

## Learn-/Training Document

Siemens Automation Cooperates with Education (SCE) | As of Version V15.1

**TIA Portal Module 142-100** Industrial Ethernet with SIMATIC S7-1500 and SCALANCE XC208

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## Matching SCE Trainer Packages for this Learn-/Training Document

#### Industrial Communication SIMATIC NET

• IE SCALANCE Switch XC208 Order no.: 6GK1950-0BB12

#### SIMATIC Controllers

- SIMATIC CPU 1516F PN/DP Safety Order no.: 6ES7516-3FN00-4AB2
- SIMATIC ET 200SP Open Controller CPU 1515SP PC F and HMI RT SW Order no.: 6ES7677-2SB42-4AB1
- SIMATIC ET 200SP Distributed Controller CPU 1512SP F-1 PN Safety Order no.: 6ES7512-1SK00-4AB2
- SIMATIC S7 CPU 1516-3 PN/DP
   Order no.: 6ES7516-3AN00-4AB3
- SIMATIC CPU 1512C PN with software and PM 1507 Order no.: 6ES7512-1CK00-4AB1
- SIMATIC CPU 1512C PN with Software, PM 1507 and CP 1542-5 (PROFIBUS)
   Order no.: 6ES7512-1CK00-4AB2
- SIMATIC CPU 1512C PN with Software Order no.: 6ES7512-1CK00-4AB6
- SIMATIC CPU 1512C PN with software and CP 1542-5 (PROFIBUS)
   Order no.: 6ES7512-1CK00-4AB7

#### SIMATIC STEP 7 Software for Training

- SIMATIC STEP 7 Professional V15.1 Single License
   Order no.: 6ES7822-1AA05-4YA5
- SIMATIC STEP 7 Professional V15.1 6+20 User Classroom License Order no.: 6ES7822-1BA05-4YA5
- SIMATIC STEP 7 Professional V15.1 6+20 User Upgrade License Order no.: 6ES7822-1AA05-4YE5
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   Order no.: 6ES7822-1AC05-4YA5

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# Industrial Ethernet with S7-1500 and SCALANCE XC208

## 1 Goal

In this chapter you learn to configure the SCALANCE XC208 Industrial Ethernet switch and to connect it to an S7-1500 controller.

The SIMATIC S7 controllers listed in chapter 3 can be used.

## 2 Requirement

This section builds on the chapter Global data blocks with S7-1500. To perform the work in this chapter, you can use the following project, for example: "SCE\_EN\_032-600\_Global\_ Data\_Block\_R1704.zap14".

## 3 Required hardware and software

- 1 Engineering station: Requirements include hardware and operating system (for additional information, see Readme on the TIA Portal Installation DVDs)
- 2 SIMATIC STEP 7 Professional software in TIA Portal V15.1 or higher
- SIMATIC S7-1500 controller, e.g. CPU 1516F-3 PN/DP –
   Firmware V2.1 or higher with memory card
- 4 Industrial Ethernet Switch SCALANCE XC208
- 5 Ethernet connection between engineering station and controller and between controller and ET 200 SP distributed I/O



3 SIMATIC S7-1500 controller

## 4 Theory

## 4.1 Structure and operation of SCALANCE XC208

## 4.1.1 Industrial Ethernet switch XC208

SCALANCE XC208 is an Industrial Ethernet switch for process automation.



- (1) Network ports
- (2) Grounding screw
- (3) Knurled screw
- (4) Fastening bolt
- (5) Lever aid for operating the fastening bolt with a screwdriver
- (6) Power supply

- (7) Signaling contact
- (8) Serial interface
- (9) "SELECT/SET" button
- (10) LED display
- (11) C-PLUG slot for removable data storage medium for storing the configuration data

## 4.1.2 SELECT/SET button

The display mode of the LEDs can be changed using the SELECT/SET button. The device can also be reset to the factory settings by means of this switch.



There are four different display modes. These can be alternated during operation by briefly pressing the SELECT/SET button and are indicated by the DM1 and DM2 LEDs.

	DM1	DM2
Display mode A	Off	Off
Display mode B	On	Off
Display mode C	Off	On
Display mode D	On	On

To reset the unit to the factory settings, simply press and hold the SELECT/SET button for 12 seconds. After 9 seconds, the DM1 and DM2 LEDs should start to flash and the port LEDs should switch on one after the other. After 12 seconds, the device automatically restarts with the factory settings.

## 4.1.3 LED indicator lights

The SCALANCE XC208 is equipped with various LEDs that provide an overview of the system status.



FA	LED to display the error status		
RM	LED to display the "redundancy manager" function		
SB	ED to display the "standby" function		
DM1/DM2	LEDs to display the display mode		
L1/L2	LEDs to display the power supply		
Р	LEDs to display the port status		

An exact description of the status of each LED can be found in the device manual.

#### 4.1.4 Port LEDs

The port LEDs provide information about the status of the individual ports and are therefore a good troubleshooting aid. The status of the individual LEDs depends on the selected display mode. The table below provides a short overview.

A complete description of all statuses can be found in the manual.

## 4.1.4.1 Display mode A

In display mode A, you can see from the port LEDs whether a valid link is available.

LED color	LED status	Meaning		
-	Off	No valid link at the port (e.g. the communication partner is switched off or the cable is not connected).		
Green	On	Link is available and port in normal state. In this state, the port can receive and transmit data.		
	Flashes 1x per period	Link is available and port in "Blocking" state. In this state, the port sends and receives only management data (no user data).		
	Flashes 3x per period	Link is available and port is switched off by management. In this state, no data is sent or received via the port.		
	Flashes 4x per period	Link is available and in "Monitor Port" state. In this state, the data traffic of another port is mirrored to this port.		
Yellow	Flashes / lights up	Data reception at port		

## 4.2 PROFINET

PROFINET or Process Field Network is an open standard for networking industrial production devices via Ethernet. PROFINET is developed by the PROFIBUS Nutzerorganisation e.V. (PNO) and uses existing protocols in addition to independently developed protocols.

Two of these protocols are mentioned and configured in the course of this chapter. One is the "Discovery and Configuration Protocol" (DCP) and the other is the Link Layer Discovery Protocol (LLDP).

#### 4.2.1 DCP: Discovery and Configuration Protocol

DCP is a PROFINET-specific protocol and mandatory for PROFINET communications. The protocol works on layer 2 of the OSI layer model and is therefore restricted to the broadcast-domain<sup>1</sup>.

DCP is used, for example, to identify the MAC address of certain PROFINET nodes and to transmit a basic configuration to them. These include, for example, the device name and the IP address of the PROFINET node.

The "Accessible devices" function of the TIA portal, for example, uses the DCP protocol to receive this information from all PROFINET nodes connected to the bus.

<sup>1</sup> In Ethernet, a broadcast domain is the area in which a broadcast packet can propagate. A simple network of computers and switches corresponds to a single broadcast domain. This single domain can be further subdivided by the use of routers or VLANs.

## 4.3 LLDP: Link Layer Discovery Protocol

The Link Layer Discovery Protocol is an existing manufacturer-independent network protocol. PROFINET uses an extended version of the protocol that is, however, compatible with the standard.

LLDP, like DCP, is an OSI layer 2 protocol and is subject to the same limitations. LLDP offers the possibility to exchange information between adjacent devices. For data exchange, data units (LLDP DUs) are exchanged between the stations.

These LLDP DUs include TLVs (Type-Length-Value), i.e. the data type of the data contained, the length of this data and its actual content. Typical contents of these data units are, for example, the station name, the port name via which the LLDP-DU was sent and other information.

Each station stores the exchanged data. You then have the option to retrieve it again, for example, to determine the topology of the network.

## 4.4 High-availability networks

The SCALANCE XC208 supports various protocols to increase the availability of the Ethernet network. These include classic network protocols such as Spanning Tree (STP), but also special protocols such as the Media Redundancy Protocol (MRP).

By default, the classic protocols on the XC208 are switched off because their recovery times are too long. Recovery time, sometimes also referred to as convergence time, is the time required by a network protocol to determine the topology and establish an error-free state. In the case of STP, this time is up to 50 seconds, i.e. in the worst case the entire network cannot transmit data for 50 seconds.

There are more specific ring protocols that have a very low convergence time in the range of several 100 milliseconds.

#### 4.4.1 The MRP ring protocol

The Media Redundancy Protocol can be used in conjunction with the SIMATIC controllers. The protocol requires a ring topology and is limited to one ring in the case of the SCALANCE XC208. Therefore, the switch cannot be used in multiple (MRP) rings at the same time.



Within the ring or MRP domain, one node must be defined as a ring manager (RM). This can also be selected automatically among the nodes, in which case ring manager now becomes the device with the lowest MAC address. In general, this decision should not be left to the devices, as the selected ring manager may be in an unfavorable position or is unsuitable for other reasons (e.g. CPU power).

In addition, the ring ports must be defined at each node. A node has two ports in a ring. On the XC208, these are by default the two ports P1 and P2. However, these can also be changed.

The ring manager now regularly checks whether the ring is closed using special test packets. As long as it gets its test packets back on its redundant port, data packets at this port are blocked.



As soon as the ring manager no longer receives its test packets, it activates the normal data traffic on the redundant port as well in order to complete the ring again. Depending on the configuration, this happens within 200 to 500 ms.



If the ring is closed again, the ring manager receives its test packets again and interrupts the data traffic at one of its ring ports.

Additional details and information can be found in the manuals, which can be downloaded from <u>support.automation.siemens.com</u>.

## 5 Task

In this section, the hardware and the program from chapter "SCE\_EN\_032-600\_Global\_Data\_Blocks" shall be extended by the SCALANCE XC208.

The entire topology of the PROFINET bus can be checked using the SCALANCE XC208. Changes and errors in the topology are reported directly to the assigned controller and can now be read via the diagnostics buffer.

The configuration of the switch can continue to be managed completely via the TIA Portal. The selected settings are transferred from the IO controller directly to the XC208.

## 6 Planning

The existing project is first extended by the XC208. The physical networking of the components should look as follows.



Then the CPU 1516F-3 PN/DP is configured as the IO controller for the XC208, and the PROFINET device name is assigned.

After the project has been expanded, it must be saved, compiled and downloaded to the CPU 1516F-3 PN/DP. Through the assignment of the CPU as IO controller for the XC208, a part of the configuration of the XC208 is taken over by the CPU. In addition, error messages of the XC208 are then available in the diagnostics buffer of the CPU.

The network topology is determined and applied last, and the ports are configured.

After reloading the devices, the result is archived in order to backup the working version.

## 7 Structured step-by-step instructions

You can find instructions on how to carry out planning below. If you already have the necessary prior knowledge, the numbered steps are sufficient for the processing. Otherwise, follow the steps illustrated below.

## 7.1 Retrieving an existing project

- → Before you can expand the "SCE\_EN\_032-600\_Globale\_Data\_Blocks\_R1704.zap14" project from chapter "SCE\_EN\_032-600\_Global\_Data\_Blocks", you must retrieve this project from the archive.
- → To do this, you must select the respective archive from the project view under → Project → Retrieve. Confirm your selection with "Open". (→ Project → Retrieve → Select a .zap archive ... → Open)



 $\rightarrow$  As the next step, select the target directory where the retrieved project is to be stored. Confirm your selection with "OK". ( $\rightarrow$  Destination directory ...  $\rightarrow$  Select folder)  $\rightarrow$  Since this is a TIA V14 project, the project must be upgraded before opening it. ( $\rightarrow$  Upgrade)

Open project		×			
TIA Portal V14 Open project					
The project has a TIA Portal project version V14.					
To use this project with TIA Portal V15.1, it is upgraded to TIA Portal pro	oject version V15.1.				
The original project remains unchanged and the upgraded project is C:\00_TIA_Portal\032-600_Global_Data_Blocks_V14_V15.1.	saved under				
Project:					
C:\00_TIA_Portal\032-600_Global_Data_Blocks_V14\032-600_Global_D	Data_Blocks_V14.ap14	•			
Product	Version used	Upgrade is possible			
STEP 7 Professional	V14 SP1	🥑 Installed			
Totally Integrated Automation Portal	V14	< Installed			
Upgrade		Open Cancel			

→ Save the upgraded and opened project under the name 140-100\_Industrial\_Ethernet\_ with\_XC208. (→ Project → Save as ... → 142-00\_Industrial\_Ethernet\_with\_XC208 → Save)

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Open project from Teamcenter		Match case
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C:\\032-600_Global_Data_Blocks_V14_V1		Use regular expressions
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	No 'properties' can be shown at the moment. There is either no object selected or the selected object does not have any displayable properties.	From current position
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		Editing language:
✓ Portal view  Overview		
Portal view     Overview	🔜 🗹 Project 032-60	0_Global_Data_Blocks_V 🎾

## 7.2 Setting the IP address

$\rightarrow$	→ Open the search for "Accessible devices". ( $\rightarrow$							
$\rightarrow$	→ Select your PN/IE interface and start the search. ( $\rightarrow$ <u>Start search</u> )							
$\rightarrow$	Select the SCA	LANCE XC-200 a	nd click "Show	v". (→ Sł	וס <u>ש</u> סו			
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		Accessible nodes of the se	lected interface:					
		Device	Device type	Interface type	Address	MAC address		
		cpu1516f.profinet interf		PN/IE	192.168.0.1	00-1B-1B-71-5D-26		
		Accessible device	SCALANCE XC-200	ISO	20-87-56-80-2B	20-87-56-80-2B-AE		
	Flash LED							
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4	Found accessible dev	vice Accessible device				^		
6	] Scan completed. 2 de	evices found.						
	🖉 Scan and information	retrieval completed.						
<u>-</u>	? Retrieving device info	rmation				~		
	Show							

 $\rightarrow$  Under "Online access", open the "Online & diagnostics" item of the displayed device.

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✓ Details view					
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 $\rightarrow$  Set the IP address to 192.168.0.250/24. ( $\rightarrow$  Functions  $\rightarrow$  Assign IP address  $\rightarrow$  IP address:

192.168.0.250  $\rightarrow$  Subnet mask: 255.255.255.0  $\rightarrow$  Assign IP address

/1000 MT Desktop Adapter 🕨	Accessible device [20-87-56-80-2B-AE] → Accessible device [20-87-56-80-2B-AE] 📃 📕 🗮 🗙					
✓ Diagnostics General	Assign IP address					
<ul> <li>Functions</li> <li>Assign IP address</li> <li>Assign PROFINET device name</li> <li>Reset to factory settings</li> </ul>	Assign IP address to the device Devices connected to an enterprise network or directly to the internet must be appropriately protected against unauthorized access, e.g. by use of firewalls and network segmentation. For more information about industrial security, please visit <a href="http://www.siemens.com/industrialsecurity">http://www.siemens.com/industrialsecurity</a>					
	MAC address:       20 - 87 - 56 - 80 - 28 - AE       Accessible devices         IP address:       192 . 168 . 0					

## 7.3 Inserting the SCALANCE XC208

 $\rightarrow$  Open the "Devices & networks" item in the Project view.

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→ In menu "Online" → "Hardware detection", open the "PROFINET devices from network ..." item (Online → Hardware detection → PROFINET devices from network ...)

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Devices	Simulation	•	🚽 Topology view	hetwork view	Device view	Options	
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Add new device	Download and reset PLC program				CPU1516F	Filter <all></all>	518
Devices & network		Card				Controllers	비 悥
CPU1516F [CPU 15]						HMI	- [-
Ungrouped devices	Load snapshots as actual values					PC systems	
Security settings	Load start values as actual values					Drives & starters	8
Common data	Upload from device (software)					Network components	Online tools
Documentation se	Unload device as new station (bardy	ware and software)		•		Detecting & Monitoring	ine
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Card Reader/USB men	Hardware detection	•	CPU from network			Power supply and distribu	- S
Card Reader/USB men	HMI Device maintenance	•	PROFINET devices from network			Field devices	
	Accessible devices	Ctrl+U	-			Other field devices	- 🕞
			_				Tasks 1
	Start CPU	Ctrl+Shift+E					sks
	Stop CPU	Ctrl+Shift+Q		×			
	😨 Online & diagnostics	Ctrl+D	> 100% 💌		< III >		
	Receive alarms		Q Properties	🗓 Info 🛛 🖸 Diag	nostics 🛛 🖛 🤜 🤜		E
	General C	ross-references	Compile				Libraries
<							ries
		all messages	•				

→ Select the appropriate interface and start the search for devices. (→ PG/PC interface ... → Start search)

Hardware detection of		the PG/PC interface :	PN/IE		×
	type of	the ron clitteriace.	T_ FINIE		
		PG/PC interface:	Intel(R) PRO/1	000 MT Desktop Adapter	- 💎 💁
	Accessible nodes of the selec				Start search
	PROFINET device name	Device series	IP address	MAC address	
	20-87-56-80-2B-AE	SCALANCE XC-200	192.168.0.250	20-87-56-80-2B-AE	
1 m.					

→ Select the SCALANCE XC-200 and add the device. (→  $\blacksquare$  SCALANCE XC-200 → Add devices)

Hardware detection of PR	OFINET devices				×
	Type of t	the PG/PC interface : PG/PC interface :	PN/IE	▼ ▼ € Q	
Ac	cessible nodes of the select	ted interface:			Start search
	PROFINET device name	Device series	IP address	MAC address	
	20-87-56-80-2B-AE	SCALANCE XC-200	192.168.0.250	20-87-56-80-2B-AE	
<b>I</b> .					
Information: There is no che it is already in the project.	ck if a device is already in th	e project. Every time	a device is selected	d for detection, it is added t	o project even if
				Add devices	Cancel

 $\rightarrow~$  Confirm the successful addition of the module (  $\rightarrow$  OK)



 $\rightarrow$  The SCALANCE XC208 should then be present in the device overview.



## 7.4 Configuration of the SCALANCE XC208 via the web interface

→ Open Management in the properties of the XC208, and open Web Based Management from there. (→ Switch\_1 → Properties → Management → Web Based Management)

Switch_1 [Module]	
General IO tags	System constants Texts
General     PROFINET interface [X1]	Management
Management Module parameters System	IP address: 192 . 168 . 0 . 250
<ul> <li>Layer 2</li> <li>Layer 3</li> </ul>	• Web Based Management
Security	Web Based Management
	▼
	OK Cancel

 $\rightarrow$  You can set the language to English in the newly opened browser window. ( $\rightarrow$  English  $\rightarrow$  Go)

SCALANCE XC208 WEB Manager × +		_			×
← → C (1) Not secure   192.168.0.250		☆	<sup>6</sup> 0	•	:
SIEMENS		Eng	glish ▼ g <mark>lish</mark> utsch	Go	*
Name Password Listin			?	-	
	LOGIN Name: Password: Login				
For inform	Switch to secure HTTP ation about browser compatibility please refer to the manual				
					•

→ Now you can log in with the user "admin" and the password "admin". ( $\rightarrow$  Name: admin  $\rightarrow$  Password: admin  $\rightarrow$  Login)

SCALANCE XC208 WEB Managen × +	– 🗆 ×
← → C ▲ Not secure   192.168.0.250	🕶 🏠 🔤 🔒 🗄
SIEMENS	English 🔻 Go
Name Password Looin	? 🗄
Name Passu <u>Switc</u>	admin Inord: Inclusion Login to secure HTTP out browser compatibility please refer to the manual

#### Note:

- The standard web connection is unencrypted. If you are not in an isolated network, please switch here to the secure HTTPS connection (switch to secure HTTP connection).
- $\rightarrow$  The default access must be changed before the first login. ( $\rightarrow$  OK)



- $\rightarrow$  First enter the old password "admin" and then a new password twice.
  - $\rightarrow$  Current user password: admin
  - $\rightarrow$  New password: \*\*\*
  - $\rightarrow$  Confirm password: \*\*\*
  - $\rightarrow$  Apply settings

Name <b>Password</b>	Account Passwords		
	Current User: Current User Password:		
	User Account: Password Policy: New Admin Account Name: New Password: Password Confirmation:	high admin	
	Set Values Refresh		

#### Note:

- The new password must have at least 8 characters, 1 number, 1 uppercase character and a special character!
- After successful login, switch to the item "Configuration" in the "System" menu.  $(\rightarrow System \rightarrow Configuration)$

SIEMENS	192.168.0.250/SCALANCE XC208	English ▼ <u>Go</u> 01/01/2000 00:35:29%
Welcome admin	System Configuration	
Logout		<b>□?</b> = ★
► Information	Teinet Server	
<b>-</b> System	SSH Server	
Configuration ►	HTTPS Server only	
▶General	SMTP Client	
► Agent IP	Syslog Client	
▶Restart	DCP Server: Read/Write	
▶Load&Save	Time: Manual	
Events	SNMP: SNMPv1/v2c/v3 •	
▶SMTP Client	SNMPv1/v2 Read-Only	
▶ DHCP	SNMPv1 Traps	
▶SNMP	SINEMA Configuration Interface	
System Time	Configuration Mode: Automatic Save	
► Auto Logout	Write Startup Config	
▶ Button	Set Values Refresh	
►Syslog Client		
▶Ports		

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sce-142-100-industrial-ethernet-xc208-en-r1906.docx

- $\rightarrow$  Deselect the Telnet server. ( $\rightarrow$   $\square$  Telnet Server)
- $\rightarrow$  Select the SSH server. ( $\rightarrow$  SSH Server)
- → Restrict Web access to HTTPS connections.

 $(\rightarrow \blacksquare \text{ HTTPS Server only} \rightarrow \text{OK})$ 

- $\rightarrow$  Select write protection for SNMP v1 and v2c.
  - $(\rightarrow \blacksquare SNMPv1/v2c Read-Only)$
- $\rightarrow$  Click on Set Values ( $\rightarrow$  Set Values)



#### Note:

- Telnet, as well as SNMP and HTTP are unencrypted connections and should not be used. It is possible to secure HTTP using SSL/TLS (HTTPS). For Telnet, SSH is a secure alternative. For SNMP, encryption version 3 must be used.
- However, since the TIA portal uses SNMP for the direct online connection to the XC208, it cannot be completely deactivated. Therefore, write access is prevented for the insecure versions here.

→ You will then be redirected to the encrypted connection and must issue an exception for the unknown certificate.

5	Priva	cy error			×	+		-	×
÷	$\rightarrow$	$\times$	▲	Not secure	http	₩;//192.168.0.250	☆	6 g	:
						Id not prove that it is <b>192.168.0.250</b> ; its security certificate is not trusted by your computer's em. This may be caused by a misconfiguration or an attacker intercepting your connection.			
				Proceed t	<u>o 192.1</u>	(68.0.250 ( <u>unsafe</u> )			
				Hide	advano	Back to safety			

#### Note:

- Depending on the browser, the confirmation of the certificate looks different.



## 7.5 Configuration of the SCALANCE XC208 using TIA

In addition to the configuration via the web interface, the XC208 can also be configured with the TIA Portal. TIA does not automatically recognize configuration changes made on the web interface, these must be manually updated in the TIA Portal.

Downloading the configuration using the TIA Portal entails a restart of the device. In addition, after assignment of an IO controller, the device can no longer be downloaded without this assignment being canceled beforehand. However, the IO controller is able to transmit a portion of the configuration made in the TIA Portal to the XC208.

 $\rightarrow$  Open the properties of the XC208 in the TIA Portal. ( $\rightarrow$  Switch\_1  $\rightarrow$  Properties)

Switch_1 [Module]		🔍 Properties 🚺 Info 🛛 Diagnostics
General IO tags	System constants Texts	
<ul> <li>▶ General</li> <li>▼ PROFINET interface [X1]</li> </ul>	Ethernet addresses	
General Ethernet addresses Operating mode	Interface networked with	: Not networked
Advanced options     Management	Subnet:	Add new subnet
Module parameters System Layer 2	IP protocol	Set IP address in the project
<ul><li>Layer 3</li><li>Security</li></ul>		IP address: 192 . 168 . 0 . 250
		Use router
		Router address: 0 . 0 . 0 . 0
		Client ID:

 $\rightarrow$  Go to the system configuration. ( $\rightarrow$  System  $\rightarrow$  Configuration)

Switch_1 [M	odule]					Rise Properties	🗓 Info	<b>Diagnostics</b>
General	IO tags	System	constants	Texts				
Operating	mode	^						
Advanced	options	0	nfiguration _					
Managemen	t							
Module para	meters					🛃 Telnet Server		
▼ System						SSH Server		
Configurat	tion					HTTPS Server only		
General						_ `		
Load&Sav	e					SMTP Client		
Events						Syslog Client		
SMTP Clier	nt			DCP Serve		Read/Write		-
DHCP								
► SNMP		-		Tim	ie:	Manual		•
System Tir	me			SNN	/IP:	SNMPv1/v2c/v3		-
Auto Logo	ut					SNMPv1/v2 Read-Or	nly	
Button						SNMPv1 Traps	-	
Syslog Clie	ent							
Ports						NFC (Near Field Cor	mmunication)	
Fault Mon	itoring		Co	nfiguration Mod	le:	Automatic Save		•
PROFINET								
Tala - shi - ali	n	~						

- $\rightarrow$  Deselect the Telnet server. ( $\rightarrow$   $\square$  Telnet Server)
- Select the SSH server. ( $\rightarrow \blacksquare$  SSH Server)  $\rightarrow$
- → Restrict Web access to HTTPS connections.
  - $(\rightarrow \blacksquare \text{ HTTPS Server only} \rightarrow \text{OK})$
- $\rightarrow$  Select write protection for SNMP v1 and v2c.
  - $(\rightarrow \blacksquare SNMPv1/v2c Read-Only)$

Switch_1 [Mo	odule]					Q Properties	L Info	<b>B</b> Diagnostics
General	IO tags	Syste	em constants	Texts				
Operating	mode	~	Configuration					
Advanced	options		Configuration _					
Management	t							
Module para	meters					] Telnet Server		
▼ System						SSH Server		
Configurat	tion					HTTPS Server only		
General								
Load&Sav	e					SMIP Client		
Events		•				Syslog Client		
SMTP Clier	nt			DCP Server:		ead/Write		-
▶ DHCP		•	Time:			Manual		
► SNMP								-
System Tir				SN	MP: S	NMPv1/v2c/v3		•
Auto Logo	ut					SNMPv1/v2 Read-Or	ıly	
	Button		SNMPv1 Traps					
	yslog Client			NFC (Near Field Communication)				
Ports		_					innunication)	
Fault Moni	itoring		Cor	nfiguration Mo	de: A	utomatic Save		•
PROFINET		~						
EtherNet/I	P	~						

 $\rightarrow$  Select the XC208 in the navigation, compile the configuration and select Download to device.

$(\rightarrow Switch_{}$	_1 →	<u> </u>	→ 些)	

Project tree 🛛	142-100_Indus	oad to device th_XC208 🔸	Devices & networks		_ # =×	Hardware catalog	<b>P</b> (1) (
Devices			불 Topology view	hetwork view	Device view	Options	
11 II I	Network	ections HMI connection	- 🕎 📲 🛄	🔍 ± 📑 📔	Network overvie 4 🕨		
- Character and the state of th				^	1 Device	✓ Catalog	
<ul> <li>142-100_Industrial_Ethernet_with_X.</li> <li>Add new device</li> </ul>				=	<ul> <li>\$71500/ET200</li> </ul>	<search></search>	init ini
Devices & networks	CPU1516F	Switch_1	II D		<ul> <li>CPU1516F</li> </ul>	Filter <all></all>	- 📦
CPU1516F [CPU 1516F-3 PN/DP]	CPU 1516F-3 PN	SCALANCE XC208	8 B		<ul> <li>SCALANCE XC</li> </ul>	Controllers	
Switch 1 [SCALANCE XC208]			åD		Switch_1	н 📄 нм	
Ungrouped devices			R R			PC systems	
Security settings		Not assigned	DD			Drives & starters	
Unassigned devices	PN/IE_1					Network components	s
Common data	PN/IC_1					Detecting & Monitoria	ng
Documentation settings						Distributed I/O	
Languages & resources				•		Power supply and dis	tribu
Online access						Field devices	
Card Reader/USB memory						Other field devices	

 $\rightarrow$  Accept the certificate of the XC208 in the preview for loading. ( $\rightarrow$  Accept certificate of the partner)

-										
<b>S</b>	🔻 Go o	nline	Online connecti	Online connection failed.						
0			issued by a trus	he security certificate presented by "SCALANCE X-Station" was not sued by a trusted certificate authority (CA). Do you still want to continue nd accept the partner's certificate? (not recommended).					ate of the par	tner
$\rightarrow$	Enter	the	HTTPS	user	you	just	set.			
	$(\rightarrow HTT)$	PS user:	admin $\rightarrow$ H <sup>-</sup>	TTPS pas	sword: .	)				
0	<ul> <li>Passv</li> </ul>	vord	Password requir	ed.						
0			Preset factory pa	ssword not a	cepted.					
			and the summer	eset factory password not accepted. Iter the HTTPS user:						
0			Enter the HTIPS	user:				admin		

 $\rightarrow$  Accept any further preconditions and click "Load". ( $\rightarrow$ 

atus	1	Target	Message	Action
ŧ[	0	<ul> <li>Switch_1</li> </ul>	Ready for loading.	Load 'Switch_1'
	0	<ul> <li>Go online</li> </ul>	Online connection failed.	
	0		The security certificate presented by "SCALANCE X-Station" was not issued by a trusted certificate authority (CA). Do you still want to continue and accept the partner's certificate? (not recommended).	Accept certificate of the partner
	9	Different modules	Differences between configured and target modules (online)	Accept all
	0	<ul> <li>Password</li> </ul>	Password required.	
	0		Preset factory password not accepted.	
	0		Enter the HTTPS user:	admin
	0		Enter the HTTPS password:	****
			III	
I				Refresh

#### Note:

- The device is restarted when downloading using the TIA Portal.
- $\rightarrow$  Save the configuration by finishing the loading process. ( $\rightarrow$  Action: Save configuration  $\rightarrow$ Finish

Status	1	Target	Message	Action	
tî	<u> </u>	<ul> <li>Switch_1</li> </ul>	Downloading to device completed without error.	Load 'Switch_1'	
	▲		Please select an action:	Save configuration	
<					
<			III		

## 7.6 Disabling unused ports

For security reasons, unused ports should be disabled. Active ports could be used to introduce an external system into the plant. If all unused ports are disabled, the external system can only be connected via an already used port.

- $\rightarrow$  Re-open the properties of the XC208 ( $\rightarrow$  Switch\_1  $\rightarrow$  Properties)
- $\rightarrow$  Go to the port configuration. ( $\rightarrow$  System  $\rightarrow$  Ports  $\rightarrow$  Configuration)

Switch_1 [Module]			<b>Properties</b>	🛄 Info	<b>Diagnostics</b>
General IO tags	System constants Tex	ts			
<ul> <li>System</li> <li>Configuration</li> </ul>	Configuration				
<ul> <li>General</li> <li>Load&amp;Save</li> </ul>		Port:	P0.1		
Events     SMTP Client		Status:	enabled		•
DHCP		Port name: Mode Type:	Auto negotiation		
<ul> <li>SNMP</li> <li>System Time</li> </ul>		egotiation:	enabled		
Auto Logout Button			Flow Ctrl. Type		
Syslog Client		Flow Ctrl.:	disabled		
<ul> <li>Ports</li> <li>Overview</li> </ul>		Port Type:	Switch-Port VLAN Hybri	d	<b></b>
Configuration Fault Monitoring	~				

 $\rightarrow$  Disable port 4 ( $\rightarrow$  Port: P0.4  $\rightarrow$  Status: disabled)

General     IO tags     System constants     Texts <ul> <li>System</li> <li>Configuration</li> <li>General</li> <li>Load&amp;Save</li> <li>Port:</li> <li>P0.4</li> <li>Pole</li> </ul> <li>Pole</li>	🗓 Info 🛛 Diagnostics	🔍 Properties		odule]	Switch_1 [Modu
Configuration			tem constants	IO tags Sys	General
Load&Save     Port: P0.4			<ul> <li>Configuration</li> </ul>	tion	Configuration General
Events     Status: disabled				_	Events
SMTP Client  DHCP  Port name:				nt	
SNMP     Mode Type:     Auto negotiation       System Time     Negotiation:     enabled	▼				System Time
Auto Logout Flow Ctrl. Type			-		Button
Yorts     Port Type: Switch-Port VLAN Hybrid     ✓	d				<ul> <li>Ports</li> </ul>
Configuration Fault Monitoring				uration	Configurati

 $\rightarrow$  Repeat the step for ports 5 through 7.

## 7.7 Assignment to the CPU 1516F

 $\rightarrow$  Assign the SCALANCE XC208 to the CPU 1516F ( $\rightarrow$  Not assigned  $\rightarrow$  CPU\_1516F.PROFINET interface\_1)

	🛃 Topology view 🚽 🛗 Network view	Device view
Network 💾 Connections	HMI connection 🔽 🗮 🖽 🛄 🔍 🛨	
CPU1516F CPU 1516F-3 PN	Switch_1 SCALANCE XC208	Network data
<	> 100%	····· •

→ Assign the PROFINET device name to the SCALANCE XC208 (→ right-click on XC208 → Assign device name)

CPU1516F CPU 1516F-3 PN	Switch_1 SCALANCE XC208	Device configuration Change device	
	CPU1516F	Change device	
CPU	1516F.PROFINET IO-S		
		X Delete Del Rename F2	
		Go to topology view	
		Compile	
		ø Go online Ctrl+K	
		Go offline Ctrl+M	
		Assign device name Receive alarms	
		Update and display forced operands	
		Show catalog Ctrl+Shift+C	
		Reperties Alt+Enter	

→ Select the suitable interfaces in the new dialog and click "Update list" (→ Type of the PG/PC interface → PG/PC interface → Update list)

		Configured PRO	FINET de	vice		
		PROFINET device	e name:	switch_1		▼
		Devi	ice type:	SCALANCE XC208		
		Online access				
		Type of the PG/PC in	nterface:	PN/IE		-
		PG/PC ir	nterface:	MIntel(R) PRO/1000 MT D	esktop Adapter	- 🕈 🖸
لي ا		Device filter				
₩ 		🖌 Only show (	devices of	the same type		
		Only show	devices wi	th bad parameter settings		
				th bad parameter settings		
		Only show		· · · · · · · · · · · · · · · · · · ·		
		Only show ovices in the network:	devices wi	thout names	Centur	
	Accessible der IP address	Only show		· · · · · · · · · · · · · · · · · · ·	Status	
		Only show ovices in the network:	devices wi	thout names	Status	
		Only show ovices in the network:	devices wi	thout names	Status	
<b>III</b>		Only show ovices in the network:	devices wi	thout names	Status	
Flash LED		Only show ovices in the network:	devices wi	thout names	Status	
Flash LED		Only show ovices in the network:	devices wi	thout names	Status	

→ Select the SCALANCE XC208 and assign the device name to it. (→ SCALANCE XC200 → Assign name)

	IP address	MAC address	Device	PROFINET device name		Status	
	0.0.0.0	20-87-56-80-2B-AE	SCALANC			No device name assigned	
Flash LED							
	<			1111			
				U	Ipda	ite list Assign name	
Online status inform							
	nation: pleted. 1 of 2 devices v	vere found.					
		vere found.					
		vere found.					
		vere found.	III				>
Search comp		vere found.	1111				>
Search comp		vere found.					>

→ The successful assignment of the device name is signaled with a corresponding message. Afterwards, close the window. ( $\rightarrow$  Status: OK  $\rightarrow$  Close)

Assign PROFINET device	name.						×
		Configured PRO	FINET dev	ice			
		PROFINET devic	e name:	switch_1			-
			vice type:	SCALANCE XC208			
		Online access					
		Type of the PG/PC i	interface:	PN/IE			•
		PG/PC i	interface:	Intel(R) PRO/10	00 MT Desktoj	p Adapter	• •
		Device filter					
		🛃 Only show	devices of th	ie same type			
		Only show	devices with	bad parameter se	ettings		
		Only show	devices with	out names			
	Accessible dev	rices in the network:					
	IP address	MAC address	Device	PROFINET device	name Sta	atus	
	0.0.0.0	20-87-56-80-2B-AE	SCALANC	switch_1	🥑 OI	к	
Flash LED							
	<				Update	list	Assign name
				L	opuate	list	Assignmente
Online status information							
<ul> <li>Search completed</li> </ul>	-	ere found.					
The PROFINET devic	ce name "switch	1" was successfully as:	signed to MA	C address "20-87-5	56-80-2B-AE".		
<							>
							Close

#### Compiling and loading the CPU 1516F-3 PN/DP 7.8

- $\rightarrow$  Select the CPU 1516F-3 PN/DP in the device overview and compile the configuration. ( $\rightarrow$ CPU\_1516F  $\rightarrow$  )
- $\rightarrow$  Then, download the compiled configuration to the device. ( $\rightarrow$  CPU\_1516F  $\rightarrow$   $\blacksquare$ )

K Siemens - C:\00_TIA_Portal\142-100_Indus	trial_Ethernet_with_XC208\142-100_Industrial_Ethernet_with_XC208	_ ¤ ×
Project Edit View Insert Online Options	Tools Window Help	tally Integrated Automation
📑 🞦 🔚 Save project 昌 🐰 💷 🗂 🗙 🕨	🕽 🛨 (省 🗄 🔃 🌆 🔛 📓 🌽 🕼 oo online 🦨 Go offline 🍶 🌆 👫 📑 🚺 🗠 earch in project> 🛛 🏭	PORTAL
Project tree 🔲 🖣	Download to device         142-100_Industrial_Enternet_with_XC208 → Devices & networks	Hardware catalog 🛛 🗊 🕨 🕨
Devices	🛃 Topology view 🛛 🛔 Network view 🛛 🙀 Device view	Options 🖭
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	💦 Network 🔢 Connections HMI connection 💌 📅 🖏 🔛 🔟 🍳 🛨 🔤	Coptions Catalog Catalog Catalog Catalog Filter (All> ) Catalog
oork		✓ Catalog
142-100_Industrial_Ethernet_with_X      Add new device		<search> iii iii g</search>
Devices & networks		Filter <all></all>
CPU1516F [CPU 1516F-3 PN/DP]	CPU 1516F-3 PN SCALANCE XC208	
Switch_1 [SCALANCE XC208]		HM     DC systems
Security settings	CPU1516F D D	PC systems     PC systems     Point Statement     Point State
Common data	РИЛЕ 1	Image: Instant American Instant Americant American Instant American Instant American Instant American I
Documentation settings		Detecting & Monitoring
Languages & resources		Distributed I/O
Online access		• Im rower supply and distribu
Card Reader/USB memory		Field devices     Gradient field devices
		Other field devices
		Other field devices
	★ III > 100% ▼	
	🔍 Properties 🔛 Diagnostics 💷 🗖 🚽	5
	General Cross-references Compile	Libraries
Details view		es l
◆ Details view	Show all messages	
	I Message Go to ? Date	
	SPEED_MOTOR' was loaded successfully. 6/28/20 ^	
Name	MAGAZINE_PLASTIC' was loaded successfully. 6/28/20	
	MOTOR_AUTO' was loaded successfully. 6/28/20	
	'MOTOR_SPEEDCONTROL' was loaded successfully.	<
	MOTOR SPEEDMONITORING' was loaded successfully. 6/28/20	> Information
Portal view 🔠 Overview	📩 Devices & ne 🔝 < Loading complete	ed (errors: 0; warning 🎾
## 7.9 Establishing an online connection to the CPU 1516F-3 PN/DP

 $\rightarrow$  After successful downloading the configuration, establish an online connection to the CPU.

K Siemens - C:\00_TIA_Portal\142-100_Indust	rial_Ethernet_with_XC208\142-100_Industrial_Ethernet_with_XC208		_ 🗆 ×
Project Edit View Insert Online Options		Тс	otally Integrated Automation
📑 🎦 🗔 Save project 昌 🐰 🗎 🛅 🗙 🕷	) 🛨 🍽 🗓 🗓 🔛 🔛 🖉 🧭 Go online 🖉 Go offline  🏭 🕞 👫 📇 🛄 🏼 < Cearch in project	ct> 🖬	PORTAL
Project tree 🔲 🖣	142-100_Industrial_Ethernet_with_XC208 > Devices & networks	_ <b>₽</b> ■ ×	Hardware catalog 🛛 🗊 🕨 🕨
Devices	🚰 Topology view 🛛 🛔 Network view	Device view	Options 📃
🖬 🖬 🖬	💦 Network 🔡 Connections 🛛 HMI connection 🔍 📅 📆 🛄 🔍 🛓	<b>_</b>	Options Catalog     Catalog     Gearch→     filter ≪lb→     filter ≪lb→     filter ≪lb→     filter ≪lb→     filter ≪lb→     filter ≤lb→     filter ≤lb
orks		<u>∧</u>	✓ Catalog
💈 💌 📋 142-100_Industrial_Ethernet_wit 🗹 🔵			⊲earch> init init o
Add new device	CPU1516F Switch_1		Filter <all></all>
8 → 1 CPU1516F [CPU 1516F-3 PN/ 🗹 🔵	CPU 1516F-3 PN SCALANCE XC208		
🗧 🕨 🧊 Switch_1 [SCALANCE XC208]	ă B		▶ 🔄 HMI
Ungrouped devices	CPU1516F	- Ze	PC systems     Drives & starters     Drives & starters     Drives & starters     Detecting & Monitoring     Detecting & Monitoring     Distributed I/O     Power supply and distribute
Security settings			Drives & starters     Metwork components
Common data	PN/IE_1		Detecting & Monitoring
Courrentation settings     Courrentation settings		- ឆ័	Distributed I/O
Canguages & resources			Power supply and distribu
Card Reader/USB memory			<ul> <li>Des right deuters</li> </ul>
Card Readenoss memory			Other field devices
			Ta
			Other field devices     Task
		~	
	K III 100%	<del></del>	<b>P</b>
	🖳 Properties 🚺 Info 🖳 Diagnos	stics 📑 🗖 🗖 🤝 🤝	3 Libraries
<	General Cross-references Compile		Ties
✓ Details view	Show all messages		
	1 Message Go to 1	? Date	
Name	🤡 'Main' was loaded successfully.	6/28/20 🔨	
	<ul> <li>Loading completed (errors: 0; warnings: 0).</li> </ul>	6/28/20	
	The project 142-100_Industrial_Ethernet_with_XC208 was saved successfully.	6/28/20	
	Connected to CPU1516F, via address IP=192.168.0.1.	6/28/20 👻	<
	۲	>	> Information
Portal view     Overview	📩 Devices & ne	Connected to CPU	J1516F, via address IP 🗰 🎾

#### Note:

– Neither device should signal an error and both should have a . A dedicated online connection to the XC208 is not necessary, because the CPU in its role as IO controller knows the status of the device.

## 7.10 Configuration of the topology

 $(\rightarrow CPU_{1516F} \rightarrow \bigcirc Go \text{ online})$ 

→ Switch to the "Topology view" tab under "Devices & networks".



 → On the right side, open the gray "Topological data" bar and go to the "Topology comparison" tab (→ Topological data → Topology comparison)

	📲 Topology view	🔒 Network view	Device view	v
🕎 🖶 📰 🛄 🔍 Ŧ			<b>=</b>	
			^	
	<b>/</b>			
	Switch 1			
CPU 1516F-3 PN	CPU1516F			Topological data
< III	> 100	%		

				🚽 To	pology view	🔒 Network vi	ew 📑 Devic	e view	
🕎 🕂 📰 🛄 🔍 Ŧ			Topology overview Topolog	y compai	rison				
		^							
	<b>V</b>		- \Upsilon Device / port	Slot	Partner station	Partner device	Partner interface	Partn	
CPU1516F	Switch_1		S71500/ET200MP station_1						^
CPU 1516F-3 PN	SCALANCE XC208		CPU1516F	1					
			<ul> <li>PROFINET interface_1</li> </ul>	1 X1					
	CPU1516F		Port_1	1 X1 P1				Any	=
	CPU1516F		Port_2	1 X1 P2				Any	
			<ul> <li>PROFINET interface_2</li> </ul>	1 X2					
			Port_1	1 X2 P1				Any	
			SCALANCE XC-200						
			Switch_1	0					
			<ul> <li>SCALANCE interface_1</li> </ul>	0 X1					
			Port_1	0 X1 1				Any	
			Port_2	0 X1 2				Any	
			Port_3	0 X1 3				Any	
		~	Port_4	0 X1 4				Any	_
< Ⅲ > 100%	▼ <u></u> ₹	- 1	<		Ш			>	

				🚽 Topology viev	Netwo	r <mark>k view</mark>	<u>I</u> Y	Device	e view
🖭 🛃 💷 🛄 🔍 ±		<b>a</b> [	Topology overview Top	ology comparison					
		^	💁 Compare offline/online  क्वें Adva	inced compare 🛓 🤔 😼					
	<b>V</b>		Name	PROFINET device name	IP address	Port	Inte	Partn	Partner I
CPU1516F	Switch_1		<ul> <li>S71500/ET200MP station_1</li> </ul>						
CPU 1516F-3 PN	SCALANCE XC208		CPU1516F	cpu1516f.profinet interf	192.168.0.1	Port_1			
-80	2		CPU1516F	cpu1516f.profinet interf	192.168.0.1	Port_2			
	8		CPU1516F	cpu1516f.profinet interf	192.168.1.1	Port_1			
	CPU1516F		<ul> <li>SCALANCE XC-200</li> </ul>						
		_	Switch_1	switch_1	192.168.0.250	Port_1			
		•	Switch_1	switch_1	192.168.0.250	Port_2			
			Switch_1	switch_1	192.168.0.250	Port_3			
			Switch_1	switch_1	192.168.0.250	Port_4			
			Switch_1	switch_1	192.168.0.250	Port_5			
			Switch_1	switch_1	192.168.0.250	Port_6			
			Switch_1	switch_1	192.168.0.250	Port_7			
			Switch_1	switch_1	192.168.0.250	Port_8			
< Ⅲ > 100%			<						>

 $\rightarrow$  Now start a comparison of the offline topology with the online topology

	(→	Compare offline/online					
		Topology overview Topo	ogy comparison				
	<u>61</u> 2	Compare offline/online	ced compare 🛨 💋 😼				
		Name Compare offline/online	ROFINET device name	IP address	Port	Inte	Partn
		<ul> <li>S71500/ET200MP station_1</li> </ul>					
		CPU1516F	cpu1516f.profinet interf	192.168.0.1	Port_1		
		CPU1516F	cpu1516f.profinet interf	192.168.0.1	Port_2		
5		CPU1516F	cpu1516f.profinet interf	192.168.1.1	Port_1		
viev	4	<ul> <li>SCALANCE XC-200</li> </ul>					
Ъб.		Switch_1	switch_1	192.168.0.250	Port_1		
blog	•	Switch_1	switch_1	192.168.0.250	Port_2		
Ê		Switch_1	switch_1	192.168.0.250	Port_3		
		Switch_1	switch_1	192.168.0.250	Port_4		

 $\rightarrow$  Confirm the assigning of temporary IP addresses. ( $\rightarrow$  OK)

Online &	diagnostics (0236:000001) X
	Temporary IP addresses will be assigned. Do you want to continue?
	Connections of communication modules that only use the ISO transport protocol could be interrupted. To continue without temporary IP address assignment, deactivate this setting under Options > Settings > Hardware configuration > Topology overview.
	Do not show this message again.
	OK Cancel

Note:

- This can lead to interrupted connections.
- $\rightarrow$  After a successful comparison, the table should then be filled with additional data.

Topology overview Top	ology comparison																
Compare offline/online	anced compare 🛔 😂 🏂																
Name	PROFINET device name	IP address	Port	Inte.	Fartn.	Partner IP addres	Partner name	Partner PROFINET device .	Status	Action	· PROFINET device name	· Paddress	0 P			· Partner IP a	· Partner PROFINET de
<ul> <li>\$71500/ET200MP station_1</li> </ul>									0								
CPU1516F	cpu1516fprofinet interf.	192.168.0.1	Port_1						0	No a 💌	cpu1516fprofinet int.	192.168.0.1	Fort 1	-	Port 1	192.168.0.250	switch_1
CPU1516F	cpu1516f.profinet interf	192.168.0.1	Port_2						0		cpu1516f.profinet interf_	192.168.0.1	Port 2				
CPU1516F	cpu1516f.profinet interf	192.168.1.1	Port_1	-					0		Notassigned						
<ul> <li>SCALANCE XC-200</li> </ul>									0								
Switch_1	switch_1	192.168.0.250	Port_1						0	No action	switch_1	192.168.0.250	Port 1	-	Port 1	192.168.0.1	cpu15161profinet inter
Switch_1	switch_1	192,168.0.250	Port_2	-					0		switch_1	192.168.0.250	Port 2	-			
Switch_1	switch_1	192.168.0.250	Port_3						0		switch_1	192.168.0.250	Port 3				
Switch_1	switch_1	192.168.0.250	Port_4	-					0		switch_1	192.168.0.250	Port-4				
Switch_1	switch_1	192.168.0.250	Port_5	-					0		switch_1	192.168.0.250	Port 5	-			
Switch_1	switch_1	192.168.0.250	Port_6	-					0		switch_1	192.168.0.250	Port 6	-			
Switch_1	switch_1	192.168.0.250	Port_7	-					0		switch_1	192.168.0.250	Port 7	-			
Switch_1	switch_1	192.168.0.250	Port_8						0	No action	switch_1	192.168.0.250	Port 8	-	Port 1	192.168.0.99	desktop-4cem0dm
<ul> <li>Not in project</li> </ul>											desktop-4cem0dm						

 $\rightarrow$  Apply the complete online topology in your project.

 $(\rightarrow right-click in the "Action" column \rightarrow Apply \rightarrow Apply all)$ 

name	Partner PROFINET device	Status	Act	tion	PROF	INET device nam	ne	IP address	🔶 P	• I	🔶 P	Partner IP a	P
		0											
		•	No	action	cpu1516	5f.profinet interf.		192.168.0.1	Port 1	-	Port 1	192.168.0.250	swit
						Sf profinet int	•	192.168.0.1	Port 2				
				Cha	inge device	9							
		•		X Cut		Ctrl+X							
		0	No	Cop	у	Ctrl+C		192.168.0.250	Port 1	—	Port 1	192.168.0.1	cpu1
				💼 Pas	te	Ctrl+V		192.168.0.250	Port 2				
				X Del	ete	Del		192.168.0.250	Port 3				
				Ren	ame	F2		192.168.0.250	Port 4				
				4.00	-les			Use selected	Port 5				
				App Res	-			Apply all	Port 6				
					ei	· ·		Apply all	Port 7				
			No	Sho	ow catalog	Ctrl+Shift+C		192.168.0.250	Port 8	-	Port 1	192.168.0.99	desk

 $\rightarrow$  Execute the actions by clicking "Synchronize" ( $\rightarrow$ 

<u>4</u> 2	Compare offline/online	nced compare 🛨 😂 🌆										
	Name	PROFINET device name	chronize	Port	Inte	Partn	Partner IP addres	Partner name	Partner PROFINET device	Status	Action	PROF
	<ul> <li>S71500/ET200MP station_1</li> </ul>									0		
	CPU1516F	cpu1516f.profinet interf	192.168.0.1	Port_1						0	Apply	cpu151
	CPU1516F	cpu1516f.profinet interf	192.168.0.1	Port_2							-	cpu151
	CPU1516F	cpu1516f.profinet interf	192.168.1.1	Port_1								Not ass
	<ul> <li>SCALANCE XC-200</li> </ul>									0		
	Switch_1	switch_1	192.168.0.250	Port_1						•	Apply	switch_
	Switch_1	switch_1	192.168.0.250	Port_2								switch_
	Switch_1	switch_1	192.168.0.250	Port_3								switch_
	Switch_1	switch_1	192.168.0.250	Port_4								switch_
	Switch_1	switch_1	192.168.0.250	Port 5								switch

 $\rightarrow$  Confirm the disconnection of the online connections. ( $\rightarrow$  Yes)



→ Zoom out of the table with the topological data so that you have a clear view of the topology view.

						an Te	opology	y view 🔥 Ne
🖭 🔂 🖽 🛄 🔍 ±		Topology overview Top	ology comparison					
	^	Compare offline/online	anced compare 🛨 💋 😼					
		Name	PROFINET device name	IP address	Port	Inte	Partn	Partner IP addres
CPU1516F Switch_1		<ul> <li>S71500/ET200MP station_1</li> </ul>						
CPU 1516F-3 PN SCALANCE XC208		CPU1516F	cpu1516f.profinet interf	192.168.0.1	Port_1	-	Port_1	192.168.0.250
		CPU1516F	cpu1516f.profinet interf	192.168.0.1	Port_2			
		CPU1516F	cpu1516f.profinet interf	192.168.1.1	Port_1			
CPU1516F 8		<ul> <li>SCALANCE XC-200</li> </ul>						
		Switch_1	switch_1	192.168.0.250	Port_1	-	Port_1	192.168.0.1
		Switch_1	switch_1	192.168.0.250	Port_2			
		Switch_1	switch_1	192.168.0.250	Port_3			
		Switch_1	switch_1	192.168.0.250	Port_4			
		Switch_1	switch_1	192.168.0.250	Port_5			
		Switch 1	switch 1	192 168 0 250	Port 6			

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sce-142-100-industrial-ethernet-xc208-en-r1906.docx

## 7.11 Compiling and loading the CPU 1516F-3 PN/DP

 $\rightarrow\,$  Select the CPU 1516F-3 PN/DP in the device overview and compile the configuration. (  $\rightarrow\,$ 

CPU\_1516F  $\rightarrow$  )

 $\rightarrow$  Next, download the compiled configuration to the device.



K Siemens - C:\00_TIA_Portal\142-100_Indus	rial_Ethernet_with_XC208\142-100_Industrial_Ethernet_with_XC208	_ ¬ ×
Project Edit View Insert Online Option	Tools Window Help	Totally Integrated Automation
📑 🔁 📑 Save project 📑 🐰 🗎 💼 🗙	) 🛨 (📲 🔚 🔃 🔛 🖳 🍠 Go online 🖉 Go offine 🕌 🖪 📑 👫 🚍 💷 <earch in="" pro<="" td=""><td>ject&gt;</td></earch>	ject>
Project tree 🛛 🕅 🗸	Download to device 142-100_Industriat_Lummet_with_XC208  ▶ Devices & networks	_ ■ ■ ■ X Hardware catalog ■ ■ >
Devices	🚽 Topology view 🔒 Network view	Device view Options
🖬 🔲 🖻	腔 🖶 💷 🔲 🍳 ± 🔤 🔄 Topology compariso	Dyblice view Options
ž	Compare offline/online	► Catalog
💈 🔻 📋 142-100_Industrial_Ethernet_with 🖉		PROFI Search> MI MI O
🗧 🎽 Add new device	Name	
🕺 🦣 Devices & networks	CPU1516F Switch_1 SCALANCE XC208 CPU1516F	tation_1
▼ ☐ CPU1516F [CPU 1516F-3 PN/	CPU1516F	
Device configuration	CPUISIOF CPUISIOF	
Conline & diagnostics	CPU1516F	Drives & starters
Program blocks	Switch 1	switch
Technology objects     External source files	Switch 1	cpu15
External source files	Switch 1	switch ) Distributed I/O
PLC tags      PLC data types	Switch_1	switch Fin Power supply and distribu
Watch and force tables	Switch_1	switch Sector 1
Online backups	Switch_1	switch ) Other field devices
Contractory	Switch_1	switch Field devices
Device proxy data	Switch_1	switch
Program info	<ul> <li>Not in project</li> </ul>	~
PLC supervisions & alarms	< III > 100% I < III	>
PLC alarm text lists	Q Properties	iostics
Local modules		osues a
< III >	General Cross-references Compile	ies
✓ Details view	😢 🛕 🕕 Show all messages	
Module		
	I Message Go to	? Date
Name	<ul> <li>Connection to CPU1516F terminated.</li> </ul>	6/28/20 🔨
Device configuration	Connected to CPU1516F, via address IP=192.168.0.1.	6/28/20
Online & diagnostics	Offline/online comparison completed successfully. Result is saved in additional files.	6/28/20
Regram blocks	Connection to CPU1516F terminated.	6/28/20 🗮 < 📖 🖒
🙀 Technology objects	< III	> > Information
Portal view     Overview		🔄 🗸 Connection to CPU1516F terminated. 🔊 🎾

## 7.12 Checking the current topology state

 $\rightarrow$  Establish an online connection to the CPU 1516F-3 PN/DP. ( $\rightarrow$  CPU\_1516F  $\rightarrow^{\checkmark}$  Go online)

142-100_Industrial_Ethernet_	with_XC208   Devices & networks	_ II = X
	🚆 Topology viev	Network view
🕎 🕂 📰 🛄 🔍 Ŧ		
		<u>∧</u>
CPU1516F CPU 1516F-3 PN	Switch_1 SCALANCE XC208	Topologi∞i data
< III	> 1	00%

Note:

- The connection between CPU and XC208 should be shown in green in the topology view and thus as error-free.
- → Move the connection between the S7 controller and the switch to port 2 of the XC208 and observe the changes in the topology view.

142-100_Industrial_Ethernet_with_XC208 → Devices & networks	_ ■■×
Topology view 🚮 Network vie	ew 📑 Device view
🖭 🖶 🖽 🛄 🔍 ±	
CPU1516F CPU 1516F-3 PN	Topological data
< III > 100%	

Note:

 Both devices should now signal an error, and the connection between the CPU and XC208 should be shown in red and thus as faulty.

## 7.13 Evaluating the diagnostics buffer of the CPU 1516F-3 PN/DP

 $\rightarrow$  Open the diagnostics buffer of the CPU\_1516F. ( $\rightarrow$  Double-click  $\rightarrow$  Diagnostics buffer)

142-100_Industrial_Eth	ernet_with	_XC208   Device	es & networks		<u>_ 1</u>	
		6	Topology view	🔒 Network view	Device v	view
🕎 🕂 📰 🛄 🚭 Ŧ					E	4
						<u>^</u>
CPU1516F CPU 1516F-3 PN	SCA	tch_1 LANCE XC208				Topological data
< III			> 100%			~
142-100_Industrial_Ethernet_wit	5 XC208 ► CP	11516E [CPU 1516E.3 PI	WDPI			_ II = X
Online access	Discussion have					^
▼ Diagnostics	Diagnostics butt	er				=
General	Events					
Diagnostic status						
Diagnostics buffer	🛃 Display	CPU Time Stamps in PG/PC loc	al time			
Cycle time	No.	Date and time	Event			
Memory	1	6/28/2019 4:31:00.571 PM		r could be detected	<b>v</b> 🛃	^
Display PROFINET interface[X1]	2		Error on partner - Wrong partn			=
PROFINET Interface[X2]	3	6/28/2019 4:30:59.194 PM	· · · · · · · · · · · · · · · · · · ·		<b>_</b>	
Functions	4	6/28/2019 4:30:59.194 PM	Error on partner - No neighbo	r could be detected	🔽 😒	
-	5	6/28/2019 4:30:59.179 PM	Diagnostics available and is b	eing processed	P 🔂	
	6	6/28/2019 4:30:59.177 PM	IO device failure - (pending fai	ults indicated)	🔽 🗹	
	7	6/28/2019 4:30:54.312 PM	IO device failure - Link down o	n all IO controller ports	💡 😒	
	8	6/28/2019 4:30:54.312 PM			🗹 📑	
	9	6/28/2019 4:30:52.809 PM	IO device failure - Watchdog ti	me expired	<b>P</b>	~
	Freeze	display				
	Details on e	vent				*

 $\rightarrow$  Select the incoming event that indicates the partner error. ( $\rightarrow$  Error on partner)

🗹 D	isplay	CPU Time Stamps in PG/PC lo	cal time	
	No.	Date and time	Event	
	1	6/28/2019 4:31:00.571 PM	Error on partner - No neighbor could be detected	Sector 1
	2	6/28/2019 4:31:00.569 PM	Error on partner - Wrong partner port	📔 📩 📔
	3	6/28/2019 4:30:59.194 PM	Diagnostics available and is being processed	🔽 🖬
	4	6/28/2019 4:30:59.194 PM	Error on partner - No neighbor could be detected	<b>?</b>
	5	6/28/2019 4:30:59.179 PM	Diagnostics available and is being processed	P 🖬
	6	6/28/2019 4:30:59.177 PM	IO device failure - (pending faults indicated)	🔽 🔽
	7	6/28/2019 4:30:54.312 PM	IO device failure - Link down on all IO controller ports	🔛 😒
	8	6/28/2019 4:30:54.312 PM	IO device failure - Watchdog time expired	🔽 🔽
	9	6/28/2019 4:30:52.809 PM	IO device failure - Watchdog time expired	N 🔁 🔛
			of 529 Event ID: 16# 0 / switch_1.Port_1 Slot 0 X1 P1 R	6:4040
			ror on partner - No neighbor could be detected 1 / Switch_1.Port_1	-
		Descript Possible is config defective	cabling or configuration is inconsistent: ion: You have configured a port interconnection but no partner was causes: A non-PNIO-compliant device is connected to this port. The ured but there is no device connected or the partner device is swit a. : Adapt the configuration or the interconnection.	detected at the port.
	I	Descript Possible is config defective	ion: You have configured a port interconnection but no partner was causes: A non-PNIO-compliant device is connected to this port. The ured but there is no device connected or the partner device is swite a.	detected at the port.
		Descript Possible is config defective Solution	ion: You have configured a port interconnection but no partner was causes: A non-PNIO-compliant device is connected to this port. The ured but there is no device connected or the partner device is swite a: Adapt the configuration or the interconnection.	detected at the port.

#### Note:

 The CPU is now able to report information about the current topology from the perspective of the CPU and the switch.

## 7.14 End of topology discovery

The topology discovery uses the Link Layer Discovery Protocol (LLDP) to determine the connections between the different nodes. By deactivating LLDP on individual ports, this discovery can be restricted, e.g. in order to limit topology discovery to individual parts of the system. But security can also be a reason to restrict the protocol. An attacker is also able to determine the exact topology with LLDP and thus identify critical points.

- $\rightarrow$  Move the connection between the S7 and the XC208 to port 3 of the XC208
- $\rightarrow$  Open the properties of the XC208 ( $\rightarrow$  Switch\_1  $\rightarrow$  Properties)
- $\rightarrow$  Go to the LLDP settings ( $\rightarrow$  Layer 2  $\rightarrow$  LLDP)

Switch_1 [Mo	odule]						🔍 Proper	ties	🛄 Info	Diagnostics	6	
General	IO tags	Syste	em cons	tants	Texts							
System		^	LLDP									^
▼ Layer 2						_					_	≣
Configurat	ion											
QoS					Setting		Copy to Table					
Rate Contr	ol			All ports	No Change	-	Copy to Table					
VLAN												
Private VLA	AN											
Provider Br	ridge	4										
Mirroring												
Dynamic N	AC Aging	Þ										
Ring Redur	ndancy											
Spanning	Tree											
Loop Dete	ction											
Link Aggre	gation											
DCP Forwa	rding											
LLDP												¥
Unicast		~	<		1111						>	

 $\rightarrow$  Scroll down to the table with the port settings

Switch_1 [Module]			Rroperties	🛄 Info	<b>Diagnostics</b>	
General IO tags	System cor	nstants	Texts			
Private VLAN	^					^
Provider Bridge						
Mirroring						
Dynamic MAC Aging		Port Se	etting			
Ring Redundancy		P0.1 R	(& Tx 💌			
Spanning Tree		P0.2 Rx	(& Tx			
Loop Detection	1	P0.3 R	< & Tx			
Link Aggregation		P0.4 R	« & Tx			=
DCP Forwarding		P0.5 R	< & Tx			
LLDP	=	P0.6 R	« & Tx			
Unicast		P0.7 R	« & Tx			
Multicast		P0.8 R	« & Tx			
Broadcast						
EDMONI						

 $\rightarrow$  Disable LLDP for port 3 ( $\rightarrow$  P0.3: -)

Port	Setting	
P0.1	Rx & Tx	
P0.2	Rx & Tx	
P0.3	- 💌	
P0.4	Rx & Tx	
P0.5	Rx & Tx	
P0.6	Rx & Tx	
P0.7	Rx & Tx	
P0.8	Rx & Tx	

- $\rightarrow$  Download the changes to the CPU. ( $\rightarrow$  CPU\_1516F  $\rightarrow$  1  $\rightarrow$  1)
- $\rightarrow$  Now open the topology comparison again.
  - $(\rightarrow \text{Devices \& networks} \rightarrow \text{Topology view} \rightarrow \text{Topological data} \rightarrow \text{Topology comparison})$

🔁 🔚 Save project 📕 🐰 🗐 🗎 🗙 🖻							PORTA
Project tree 🔲 🖣	142-100_Industrial_Etherne	t_with_XC208 ► Dev	ices & networks	-	∎∎×	Hardware catalog	
Devices			🚽 Topology view 🛛 🛔 Net	twork view 📑 Device	view	Options	
1 🖬 🛄 🖬	🖭 🖶 🔛 🛄 🔍 ±	I I I I I I I I I I I I I I I I I I I	Topology overview To	pology comparison			
		<u>^</u>	🗅 Compare offline/online 📲 Ad	vanced compare 🛨 🔁 ዄ		✓ Catalog	
142-100_Industrial_Ethernet_with_X			Name	PROFINET device name	IP	<search></search>	init init
Add new device	CPU1516F	Switch 1	<ul> <li>\$71500/ET200MP station 1</li> </ul>	TROTINET device fibilite	·····	Filter <all></all>	•
Devices & networks	CPU 1516F-3 PN	SCALANCE XC20	CPU1516F	cpu1516f.profinet interf		Controllers	
CPU1516F [CPU 1516F-3 PN/DP]			CPU1516F	cpu1516f.profinet interf		HMI	
Switch_1 [SCALANCE XC208]      Generation of the second seco			CPU1516F	cpu1516f.profinet interf		PC systems	
Gecurity settings		CPU1516F	<ul> <li>SCALANCE XC-200</li> </ul>		=	Drives & starters	
Common data			Switch_1	switch_1	19	Interverk compone	nts
Documentation settings			Switch_1	switch_1	19	Detecting & Monitor	
Canquages & resources			Switch_1	switch_1	19	Distributed I/O	
Online access			Switch_1	switch_1	19	Power supply and a	distribu
Card Reader/USB memory			Switch_1	switch_1	19	Field devices	
			Switch_1	switch_1	19	Other field devices	
			Switch_1	switch_1	19	-	
			Switch_1	switch_1	19		
		~	<ul> <li>Not in project</li> </ul>		~		
	< III >	· · . 1	<		>		
			Properties	Diagnostics	∎ = ▼		
	General Cross-referen	nces Compile		1- 0			
Details view	Show all messages						
Module							
	I Message			Go to ? Dat	te		
	<ul> <li>Hardware conf</li> </ul>	iguration was loaded succ	essfully.	6/2	8/20 ^		
Name	CPU1516F star	1					
Device configuration Online & diagnostics	The software has it	not been loaded, because	it is up-to-date.	6/2	8/20		
Online & diagnostics Switch_1	<ul> <li>Loading completed (error</li> </ul>	rs : 0; warnings : 0).		6/2	8/20 🗏	<	>
Switch_1					~	> Information	,

 $\rightarrow$  Update the topology comparison. ( $\rightarrow$   $\bigcirc$ )

	Topology view 🔐 Network view 🔐 Device view										
	Topology overview Topology comparison										
<u>6</u> 12	🚇 Compare offline/online 📲 Advanced compare 🛨 😂 😼										
_	Name	PROFINET device name	P address	Port	Inte	Partn	Partner IP addres				
	<ul> <li>S71500/ET200MP station_1</li> </ul>							^			
3	CPU1516F	cpu1516f.profinet interf	192.168.0.1	Port_1	-	Port_1	192.168.0.250				
- A	CPU1516F	cpu1516f.profinet interf	192.168.0.1	Port_2				≡			
	CPU1516F	cpu1516f.profinet interf	192.168.1.1	Port_1							
6	<ul> <li>SCALANCE XC-200</li> </ul>										
	Switch_1	switch_1	192.168.0.250	Port_1	-	Port_1	192.168.0.1				
	Switch_1	switch_1	192.168.0.250	Port_2							
	Switch_1	switch_1	192.168.0.250	Port_3							

 $\rightarrow~$  Confirm the assigning of temporary IP addresses. (  $\rightarrow$  OK)

Online &	diagnostics (0236:000001) X
	Temporary IP addresses will be assigned. Do you want to continue?
	Connections of communication modules that only use the ISO transport protocol could be interrupted. To continue without temporary IP address assignment, deactivate this setting under Options > Settings > Hardware configuration > Topology overview.
	Do not show this message again.
	OK Cancel

 $\rightarrow~$  No partner should be found on either the switch or the CPU.

						📇 T	opolo	gy view	n 品 Networl	k view 🛛 🚺 Device vie	ew
	Topology over	view	Topolog	y comparison							
	🚇 Compare offline/online 🏽 📲 Advanced compare 🛨 😂 🍢										
	FINET device	Status /	Action	PROFINET device name	IP address	• P	• I	• P	🔶 Partner IP a	Partner PROFINET dev	
											^
				cpu1516f.profinet interf	192.168.0.1	Port 1					
				cpu1516f.profinet interf	192.168.0.1	Port 2					
3 -				Not assigned							=
j i											
<u> </u>	rofinet interf			switch_1	192.168.0.250	Port 1					
				switch_1	192.168.0.250	Port 2					
		0	-	switch_1	192.168.0.250	Port 3					
				switch_1	192.168.0.250	Port 4					
				switch_1	192.168.0.250	Port 5					
				switch_1	192.168.0.250	Port 6					
				switch_1	192.168.0.250	Port 7					
			No action	switch_1	192.168.0.250	Port 8	-	Port 1	192.168.0.99	desktop-4cem0dm	
				dockton (com0dm							>

### 7.15 End of detection of accessible devices

In addition to topology discovery, there is also the option to interrupt the detection of accessible devices. Accessible devices in PROFINET are determined via the "Discovery and Configuration Protocol" (DCP). The switch is adjustable so that DCP packets are not forwarded to the configured ports. Incoming packets will still be accepted.

- $\rightarrow$  Open the properties of the XC208. ( $\rightarrow$  Switch\_1  $\rightarrow$  Properties)
- $\rightarrow$  Go to the DCP settings. ( $\rightarrow$  Layer 2  $\rightarrow$  DCP Forwarding)

Switch_1 [Module]	🔍 Properties 🔩	Info 🛛 🗓 Diagnostics
General IO tags	System constants Texts	
<ul> <li>System</li> </ul>	DCP Forwarding	^
✓ Layer 2		
Configuration		
▶ QoS	Setting Copy to Table	
Rate Control	All ports No Change 💌 Copy to Table	
VLAN		
Private VLAN		
Provider Bridge		
Mirroring		
Dynamic MAC Aging	•	
Ring Redundancy		
Spanning Tree		
Loop Detection		
Link Aggregation		
DCP Forwarding		
LLDP		
Unicast		*

#### $\rightarrow$ Scroll down to the table with the port settings

Switch_1 [Module]				<u>q</u>	Properties	🛄 Info	<b>Diagnostics</b>	
General IO tags	System cor	stants	Texts					
System	^							^
✓ Layer 2								
Configuration								
QoS								
Rate Control		Port Se	tting					
► VLAN			rward 💌					
Private VLAN			orward					
Provider Bridge	•		orward					
Mirroring			orward					≣
Dynamic MAC Aging	•		orward					
Ring Redundancy			orward					
Spanning Tree			orward					
Loop Detection								
Link Aggregation		P0.8 Fc	orward					
DCP Forwarding								
LLDP								
Unicast	~							*

 $\rightarrow$  Disable DCP forwarding for port 3 ( $\rightarrow$  P0.3: Block)

Port	Setting
P0.1	Forward
	Forward
P0.3	Block 🔹 💌
P0.4	Forward
P0.5	Forward
P0.6	Forward
P0.7	Forward
P0.8	Forward

- $\rightarrow$  Download the changes to the CPU. ( $\rightarrow$  CPU\_1516F  $\rightarrow$  1  $\rightarrow$  1)
- $\rightarrow$  Open the "Accessible devices" dialog. ( $\rightarrow$  <sup>1</sup>/<sub>1</sub>).

Siemens - C:\00_TIA_Portal\142-100 oject Edit View Insert Online		al_Ethernet_with_XC208\142-100_Industrial_Ethernet_with_XC208		-
<ul> <li>A second sec second second sec</li></ul>	1 A A A A A A A A A A A A A A A A A A A		Т	otally Integrated Automation PORTA
Project tree		142-100_Industrial_Ethernet_with_XC208 > Devices & Accessible devices	_ # = ×	Hardware catalog 🛛 🗊 🗍
Devices		🚝 Topology view 🛛 🏭 Network view 🛛 🛐 Dev	vice view	Options
	•	💦 Network 🔢 Connections 🔣 🖃 🖽 🛄 🍳 生		
142-100_Industrial_Ethernet_with,     142-100_Industrial_Ethernet_with,     Devices & networks     Devices & networks     If CPU1516F [CPU 1516F-3 PNJDF     If SWith_1 [SCALNET XC208]     If Security settings     If Security settings     If Common data		CPU1516F CPU 1516F-3 PN CPU 1516F-3 PN CPU 1516F PN/IE_1		V Catalog     Catalog     Catalog     Filter <all>     W     Filter <all>     W     Filter <all>     W</all></all></all>
		< III > 100% T		
Details view	>	Properties Linfo Diagnostics      General Cross-references Compile      A      Show all messages		
Name		Message Go to ?     Hardware configuration was loaded successfully.     CPUISIGF started.     The software has not been loaded, because it is up-to-date.     Loading completed (errors: 0; warnings: 0).	Date 6/28/20 A 6/28/20 6/28/20	< m 13
		K III	>	> Information
Portal view     Overview	N	🛔 Devices & ne 🔝 😪 L	oading comple	ted (errors: 0; warning

 $\rightarrow$  Start the search for accessible devices. ( $\rightarrow$  <u>Start search</u>

Accessible devices			_		×
	Accessible nodes of th	Type of the PG/PC interfa PG/PC interfa		°RO/1000 MT Desktop	Adapter 💌 🕐 🔯
	Device		Interferent in a	Address	MAC address
		Device type	Interface type		
	switch_1	SCALANCE XC208	PN/IE	192.168.0.250	20-87-56-80-2B-AE
II.					
E Flash LED					
Online status information:	:			Display only e	<u>S</u> tart search error messages
🚹 Scan completed. 1 de	evices found.				^
Scan and information					
Retrieving device info					
					Sho <u>w</u> <u>C</u> ancel

 $\rightarrow$  The CPU no longer appears in the list of accessible devices.

## 7.16 Activation of media redundancy

- $\rightarrow$  Move the connection between the S7 controller and the XC208 back to port 1 of the XC208
- $\rightarrow$  Open the properties of the XC208. ( $\rightarrow$  Switch\_1  $\rightarrow$  Properties)

Properties		
Switch_1 [Module]	🔍 Properties 🚺 Info 🖳 Diagnostics	
General IO tags	System constants Texts	
General     PROFINET interface [X1]     Management     Module parameters     System     Layer 2     Layer 3     Security	General	* III
	Catalog information	*

 $\rightarrow$  Go to the "Ring Redundancy" item in the "Layer 2" menu. ( $\rightarrow$  Layer 2  $\rightarrow$  Ring Redundancy)

Properties		I
Switch_1 [Module]	🔍 Properties 🚺 Info 🛛 🗓 Diagnostics	
General IO tags	System constants Texts	
<ul> <li>System</li> <li>Layer 2</li> </ul>	Ring Redundancy	- =
Configuration QoS	> Ring	-
Rate Control VLAN	■ Ring Redundancy	
<ul> <li>Private VLAN</li> <li>Provider Bridge</li> </ul>	Ring redundancy mode: Automatic Redundancy Detection	
<ul> <li>Mirroring</li> <li>Dynamic MAC Aging</li> </ul>	Ring ports: P0.1	
Ring Redundancy	Observer	
<ul> <li>Spanning Tree</li> <li>Loop Detection</li> </ul>	V Standby	*

- $\rightarrow$  Set the ring redundancy mode to MRP Auto-Manager.
- $\rightarrow$  Set the ring ports to P0.1 and P0.2.

	Ring Redundancy	
Ring redundancy mode:	MRP Auto-Manager	•
Ring ports:	P0.1	•
	P0.2	•
	Observer	

→ Now open the properties of the X1 interface in the CPU\_1516F. ( $\rightarrow$  CPU\_1516F  $\rightarrow$  Device configuration  $\rightarrow$  X1  $\rightarrow$  Properties)

Properties						I
PROFINET interface_1 [Modu	le]		Rroperties	🗓 Info	Diagnostics	
General IO tags Sy	stem constants	Texts				
General F-parameters	Ethernet addresse	es				<b>^</b>
Ethernet addresses Time synchronization	Interface netwo	rked with				
Operating mode		Subnet:	PN/IE_1		•	
<ul> <li>Advanced options</li> <li>Web server access</li> </ul>			Add new subnet	:		

→ Under "Advanced options", switch to "Media redundancy": (→ Advanced options → Media redundancy)

Properties			I
PROFINET interface_1 [Module	]	🔍 Properties 🚺 Info 🖳 Diag	gnostics
General IO tags Syst	tem constants Texts		
General F-parameters	Media redundancy		
Ethernet addresses			
Time synchronization	MRP domain	mrpdomain-1	-
Operating mode	Media redundancy role:	Not device in the ring	-
▼ Advanced options			
Interface options	Ring port 1:	PROFINET interface_1 [X1]\Port_1 [X1 P1 R]	<b>*</b>
Media redundancy	Ring port 2:	PROFINET interface_1 [X1]\Port_2 [X1 P2 R]	
Real time settings		Diagnostics interrupts	
Port [X1 P1 R]		Domain settings	
Port [X1 P2 R]		Domain settings	
Web server access			

 $\rightarrow$  Set the media redundancy role to client. ( $\rightarrow$  Media redundancy role: Client)

MRP domain	mrpdomain-1	-
Media redundancy role:	Client	-

 $\rightarrow$  Then download the changes in the CPU\_1516F. ( $\rightarrow$  CPU\_1516F  $\rightarrow$  12  $\rightarrow$  12)

## 7.17 Checking the ring status

- $\rightarrow$  Connect to the CPU. ( $\rightarrow$  CPU\_1516F  $\rightarrow \overset{\checkmark}{\longrightarrow}$  Go online)
- $\rightarrow$  Open the online diagnostics of the XC208. ( $\rightarrow$  Switch\_1  $\rightarrow$  Online & diagnostics)

Siemens - C:\00_TIA_Portal\142-100_Indust		00_Industrial_Ethernet_with_XC208		>
Project Edit View Insert Online Options			Totally I	ntegrated Automation
📑 🔁 📑 Save project 📑 🐰 🗎 🗎 🗙 🖷	) * (* * 🗟 🗓 🗓 🖉 🍬	🕻 Go online 🖉 Go offline 🛛 🏭 🚺	🗶 🚍 🛄 <search in="" project=""> 🆓</search>	PORTAL
Project tree 🔲 🖣	142-100_Industrial_Ethernet_			_ # # × 4
Devices				8
. 🗃 🔳	Online access	General		Online
5	<ul> <li>Diagnostics</li> </ul>	General		I I I
🧧 🔻 📋 142-100_Industrial_Ethernet_wit 🔽 🔵	General	Module		5
Add new device	Diagnostic status			tools
Devices & networks	<ul> <li>PROFINET interface [X1]</li> </ul>	Short designation:	SCALANCE XC208	
CPU1516F [CPU 1516F-3 PN/ V •	<ul> <li>Functions</li> </ul>	Article number:	6GK5 208-0BA00-2AC2	Tasks
Switch_1 [SCALANCE XC208]		Hardware:	1	
Device configuration		Firmware:		sks
😵 Online & diagnostics				
📜 Switch_1 [SCALANCE XC208] 🗹		Firmware expansion:		
Ungrouped devices				Libraries
Security settings		Rack:	0	bra
Common data			0	Tie
Documentation settings				
Languages & resources				
Online access		Module information		
Card Reader/USB memory				
		Device name:		
		Module name:	Switch_1	
		Plant designation:		
< III >				<b>v</b>
> Details view			🖳 Properties 🚺 Info 🚺 🗓 🛙	Diagnostics 🔤 🗖 🗏 🔶
Portal view     Overview	📥 CPU1516F 🛛 😟 Online & di	ia	Connected to CPU1516F,	via address IP 🗰 🎾

 $\rightarrow$  Go to the diagnostics of the MRP domain.

 $(\rightarrow \text{Diagnostics} \rightarrow \text{PROFINET} \text{ interface } [X1] \rightarrow \text{Domain} \rightarrow \text{MRP domain})$ 

142-100_Industrial_Ethernet_with	h_XC208 → Sv	vitch_1 [SCALAN	CE XC208]				_ I≣ ■ ×
Online access		la marta					
<ul> <li>Diagnostics</li> </ul>	>> MRP of	Iomain					
General	MRP dom	ain					
Diagnostic status							
<ul> <li>PROFINET interface [X1]</li> </ul>	Instance	MRP domain	MRP role	MRP ring status	Ring port 1	Ring port 2	
IO controller	1	mrpdomain-1	Manager (auto)	Open	Port 1 (R-/S0/X1 P1R)	Port 2 (R-/S0/X1 P2R)	
Ethernet address							
Ports	•						
Communication diagnostics	-						
PROFINET IO diagnostics	•						
▼ Domain							
MRP domain	<						>
Functions							

#### Note:

 The MRP ring status should be described as open, because the redundant line is not yet inserted.  $\rightarrow$  Now connect port P2 of the XC208 to port X1P2R on the CPU 1516F-3 PN/DP.



 $\rightarrow$  Check the MRP ring status again in the online diagnostics.

142-100_Industrial_Ethernet_with	n_XC208 🕨 Sv	vitch_1 [SCALAN	CE XC208]				_ 12 0
Online access	>> MRP (	la marta					
<ul> <li>Diagnostics</li> </ul>		domain					
General	MRP dom	ain					
Diagnostic status							
<ul> <li>PROFINET interface [X1]</li> </ul>	Instance	MRP domain	MRP role	MRP ring status	Ring port 1	Ring port 2	
IO controller	1	mrpdomain-1	Manager (auto)	Closed	Port 1 (R-/S0/X1 P1R)	Port 2 (R-/S0/X1 P2R)	
Ethernet address							
Ports	4						
Communication diagnostics	E						
PROFINET IO diagnostics	•						
▼ Domain							
MRP domain	<			1111			>
Functions							

#### Note:

- The MRP ring status should now be described as closed.

## 7.18 Diagnostics of the ring status in the web interface

- $\rightarrow$  Open the web interface of the XC208 ( $\rightarrow$  <u>https://192.168.0.250</u>)
- $\rightarrow$  Go to the redundancy information ( $\rightarrow$  Information  $\rightarrow$  Redundancy)

SCALANCE X	C208 WEB Managen 🗙 🕒	F							-		×
$\leftrightarrow$ $\rightarrow$ G	A Not secure   https://	/192.168.0.2	60					☆	6 g		:
SIEMENS								[	English	▼ <u>Go</u>	
SIEWIENS	192.168.0.2	50/SC/		CE XC208				01/01/20	00 00:5	i3:37 <b>%</b>	
Welcome admin	Spanning Tree										
Logout									<b>?</b>	≞★	
Information	Spanning Tree Ring Redu	Indancy Star	dby								
In Start Page	Spanning Tree Mode:										
► Versions	Instance ID:										
▶I&M	Bridge Priority:										
♦ARP Table	Bridge Address:		00-00								
▶Log Table	Root Priority:										
▶Faults	Root Address:	00-00-00-00-0	00-00								
▶Redundancy	Root Cost:	0									
<ul> <li>Ethernet Statistics</li> </ul>											
▶Unicast											
►Multicast		Port F	ole	State	Oper. Version	Priority	Path Cost	Edge Ty	pe	P.t.P. Ty	4
▶LLDP		4								+	
▶Routing											
DHCP Server	Refresh										
Diagnostics											
▶SNMP											-

 $\rightarrow$  Go to the Ring Redundancy tab ( $\rightarrow$  Ring Redundancy)

Ring Redundancy		
		🔤 <b>?</b> 🗄 🗡
Spanning Tree Ring Redundancy	Standby	
Redundancy Functio	n: MRP Auto-Manager	
RM Statu	s: Passive	
Observer Statu	s: -	
Ring Port	1: P0.1	
Ring Port	2: P0.2	
No. of Changes to RM Active Stat	e: 2	
Max. Delay of RM Test Packets[ms	3]: 3	
	Reset Counters	
Refresh		

#### Note:

 The ring status is output here under RM Status. Since the ring is closed, the ring manager behaves passively.

- $\rightarrow$  Open the ring by disconnecting one of the two connections between S7 and XC208.
- $\rightarrow$  Update the display in the web page. ( $\rightarrow$  Update)

Ring Redundancy		
		■?≞★
Spanning Tree Ring Redundancy	Standby	
Redundancy Function	n: MRP Auto-Manager	
RM Statu	s: Active	
Observer Statu	s: -	
Ring Port	1: P0.1	
Ring Port	2: P0.2	
No. of Changes to RM Active Sta	e: 3	
Max. Delay of RM Test Packets[m	s]: <b>4</b>	
	Reset Counters	
Refresh		

#### Note:

 The status then changes to active because the ring manager became active and has activated its redundant port.

## 7.19 Archiving the project

→ Finally, the complete project is to be archived. Select the "Archive ..." command in the "Project" menu. Enter a target path in the following dialog and archive the project. (→ Project
 → Archive → Destination path ... → Archive)



## 7.20 Checklist – step-by-step instructions

The following checklist helps students/trainees to independently check whether all steps of the step-by-step instructions have been carefully completed and enables them to successfully complete the module on their own.

No.	Description	Checked
1	Project successfully retrieved from archive	
2	SCALANCE XC208 added	
3	IP address successfully set	
4	Web management login and password changed	
5	Basic configuration completed (HTTPS, SNMP, Ports, etc.)	
6	CPU_1516F assigned to XC208 as IO controller	
7	CPU_1516F compiled and downloaded	
8	Insecure HTTP access no longer possible	
9	Link via ports 4 to 7 no longer possible	
11	Topology synchronized	
12	CPU_1516F compiled and downloaded again	
13	Online connection to CPU_1516F established	
14	CPU connected to port 1 of XC208: Topology view error-free	
15	CPU connected to port 2 of XC208: Errors in topology view	
16	Diagnostics buffer of the CPU_1516F evaluated	
17	LLDP on port 3 deactivated	
18	Configuration successfully downloaded to CPU_1516F	
19	Topology discovery with CPU connected to port 3 is no longer	
20	DCP on port 3 deactivated	
21	Configuration successfully downloaded to CPU_1516F	
22	CPU connected to port 3 no longer visible as accessible device	
23	CPU reconnected to correct port on XC208	
24	Ring redundancy at switch_1 set to MRP Auto-Manager	
25	CPU_1516F configured as client in the MRP ring	
26	Configuration successfully downloaded to CPU_1516F	
27	Ring interrupted: MRP ring status open	
28	Ring closed: MRP ring status closed	
29	Project successfully archived	

# 8 Exercise

## 8.1 Task – Exercise

The changed cabling is to be applied to the topology of the current project. This allows errors in the cabling of the PROFINET bus to be diagnosed better and faster.

Also, the topology discovery and the detection of accessible devices on port 3 of the switch will be activated and tested again in order to be able to comfortably expand the system on this port in the future.

For security reasons, port 3 should be deactivated until it is ultimately used.

## 8.2 Planning

In the next step, plan the implementation of the task on your own.

### 8.3 Checklist – Exercise

The following checklist helps students/trainees to independently check whether all steps of the exercise have been carefully completed and enables them to successfully complete the module on their own.

No.	Description	Checked
1	New inserted connection configured in the topology view	
2	LLDP for port 3 enabled again	
3	DCP enabled for port 3 again	
4	Port 3 deactivated	
5	Configuration was compiled without error message	
6	Configuration downloaded to CPU_1516F without error message	
7	Devices show no group error	
8	Group error when connection to P2 at Switch_1 is disconnected	
9	Project successfully archived	

# 9 Additional information

More information for further practice and consolidation is available as orientation, for example: Getting Started, videos, tutorials, apps, manuals, programming guidelines and trial software / firmware, under the following link:

siemens.de/sce/s7-1500

Preview "Additional information" - In preparation

### **Further Information**

Siemens Automation Cooperates with Education siemens.com/sce

SCE Learn-/Training Documents siemens.com/sce/documents

SCE Trainer Packages siemens.com/sce/tp

SCE Contact Partners siemens.com/sce/contact

Digital Enterprise siemens.com/digital-enterprise

Industrie 4.0 siemens.com/future-of-manufacturing

Totally Integrated Automation (TIA) **siemens.com/tia** 

TIA Portal siemens.com/tia-portal

SIMATIC Controller siemens.com/controller

SIMATIC Technical Documentation siemens.com/simatic-docu

Industry Online Support support.industry.siemens.com

Product catalogue and online ordering system Industry Mall **mall.industry.siemens.com** 

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