.
- The slave devices appear in the topology view.

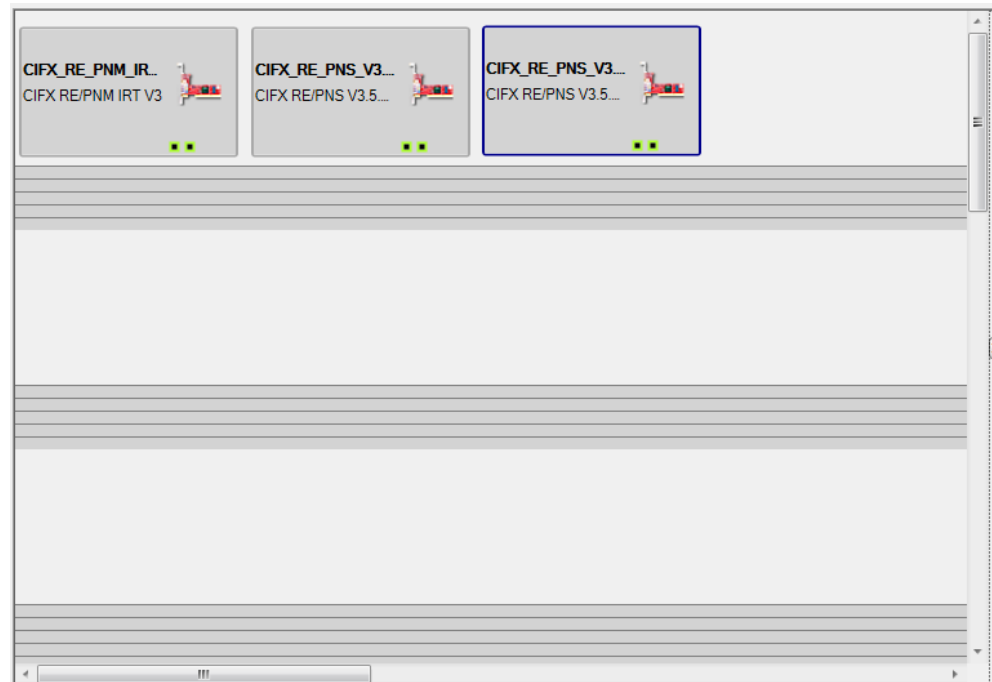


Figure 24: Further slave devices added to the topology view (e. g. PROFINET IO-Device for IRT)

## Shifting devices

- In the topology editor select the device you wish to shift.

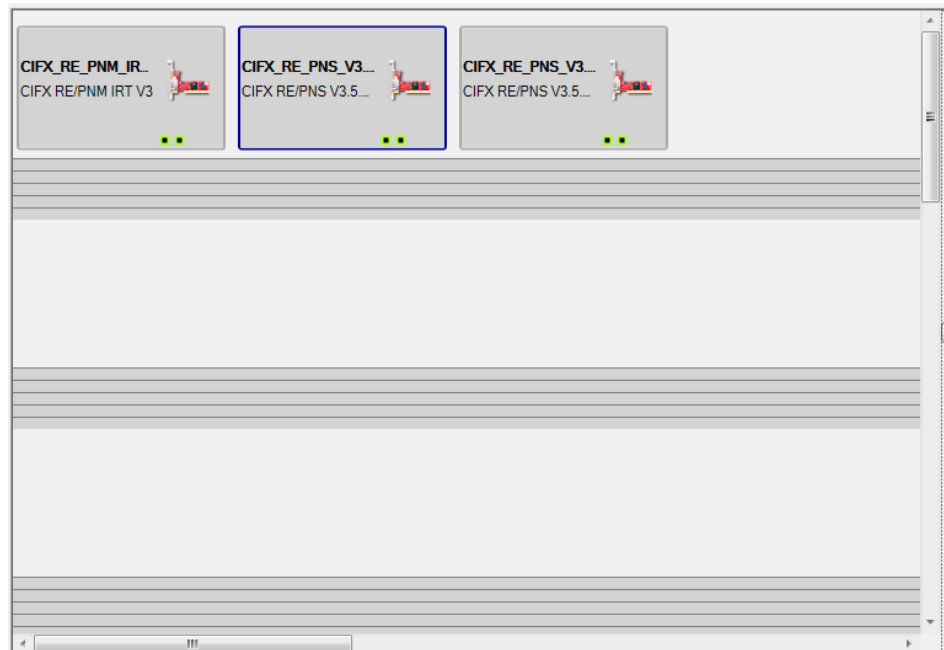


Figure 25: Slave device selected in the topology view (e. g. PROFINET IO-Device for IRT)

- The selected device has a blue frame.
- Keep the left mouse button pressed and drag the device to the desired position in the topology view.
- The device is located at the new position.

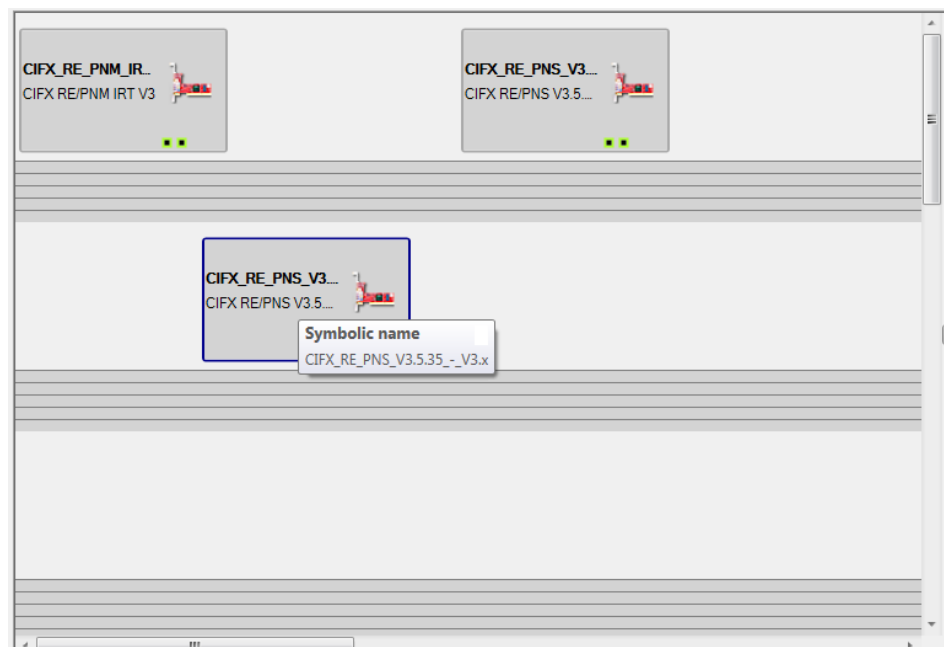


Figure 26: Slave device moved in the topology view (e. g. PROFINET IO-Controller and -Device for IRT, tooltip shows the device name)

- Arrange all devices in the Topology Editor as desired.



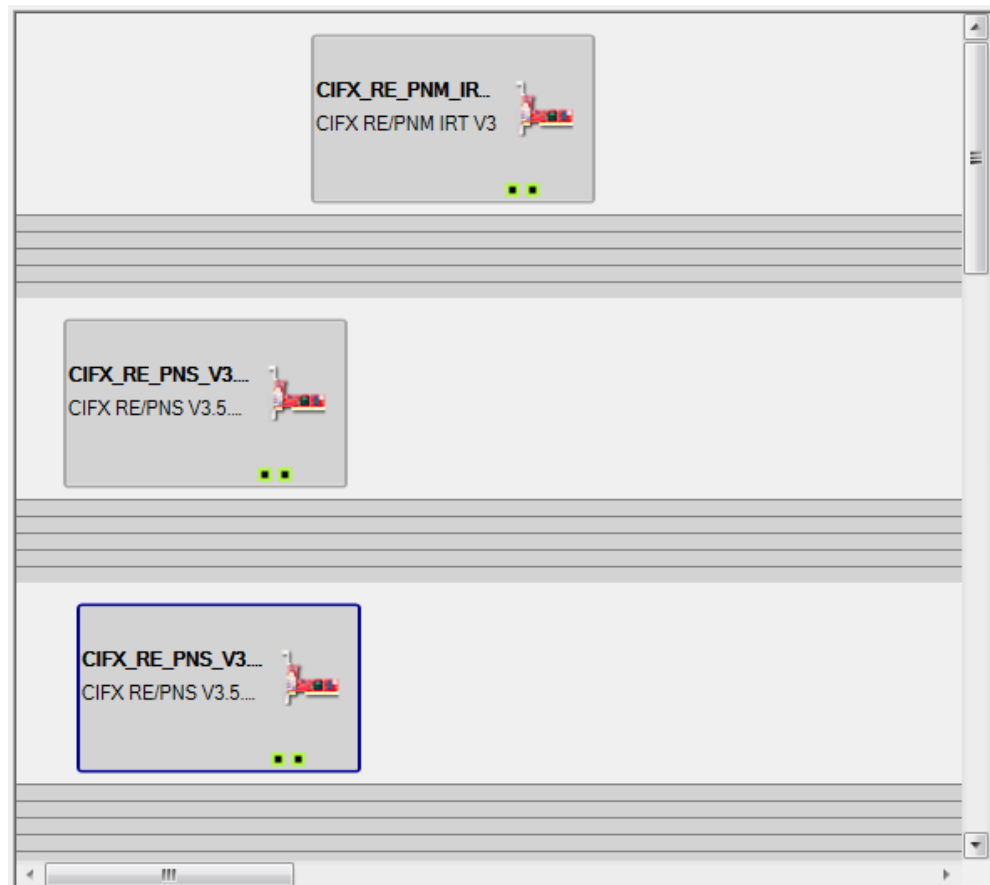


Figure 27: Master devices and slave devices rearranged in the topology view (e. g. PROFINET IO-Controller and -Device for IRT)

## 4.4 Connecting devices, configuring connections

The Topology Editor allows the connection of IO devices. To connect two devices in the configuration, connect their ports and configure the cable length.

### Connecting devices



- In your configuration connect the intended port of device 1 with the intended port of device 2.

Via 'port 1' in the topology view, connect 'channel 0' of the Ethernet connector.

Via 'port 2' in the topology view, connect 'channel 1' of the Ethernet connector.

When establishing the connection observe the general rules (for example, for auto-crossover and instructions in the manual for your device).

Deactivated ports cannot be used (see *Port properties* [▶ page 41] / 'port deactivation').

- Click on the port  of device 1 and keep the mouse button pressed.
- To create a connection, move the pointer to another port  and release the mouse button thereafter.
- The connection is displayed as a green line in the Topology Editor:

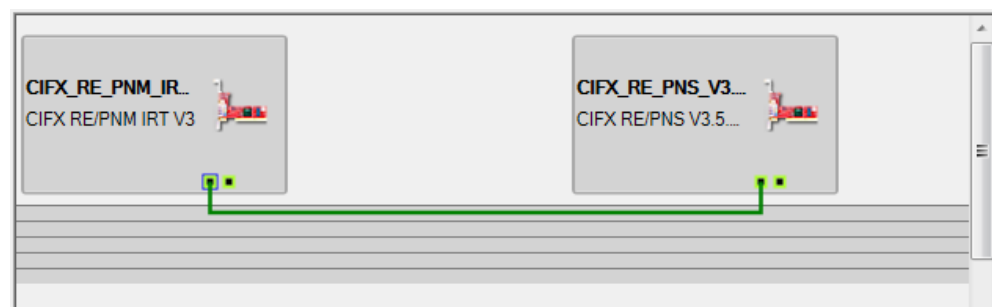



Figure 28: Graphical illustration of the connection between two devices in the Topology Editor



### Note:

No connection will be established if you try to connect ports with red marks . These ports can neither be connected nor included within the communication.

### Configuring the connection

The cable length or delay time to be used for a connection can be configured in the Topology Editor in the connection properties.



For information on configuring cable length, see *Connection properties* [► page 44].

---

## 4.5 Removing a device or connection

Devices or connections configured in the Topology Editor can be removed from the configuration.



### Note:

Master devices cannot be deleted in the Topology Editor.

### Removing device

- In the Topology Editor select the device you wish to delete.
- Press the 'Delete' key.
- Or right click on the device to open the context menu.
- And click **Remove device**.

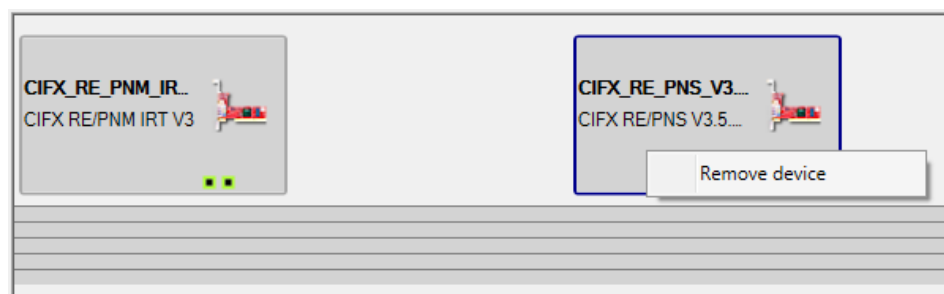


Figure 29: Remove device (example of an unconnected device)

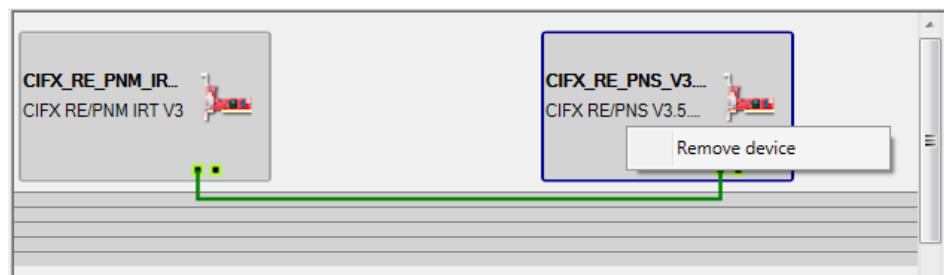


Figure 30: Remove device (example of an connected device)

- The request pops up and asks if you want to delete the device.

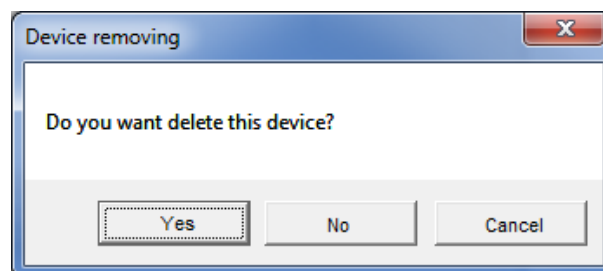


Figure 31: Request whether you want to delete the device

- Click **Yes**.
- The device will be deleted along with its connections if there are any.

### Deletion of master device impossible

The master device cannot be deleted from the topology.

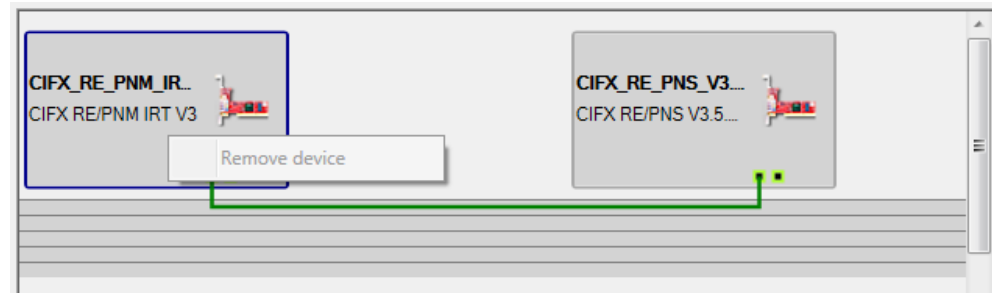


Figure 32: Deleting the master device is not possible (example of a connected device)

### Remove connection

- In the Topology Editor click on the connection you want to remove.
- ⇒ The connecting line is displayed in blue.
- Press the 'Delete' key.
- Or right click on the connection to open the context menu.
- And click **Remove connection**.

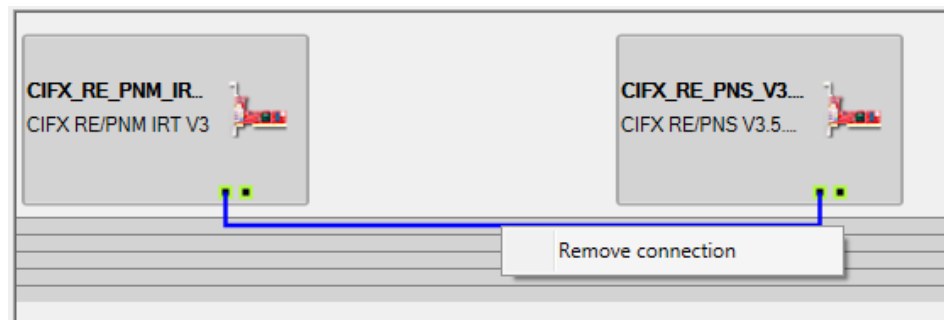


Figure 33: Remove device (example of a not connected device)

- ⇒ The connection is removed.

## 4.6 Properties

The properties of device, port and connection required for the topology of a network configuration are displayed in the property view. Here you can also configure the settings of cable lengths, cable material or switching delays, etc., required for a PROFINET IO-Controller DTM (for IRT).

### 4.6.1 Device properties

The device property view shows general and bus-specific parameters of the devices and allows their configuration.

#### IRT communication

When configuring PROFINET IO IRT, correct device identification data is displayed: 'Symbolic name', 'Description' (text info from the GSDML file), 'Device type' (physical device name) and 'Name of station' (network name of the PROFINET IO-Controller station). Additionally the device's 'IP address' is displayed which can be changed in the controller DTM. In the device property view also the data necessary for IRT communication can be set: 'Synchronization role' and 'Sync domain name'.

The synchronization of the data exchange for the IRT communication is controlled by a sync master. For each sync domain, exactly one sync master is allowed. For Hilscher, the PROFINET IO-Controller device (for IRT mode) assumes the role of the sync master. The sync master sets the synchronization clock for data exchange with the sync slaves.

The slave devices used for the IRT communication must support the IRT communication feature and must be able to work as a "sync slave". Whether or not a device can take over the role as "sync slave" or whether it does not support IRT, is defined in its GSDML file.

#### Viewing device properties

- In the topology view select the device whose properties you wish to display.
- In the property view, the properties of this device are displayed. See also *Property view* [▶ page 24].

## Device properties

Device	
Symbolic name	CIFX_RE_PNM_IRT V3 PROFINET IRT CONTF
Description	CIFX_RE_PNM_IRT V3 PROFINET IRT CONTF
Device type	CIFX RE/PNM V3
Name of station	controller
IP address	192.168.0.1
Synchronization role	Synchronized (IRT) master
Sync domain name	default-sync-domain
MRP role	Not active
MRP domain name	default-mrp-domain
Ports	

Figure 34: Master devices properties (e. g. PROFINET IO-Controller for IRT)

Device	
Symbolic name	CIFX_RE_PNS_V3.5.35_-V3.x
Description	PROFINET IO-Device PCI Erweiterung:
Device type	CIFX RE/PNS V3.5.35 - V3.x
Name of station	cifxrepns
IP address	192.168.0.2
Synchronization role	Synchronized (IRT) slave
Sync domain name	default-sync-domain
MRP role	Not active
MRP domain name	default-mrp-domain
Ports	

Figure 35: Slave devices properties (e. g. PROFINET IO-Device for IRT)

Meaning	Meaning	Value range/value
<b>Symbolic name</b>	Freely editable name of the PROFINET IO-Controller device or the PROFINET IO Device which can also be changed in the DTM or via the context menu.  In the PROFINET IO-Controller DTM, the setting can be made under 'Controller network settings' or 'Device table' each under 'Description'.	Freely editable
<b>Description</b>	GSDML element module info  This element contains human-readable text information about the device.	**
<b>Device type</b>	Name of the physical device (also named as 'Device name'). The name is stored in a non-volatile memory of the device.	**
<b>Name of station</b>	<b>Network name of the PROFINET IO-Controller station or network name of the PROFINET IO-Device station</b>  The name of station is only displayed here.  For the PROFINET IO-Controller the name of station is set in the PROFINET IO-Controller DTM (in SYCON.net under 'Controller network settings').  For the PROFINET IO-Device, the name of station is set directly in the configuration tool for the PROFINET IO-Device device (for SYCON.net in the PROFINET IO-Controller DTM under 'Device table').	**  Name according to PROFINET specification, PNO document 2722
<b>IP address</b>	IP address of the PROFINET IO-Controller station or PROFINET IO-Device station  The IP address is only displayed here. It is set in the PROFINET IO-Controller DTM (under 'Controller network settings' or 'IP address table').	**

Meaning	Meaning	Value range/value
<b>Synchronization role</b>	<b>Master device: (or PROFINET IO-Controller)</b> <ul style="list-style-type: none"> <li>The option <b>Unsynchronized (RT)</b> means that this master device performs a non-synchronized data exchange with connected slave devices. The option effectuates that RT is used.</li> <li>The option <b>Synchronized (IRT) Master</b> means that this master device in a sync domain takes over the role as sync master. The sync master sets the synchronization clock or the clock rate for the data exchange with the sync slaves. The option effectuates that IRT is used.</li> </ul>	Unsynchronized (RT), Synchronized (IRT) Master
	<b>Slave device: (or PROFINET IO-Device)</b> <ul style="list-style-type: none"> <li>The option <b>Unsynchronized (RT)</b> means that the data exchange from the master device with this slave device is not synchronized. The option effectuates that RT is used.</li> <li>The option <b>Synchronized (IRT) Slave</b> means that the data exchange from the master device with this slave device is synchronized. The option effectuates that IRT is used.</li> <li>The display 'Unsynchronized (RT)' indicates that this slave device does not support IRT communication and that the data exchange from the master device with this slave device cannot be synchronized.</li> </ul>	Options (for IRT): Unsynchronized (RT), Synchronized (IRT) Slave or Display (IRT not supported): Unsynchronized (RT)
<b>Sync domain name</b>	The sync domain comprises all devices controlled by a sync master.  The sync domain name is set in the PROFINET IO-Controller DTM (for IRT) under 'Stations timing' > 'Sync domain settings' > 'Name'.	**
<b>MRP role</b>	Refer to <i>MRP properties</i> [► page 46].	
<b>MRP domain name</b>	Refer to <i>MRP properties</i> [► page 46].	

Table 1: PROFINET IO IRT device properties

\*\* cannot be edited in the Topology Editor

### Configuring device properties

For IRT communication:

- Assign the 'Sync master' role to the master device (e. g. PROFINET IO-Controller): Select the **Synchronization role** 'Synchronized (IRT) Master'.
- Assign the 'Sync slave' role to the slave device (e. g. PROFINET IO-Device): Select the **Synchronization role** 'Synchronized (IRT) Slave'.



## 4.6.2 Port properties

The port property view shows general and bus-specific parameters of the ports and allows their configuration.


### IRT communication

For each port of the PROFINET IRT network devices, the following parameters are displayed: 'Name' (of the port), 'MAU type', 'Port deactivation' and 'Connected to'. For the parameters MRP support and MRP port, see section *MRP properties* [► page 46].

A single MAU type or media converters must be used within the network for the IRT communication.

For information about the connection properties, refer to section *Connection properties* [► page 44].

### Viewing port property

- To display the port properties in the topology view, click on the port.
- Click .
- The port properties are displayed in the property view.

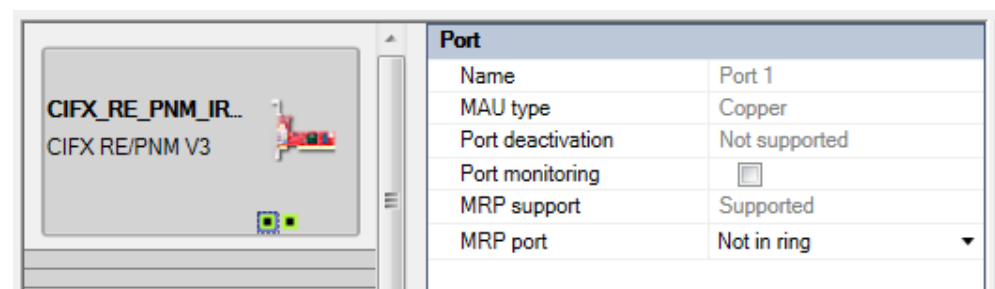


Figure 36: Properties of port 1, master device (e. g. PROFINET IO-Controller CIFX RE/PNM IRT V3)

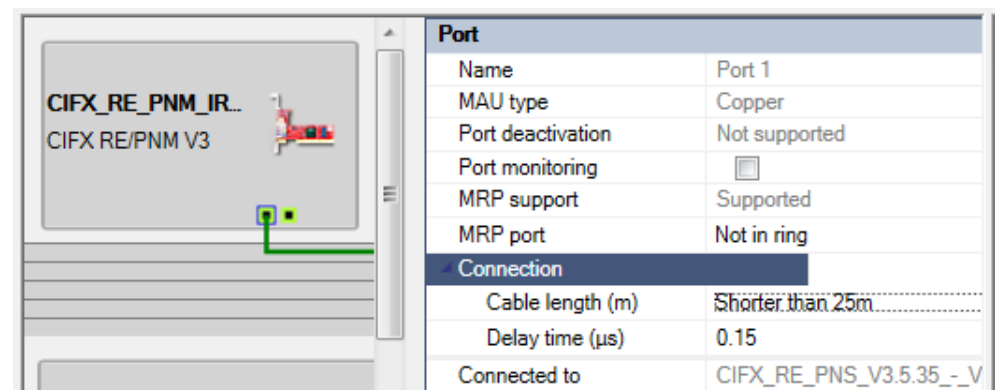


Figure 37: Properties of port 1, master device connected (e. g. PROFINET IO-Controller CIFX RE/PNM IRT V3)

### Example 'Port deactivation' configurable

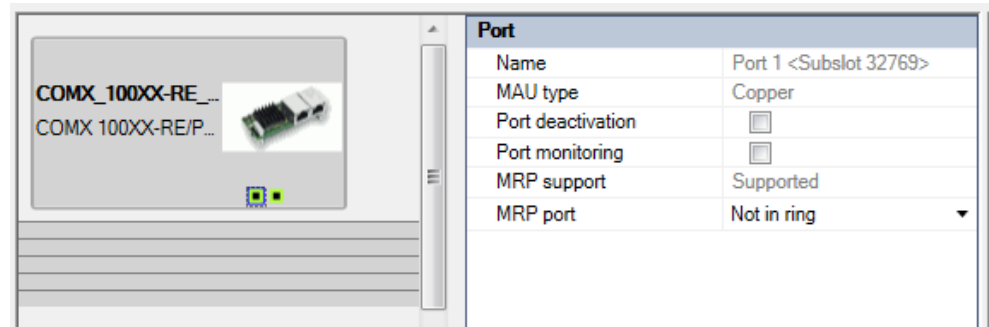


Figure 38: Properties of port 1, slave device, example 'Port deactivation' configurable (e. g. PROFINET IO-Device COMX\_100XX-RE\_PNS\_V3.5.35\_- V3.x)

### Example MRP not supported

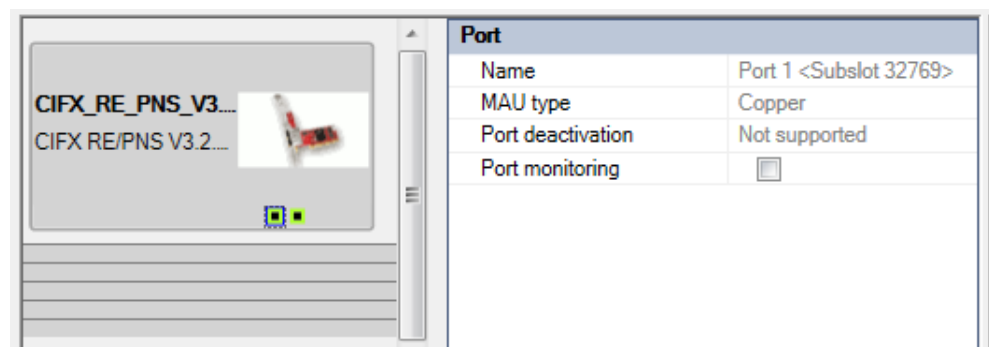


Figure 39: Properties port 1, slave device, MRP not supported (e. g. PROFINET IO-Device CIFX\_RE\_PNS\_V3.2.x\_- V3.4.18)

### Port properties

Port	
Name	Port 1
MAU type	Copper
Port deactivation	Not supported
Port monitoring	<input type="checkbox"/>
MRP support	Supported
MRP port	Not in ring

Figure 40: Properties port 1, master device (e. g. PROFINET IO-Controller CIFX RE/PNM IRT V3)

Port	
Name	Port 1
MAU type	Copper
Port deactivation	Not supported
Port monitoring	<input type="checkbox"/>
MRP support	Supported
MRP port	Not in ring
Connection	
Cable length (m)	Shorter than 25m
Delay time (µs)	0.15
Connected to	CIFX_RE_PNS_V3.2.x_- V3.4.18-Port 1 <Subslot 32769>

Figure 41: Properties port 1, master device connected (e. g. PROFINET IO-Controller CIFX RE/PNM IRT V3)

Port properties	Meaning	Value range/value
<b>Name</b>	Name of the device port in the Topology Editor	**
<b>MAU type</b>	MAU type: The specifications for the cable material (media type) are defined in the GSDML file of the specific device or controller. Cable materials can be copper or fiber optic (FO) made from glass or plastic. The setting is made in the PROFINET IO-Controller DTM.	**
<b>Port deactivation</b>	Setting option to disable or enable the specified port Depending on the settings in the GSDML file, 'Port deactivation' is settable via a checkbox or 'not supported' is displayed. With checkbox: <ul style="list-style-type: none"> <li>'Port deactivation' <i>not</i> checked: The port remains active. A connection can be established via this port.</li> <li>'Port deactivation' checked: The port is disabled. No connection can be established via this port.</li> </ul> Without checkbox: display 'not supported' (i. e., the 'Port deactivation' cannot be configured).	Checkbox: not checked, checked Default: Not checked  Display (without checkbox): Not supported
<b>Port monitoring</b>	This option is used to activate or deactivate the port diagnostics. <ul style="list-style-type: none"> <li>'Port monitoring' <i>not</i> checked: The port diagnosis is disabled.</li> <li>'Port monitoring' checked: The port diagnosis is enabled.</li> </ul> Examples: <ul style="list-style-type: none"> <li>Link status is monitored, i.e., a diagnosis is generated if link-down occurs.</li> <li>Attenuation (system reserve) is monitored (only for glass fiber).</li> </ul>	Checkbox: not checked, checked Default: not checked
<b>MRP support*</b>	Refer to section <i>MRP properties</i> [► page 46].	**
<b>MRP port*</b>	Refer to section <i>MRP properties</i> [► page 46].	**
<b>Connection / Cable length Delay time</b>	Selection of cable length for the connection between two devices or the delay time. For details refer to section <i>Connection properties</i> [► page 44].	
<b>Connected to</b>	Specifying the symbolic name of the connected device as well as the port name of this device.	**

Table 2: PROFINET IO IRT port properties

\*appears only if MRP is supported

\*\*cannot be edited in the topology editor

### Configuring port properties

Wenn ein Geräte-Port bei der Konfiguration von Geräteverbindungen für IRT-Kommunikation verwendet werden soll (und wenn 'Port-Deaktivierung' konfigurierbar ist),

- Do *not* check **Port deactivation**.

### 4.6.3 Connection properties

The cable length must be set in the connection properties. The values are transmitted to the device DTM and calculated there.

The right value for cable length determines whether the communication between the two devices is established. A connection between the devices will not be established if the cables are too long.

#### Displaying connection properties

- In the topology view use the mouse to select the connection you want to display.
- The connection is represented as a blue line and the properties of this connection are displayed in the property view.

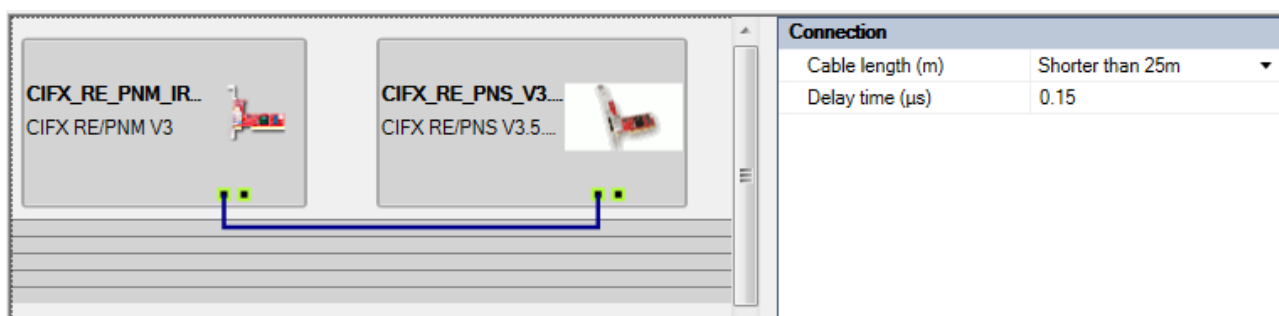


Figure 42: Connection selected per mouse click in the Topology Editor (left) and connection properties (right)

#### Connection properties

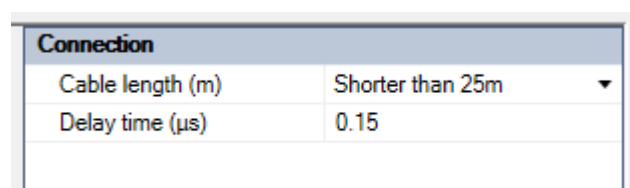


Figure 43: Cable length - 'Shorter than 25 m' selected

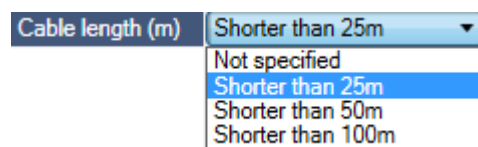


Figure 44: Drop-down list for cable length

Connection property	Meaning	Value range/value
Cable length (m)	<p>Selection of the cable length in meters for the connection between two devices.</p> <p>Possible cable lengths are 25, 50 and 100 m.</p> <p>If you select 'Not specified', no cable length will be provided.</p> <p><b>Note:</b> Cables that are too short may cause problems during maintenance tasks (e. g., when replacing a defective cable).</p>	<p>Not specified, Shorter than 25 m, Shorter than 50 m, Shorter than 100 m,</p>

Connection property	Meaning	Value range/value
<b>Delay time (µs)</b>	<p>Signal transition time: Selection of the delay in microseconds required for the signal transmission from the port of a device to the port of the next device. The signal transition time per meter is a little less than 6 ns/m.</p> <p>A manual adjustment of the delay time is not recommended.</p> <p><b>Note:</b> When you enter values of less than 1µs you must use a period (instead of a comma).</p>	0.000 ... 99.999 µs

Table 3: PROFINET IO IRT connection properties

### Configure connection properties

For IRT communication:

- Configure the **Cable length** in meters for each connection.
- ⇒ The associated **Delay time** in microseconds is displayed.



#### **Note:**

Cables that are too short may cause problems during maintenance tasks (e. g., when replacing a defective cable).

## 4.6.4 MRP properties

### Media redundant communication

To build a redundant ring topology, certain rules must be observed. For information on the rules for media-redundant communication with highly available networks, refer to section *MRP rules* [► page 16].

### MRP device properties

The settings required for a media-redundant communication ('MRP-role' and 'MRP domain name') can be set for each PROFINET IO MRP device.

Device property	Meaning	Value range/value
<b>MRP role</b>	<p>Property of the PROFINET interface sub-module format. Specifies the role of the PROFINET interface submodule: 'Manager' or 'Client'.</p> <p>To support a media-redundant communication for highly available networks, select the MRP role 'Ring client' or 'Ring manager'.</p> <p>If you select 'Not active', the device is not in the ring. To learn more about the importance of MRP-roles, read section <i>MRP rules</i> [► page 16].</p> <p>If the device does not support media-redundant communication (MRP), 'Not supported' is displayed.</p>	<p><i>Selection (for MRP):</i> Not active, Ring client, Ring manager</p>
<b>MRP domain name</b>	<p>Property of the PROFINET interface sub-module format.</p> <p>Freely editable name for the MRP domain. The MRP domain includes all devices that are configured as participants in the ring.</p> <p><b>Important!</b> For all participants of an MRP domain, <i>one</i> identical <b>MRP domain name</b> must be used.</p> <p>The MRP domain name must be written in lowercase.</p>	<p>Freely editable</p> <p>Identical name for all participants of an MRP domain</p>

Table 4: PROFINET IO MRP device properties

### Configure MRP device properties

If media redundancy is supported:

- Assign the 'MRP client' role to the PROFINET IO-Controller device: Select the **MRP role** 'Ring client'.
- Select a PROFINET IO-Device which supports the 'MRP manager' role and assign the 'MRP manager' role to that device: Select the **MRP role** 'Ring manager'.
- If a device is not to be included in the MRP domain, assign the role 'Not active' to this device: Select the **MRP role** 'Not active'.
- Enter an **MRP domain name**. This name must be identical for all participants in an MRP domain.

### MRP port properties

The port property view shows whether MRP is supported ('MRP support') and whether the device port is connected ('MRP port').

The parameters 'MRP support' and 'MRP port' are displayed for each port of the PROFINET MRP network devices.

The implementation of high-availability networks using media-redundant communication is only possible via a ring topology. Without a ring topology, there is no protection against connection breakdown. If an error occurs, the error-free part of the ring can be used as a redundant communication path.

Port properties	Meaning	Value range/value
<b>MRP support *</b>	Indicates whether the device supports media redundancy. This is defined in the GSDML file of the device.  Media redundancy (using MRP or MRPD) is an optional functionality in the PROFINET to build a redundant ring topology.	** Supported
<b>MRP port*</b>	Indicates whether a port (according to the definition of the GSDML file) is suitable for a media-redundant communication and whether the port is connected.  Display 'In ring' (In the ring): MRP is supported, port is connected  Display 'Not in ring' (Not in the ring): MRP is supported, port is not connected	** In ring, Not in ring

Table 5: PROFINET IO MRP port properties

\*appears only when MRP is supported

\*\*not editable in the Topology Editor

## 4.7 Validation of configuration steps

The DTM or Topology Editor will check all your configuration steps. Incorrect settings will trigger the following warnings:

- **Incorrect configuration of the topology:** A warning appears in the DTM output window.
- **Input of faulty values for the device or port properties:** In the property view of the Topology Editor the faulty value is marked in red and cannot be saved.
- **Failure when trying to connect two ports which must not be connected.** The ports marked in red are excluded from the communication because it is impossible to combine or connect devices of different MAU types, e. g. copper and fiber optic material (FO).



## 5 Annex

### 5.1 References

[1] Application Layer protocol for decentralized periphery and distributed automation, Technical Specification for PROFINET, Version 2.3Ed2MU2, February 2015, Order No: 2.722, PROFIBUS Nutzerorganisation e.V., Karlsruhe

[2] Operating instruction manual, DTM for PROFINET IO-Controller/Master devices, Doc-ID: DOC060302OIXXEN, PROFINET IO Controller DTM OI XX EN.pdf

[3] Operating instruction manual, Generic DTM for PROFINET IO-Device devices, Doc-ID: DOC060305OIXXEN, PROFINET IO-Generic Device DTM XX EN.pdf

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## Glossary

<b>DTM</b>	Device Type Manager: Software module with graphical user interface for the configuration and/or for diagnosis of devices
<b>FDT</b>	Field Device Tool: FDT specifies an interface, in order to be able to use DTM (Device Type Manager) in different applications of different manufacturers
<b>IP address</b>	Identifies a device or a computer within an IP-based network and is defined in the Internet Protocol Version 4 (IPv4) as a 32-bit number. For ease of notation the address is usually divided into four 8-bit numbers represented in decimal notation and separated by points: a.b.c.d. Each letter stands for an integer value between 0 and 255, e.g. 192.168.30.16. However, not all combinations are allowed, some are reserved for special purposes. The IP address 0.0.0.0 is defined as invalid.
<b>MAU</b>	Medium Access Unit: Transmitting and receiving device for signals (for feeding signals into and extracting them from the media). On the side of the network medium (cable), the device is the interface for connecting network stations.
<b>MRP</b>	Media Redundancy Protocol: Data network protocol for high-availability networks. The protocol is defined in standard IEC 62439 and suitable for most Industrial Ethernet applications.
<b>MRPD</b>	Media Redundancy for Planned Duplication: is a method for the bumpless changeover of the IRT telegrams (high-availability). The bumpless changeover is ensured, as the cyclic IRT data is sent via both ways of communication in the ring, i. e. if there is no failure in the network, the receiver will get the same IRT telegram twice. The first telegram will be used; the second one will be discarded.
<b>PROFINET</b>	Communication system for Industrial Ethernet designed and developed by PROFIBUS & PROFINET International (PI) which uses some mechanisms similar to those of the PROFIBUS field bus
<b>PROFINET IO</b>	PROFINET IO (Input - Output) has been created for the connection of remote peripheral to a controller
<b>PROFINET IRT</b>	PROFINET protocol level for PROFINET IO applications in drive systems with cycles times of less than 1 ms; IRT = Isochronous real-time

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