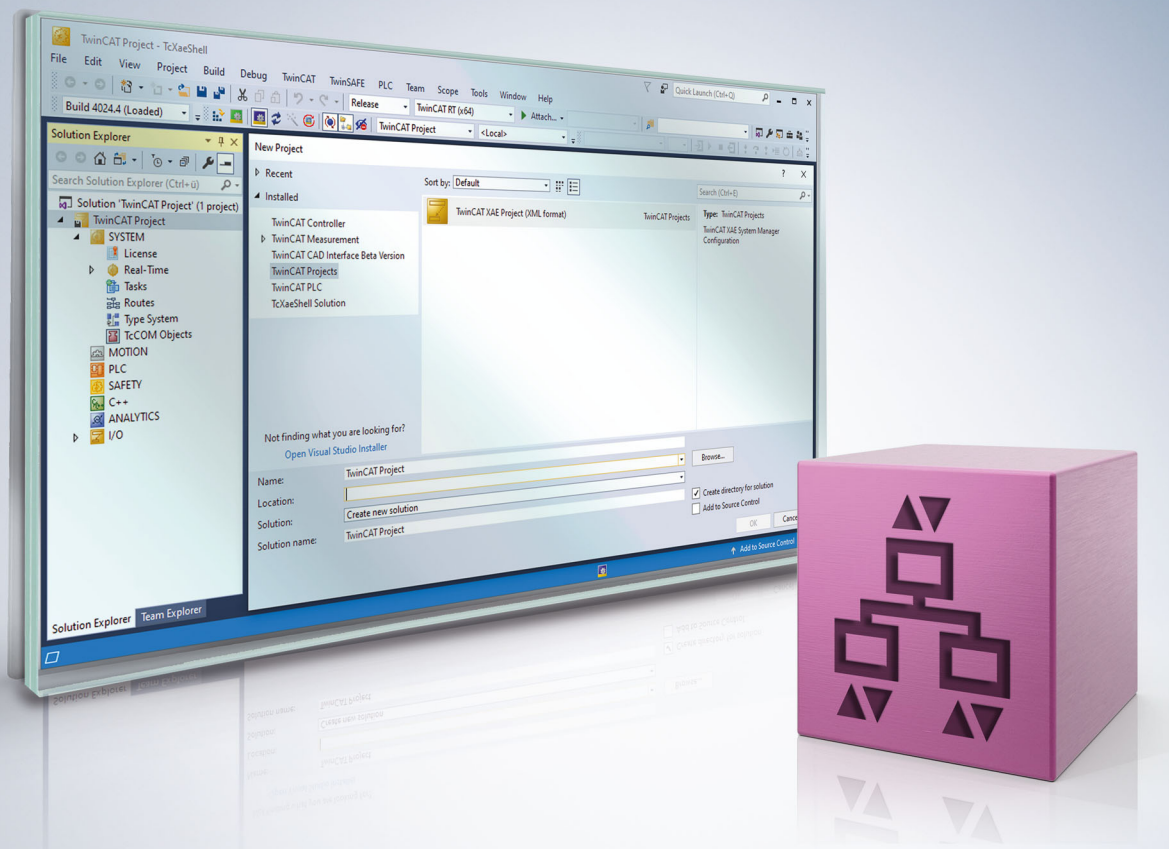
BECKHOFF New Automation Technology

Manual | EN

TF6230

TwinCAT 3 | Parallel Redundancy Protocol (PRP)



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1 Foreword

1.1 Notes on the documentation

This description is intended exclusively for trained specialists in control and automation technology who are familiar with the applicable national standards.
For installation and commissioning of the components, it is absolutely necessary to observe the documentation and the following notes and explanations.
The qualified personnel is obliged to always use the currently valid documentation.

The responsible staff must ensure that the application or use of the products described satisfies all requirements for safety, including all the relevant laws, regulations, guidelines, and standards.

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The documentation has been prepared with care. The products described are, however, constantly under development.
We reserve the right to revise and change the documentation at any time and without notice.
No claims to modify products that have already been supplied may be made on the basis of the data, diagrams, and descriptions in this documentation.

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EP1590927, EP1789857, EP1456722, EP2137893, DE102015105702
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This description is only intended for trained specialists in control, automation, and drive technology who are familiar with the applicable national standards.

Signal words

The signal words used in the documentation are classified below. In order to prevent injury and damage to persons and property, read and follow the safety and warning notices.

Personal injury warnings

⚠ DANGER

Hazard with high risk of death or serious injury.

⚠ WARNING

Hazard with medium risk of death or serious injury.

⚠ CAUTION

There is a low-risk hazard that could result in medium or minor injury.

Warning of damage to property or environment

NOTICE

The environment, equipment, or data may be damaged.

Information on handling the product

This information includes, for example:
recommendations for action, assistance or further information on the product.

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2 Overview

General overview

The TwinCAT 3 Parallel Redundancy Protocol enables real-time capable and redundant Ethernet communication via two separate networks. For this purpose, the Parallel Redundancy Protocol (PRP) according to IEC 62439-3:2018 is implemented and the prerequisite for using a PC with TwinCAT 3 as a so-called "Double Attached Node" (DAN) is created.

PRP is a protocol and method for redundancy of Ethernet at the MAC level (or layer 2), which is thus independent of the higher layers and protocols. The TwinCAT PRP Adapter used for this purpose implements the redundancy procedure in the TwinCAT real-time environment, as well as with a virtual adapter to the operating system, and can be used completely transparently for the system. All real-time capable protocols based on the TwinCAT Realtime Ethernet Adapter can communicate via the TwinCAT PRP Adapter. However, any non-real-time protocols and applications that communicate from the operating system via the drivers can also be used via PRP. For example, the real-time capable EtherCAT Automation Protocol can be used for redundant communication via PRP, as can the TwinCAT OPC UA server.

Components

The TwinCAT PRP Adapter requires two individual network interface cards (NICs), which are supported by the TwinCAT RT network driver (see system requirements [▶ 9]) and can thus be integrated as TwinCAT Realtime Ethernet Adapters. These two adapters are then used for the interfaces to LAN-A and LAN-B defined in the standard.

Functionalities

The two network interface cards are combined via the TwinCAT Realtime Ethernet Adapter by means of the TwinCAT PRP Adapter to form a virtual network interface card in accordance with IEC 62439-3. The TwinCAT PRP Adapter can then be used to communicate redundantly via the two networks using PRP. This virtual network interface card then provides all the familiar functions and information as a real NIC. The two set network interface cards then act as a "Double Attached Node" (DAN) in the PRP network. It is still possible to use each individual TwinCAT Realtime Ethernet Adapter in TwinCAT as a "Single Attached Node" (SAN) and without PRP for communication via the individual network.

Since the use of PRP is completely transparent for the applications, the TwinCAT PRP Adapter has a corresponding diagnostic interface. This provides the necessary information for the evaluation of redundancy and all states.

3 Installation

3.1 System requirements

Technical data	Requirement
Operating system	Windows 10, TwinCAT/BSD
Target platform	PC (x64)
Ethernet interface	2 compatible NICs (see "Supported network controllers")
Minimum TwinCAT version	TwinCAT 3.1 Build 4026.0 or higher
Required TwinCAT setup level	TwinCAT 3 XAE, XAR
Required TwinCAT license	TF6230 | TwinCAT 3 Parallel Redundancy Protocol (PRP)

3.2 Installation

TwinCAT Package Manager: Installation (TwinCAT 3.1 Build 4026)

Detailed instructions on installing products can be found in the chapter Installing workloads in the TwinCAT 3.1 Build 4026 installation instructions.

Install the following workload to be able to use the product:

- **TF6230 | TwinCAT 3 Parallel Redundancy Protocol**

3.3 Licensing

The TwinCAT 3 function can be activated as a full version or as a 7-day test version. Both license types can be activated via the TwinCAT 3 development environment (XAE).

Licensing the full version of a TwinCAT 3 Function

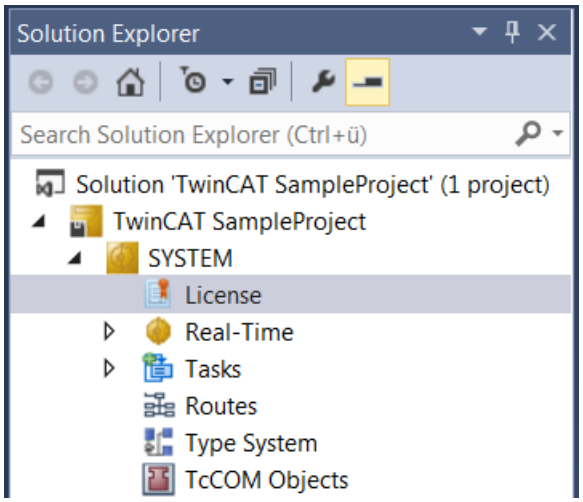
A description of the procedure to license a full version can be found in the Beckhoff Information System in the documentation "TwinCAT 3 Licensing".

Licensing the 7-day test version of a TwinCAT 3 Function

A 7-day test version cannot be enabled for a TwinCAT 3 license dongle.

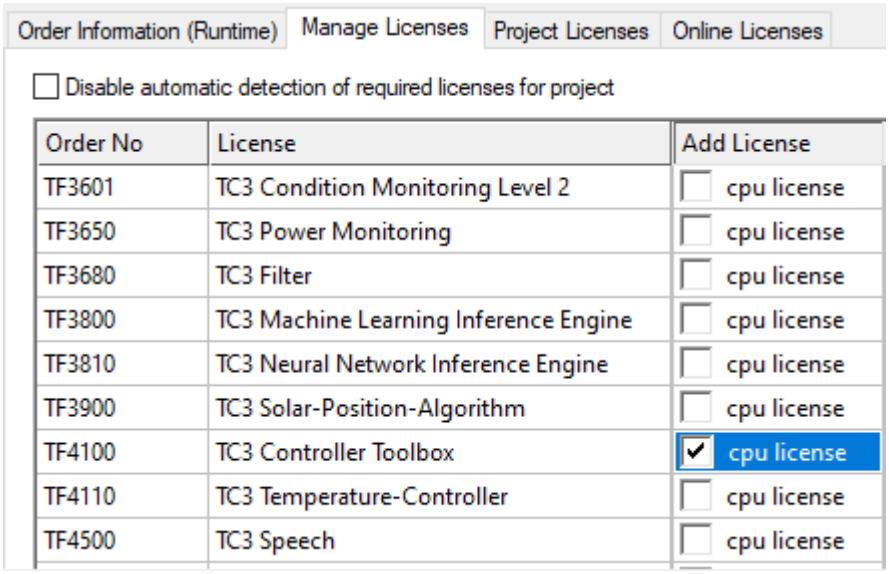
1. Start the TwinCAT 3 development environment (XAE).
2. Open an existing TwinCAT 3 project or create a new project.
3. If you want to activate the license for a remote device, set the desired target system. To do this, select the target system from the **Choose Target System** drop-down list in the toolbar.
   ⇨ The licensing settings always refer to the selected target system. When the project is activated on the target system, the corresponding TwinCAT 3 licenses are automatically copied to this system.

4. In the **Solution Explorer**, double-click **License** in the **SYSTEM** subtree.



⇨ The TwinCAT 3 license manager opens.

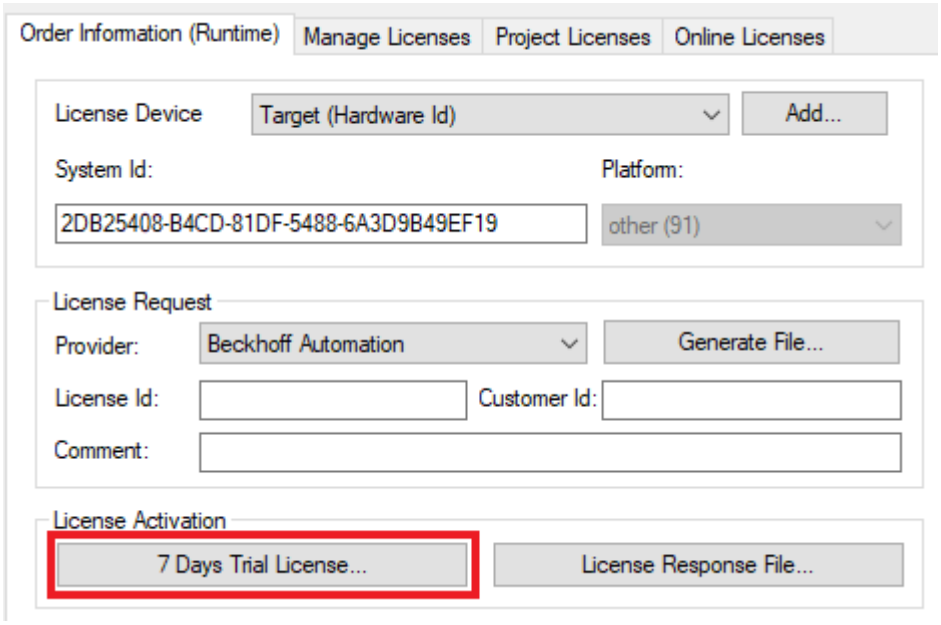
5. Open the **Manage Licenses** tab. In the **Add License** column, check the check box for the license you want to add to your project (e.g. "TF4100 TC3 Controller Toolbox").



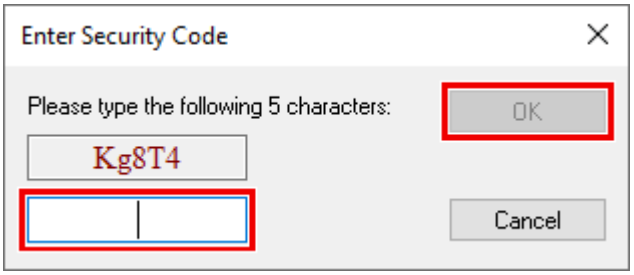
6. Open the **Order Information (Runtime)** tab.

⇨ In the tabular overview of licenses, the previously selected license is displayed with the status “missing”.

7. Click **7-Day Trial License...** to activate the 7-day trial license.



⇨ A dialog box opens, prompting you to enter the security code displayed in the dialog.



8. Enter the code exactly as it is displayed and confirm the entry.
9. Confirm the subsequent dialog, which indicates the successful activation.
   ⇨ In the tabular overview of licenses, the license status now indicates the expiry date of the license.
10. Restart the TwinCAT system.

⇨ The 7-day trial version is enabled.

4 Technical introduction

For PRP, a so-called "Redundancy Control Trailer" (RCT) is attached to each Ethernet frame by the TwinCAT PRP Adapter and the Ethernet frame is sent twice via both NICs. When receiving Ethernet frames the RCT is evaluated, double received Ethernet frames from the individual networks are detected. The RCT is removed from the Ethernet frame received first and transferred to the higher-level applications, and the Ethernet frame received twice later is evaluated and then discarded. In addition, the so-called "Supervision Frame" is sent as a multicast and as a sign of life via both NICs at a configurable interval, and is received and evaluated accordingly by other DANs.

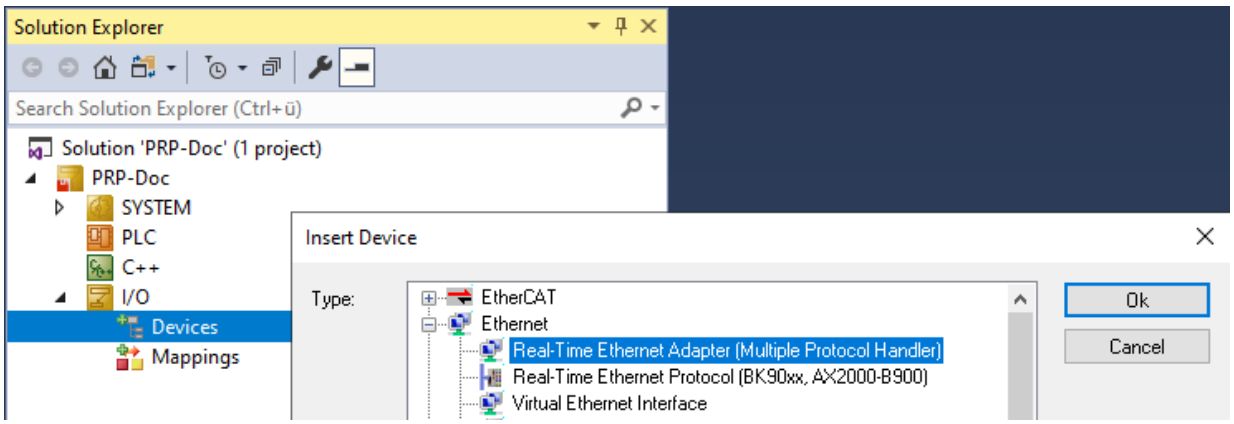
For the administration and diagnosis of the redundant communication, information about all known nodes of the network is stored as "Nodes" in a so-called "Nodes Table" on the basis of the received Ethernet frames. This "Node Table" and further information are provided by TwinCAT PRP Adapter and are suitable for a very detailed diagnosis of the network and the detection of errors in the network. (See PRP Adapter Diagnosis [▶ 16])

For the operating system, the network interface card configured for LAN-A in the TwinCAT PRP Adapter is used as a single virtual interface to the redundant networks. All Ethernet frames sent via this interface in the operating system are sent to both networks using PRP, and all received Ethernet frames are forwarded to the operating system via this interface. Thereby the TwinCAT PRP Adapter already removes the RCT and processes other PRP specific Ethernet frames and does not forward them. In the same way, all Ethernet frames for the functions configured in TwinCAT are passed on by both the TwinCAT Realtime Ethernet Adapter and the TwinCAT PRP Adapter to the corresponding drivers and not to the operating system. The network interface card for LAN-B is disabled for the operating system and displayed as if there were no link.

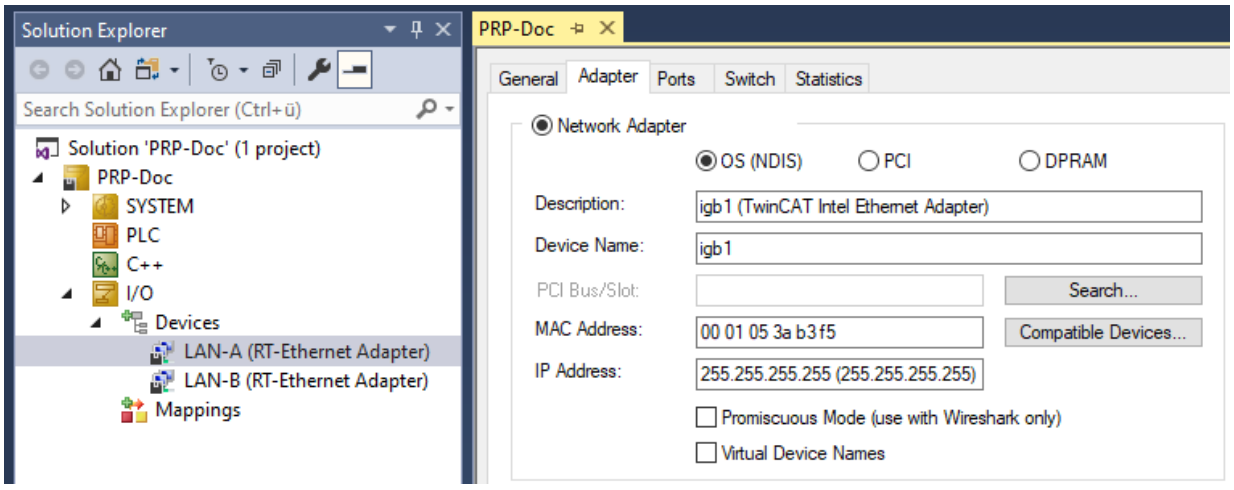
5 Configuration

To configure a PRP Adapter, first the two NICs (see Supported network controllers) for LAN-A and LAN-B are added as "RT-Ethernet Adapters" and assigned to one network adapter each.

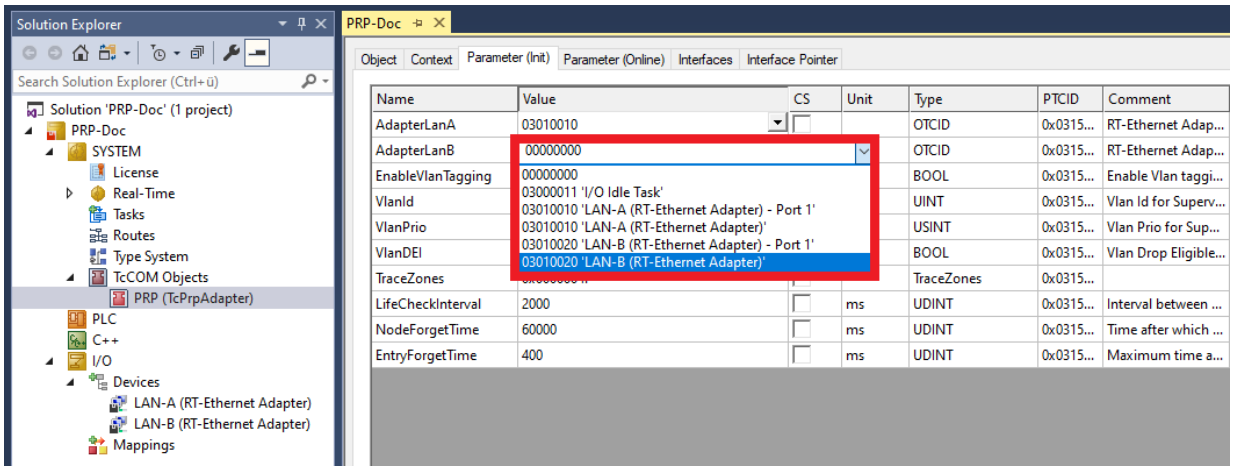
1. To do this, add the **Real-Time Ethernet Adapter (Multiple Protocol Handler)** twice at **I/O** and **Devices**.



2. For each **RT-Ethernet Adapter**, select the appropriate network interface as **Adapter**.

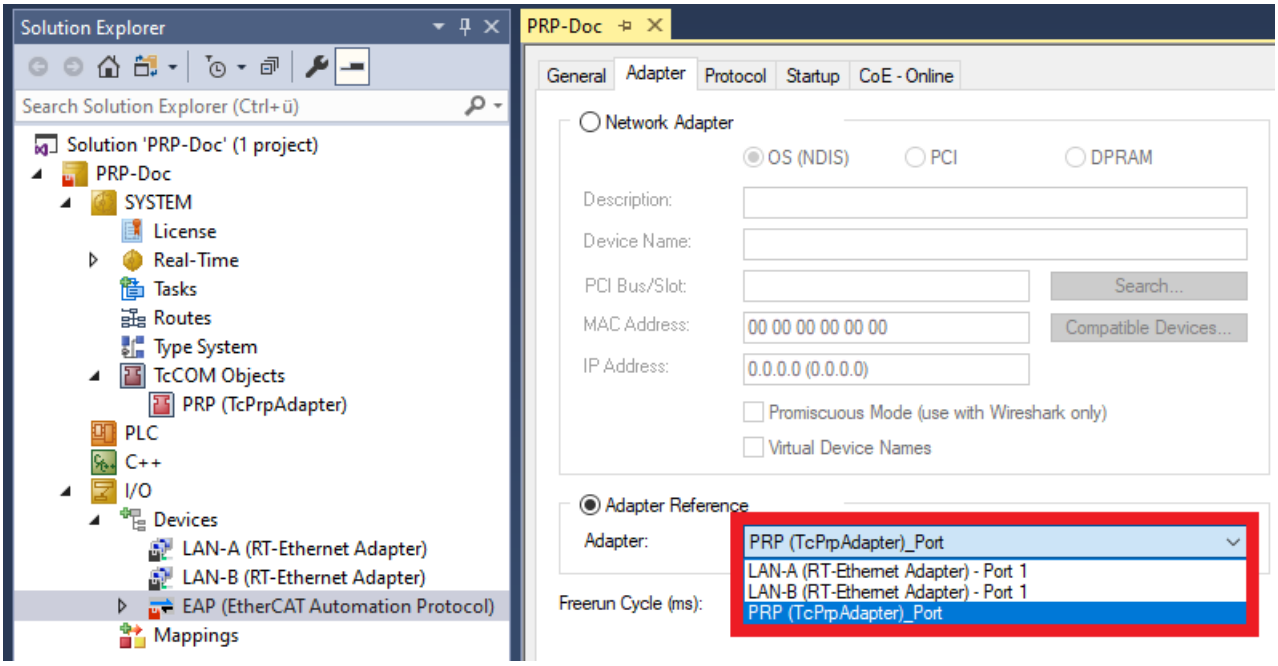


3. Under **TcCOM Objects** , add the **PRP Adapter** via the **TcPrpAdapter** module from the **PRP - Parallel Redundancy Protocol** group. Select the two NICs for LAN-A and LAN-B each as **RT-Ethernet Adapter** in the parameters of the PRP adapter.

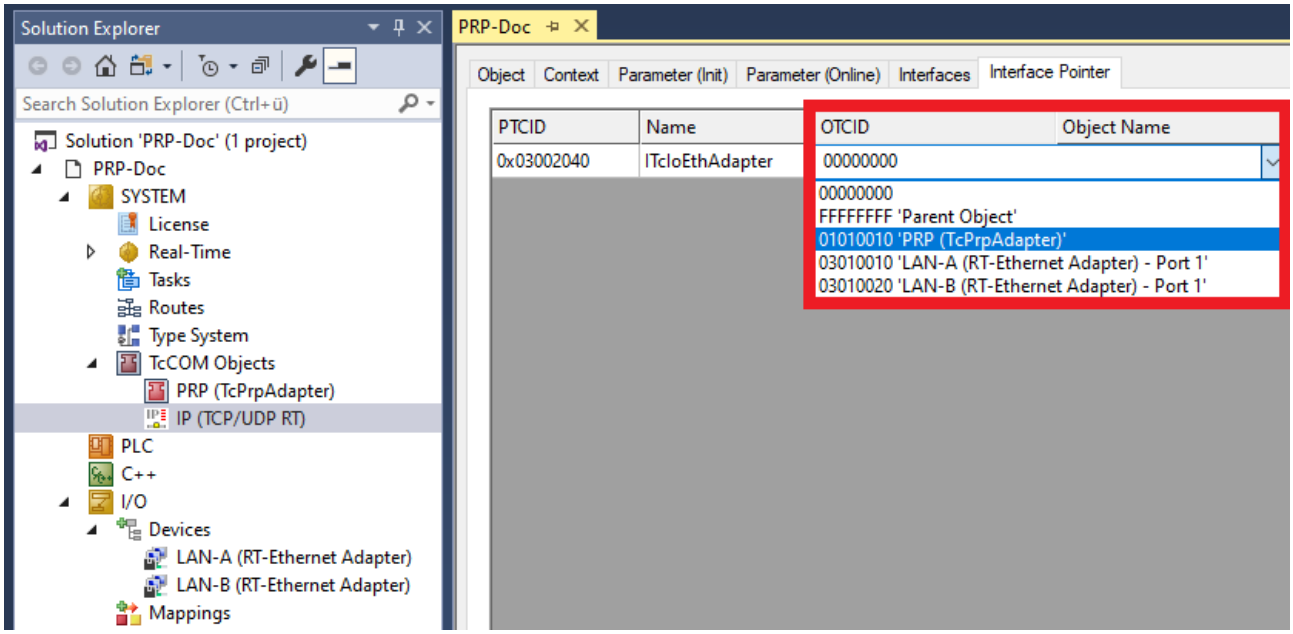


⇨ Further devices can then be added to the TwinCAT configuration and the PRP adapter can be selected as the network adapter via an adapter reference.

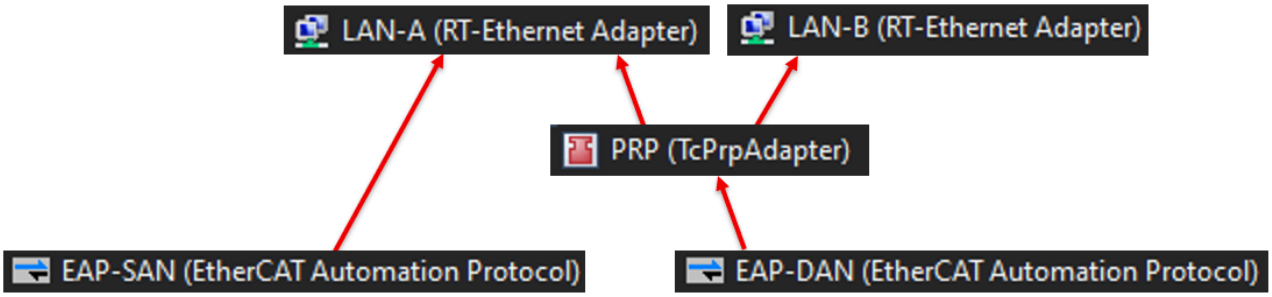
For example, for an adapter for communication via the "EtherCAT Automation Protocol" (EAP) the **PRP Adapter** can be selected as reference and thus transferred via both networks using the Parallel Redundancy Protocol.



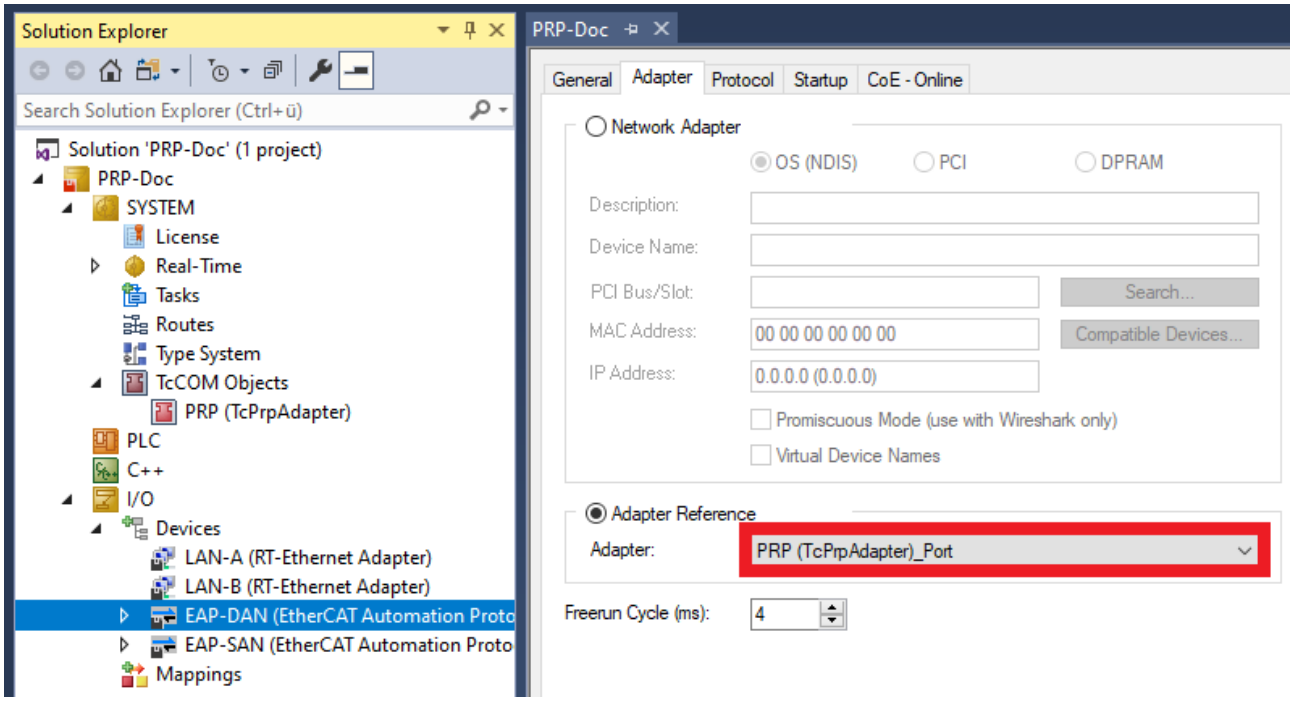
In the following, a module for real-time communication via TCP or UDP from the TwinCAT Function "TF6311 | TwinCAT 3 TCP/UDP Realtime" was added as an example and the previously created PRP adapter was selected as Ethernet adapter. In this way, communication can take place using TCP or UDP via PRP and thus redundantly via the NICs of LAN-A and LAN-B.



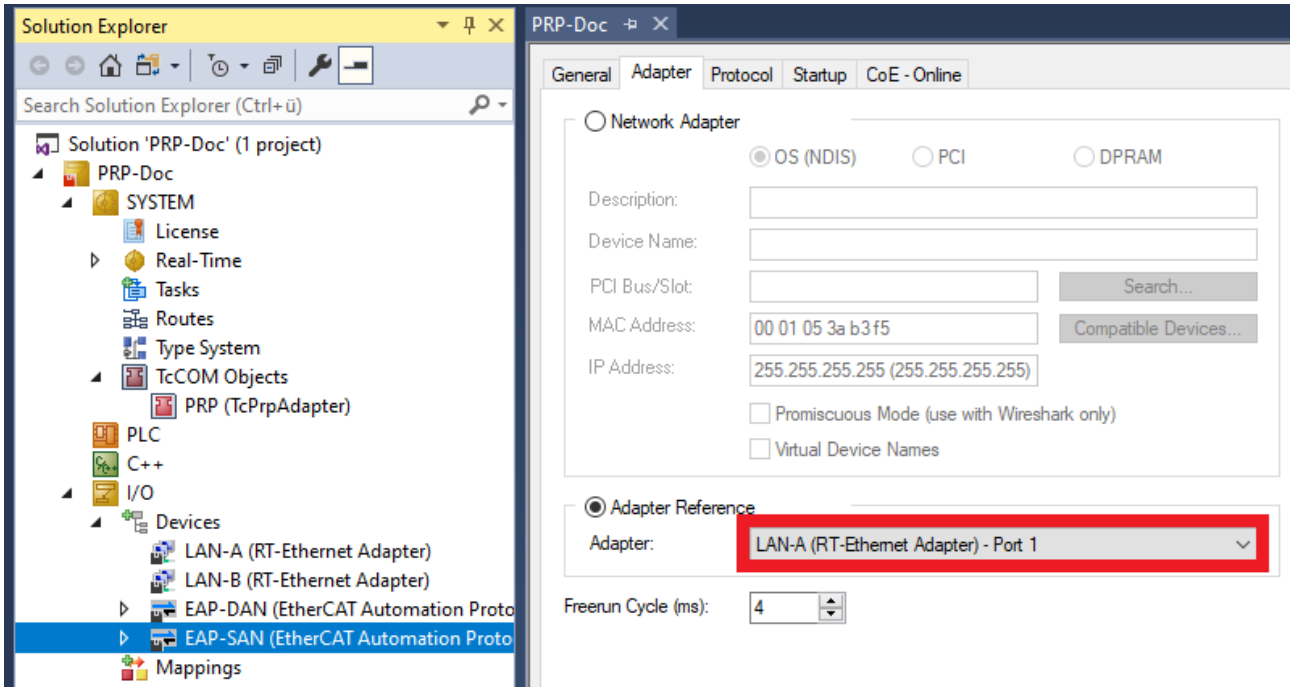
The following images show the relationship between the adapters.
The "RT-Ethernet Adapters" for LAN-A and LAN-B form the interface to the network adapters or NICs of the system. The PRP adapter combines the two "RT-Ethernet Adapters" into one DAN (Double Attached Node) for communication via PRP. The adapter "EAP-DAN" communicates by means of EAP (EtherCAT Automation Protocol) via PRP or the PRP adapter. The second EAP adapter named "EAP-SAN" is again directly linked to the RT-Ethernet Adapter of LAN-A and would thus communicate as a SAN (Single Attached Node), without the RCT of PRP.



EAP-DAN (EtherCAT Automation Protocol):



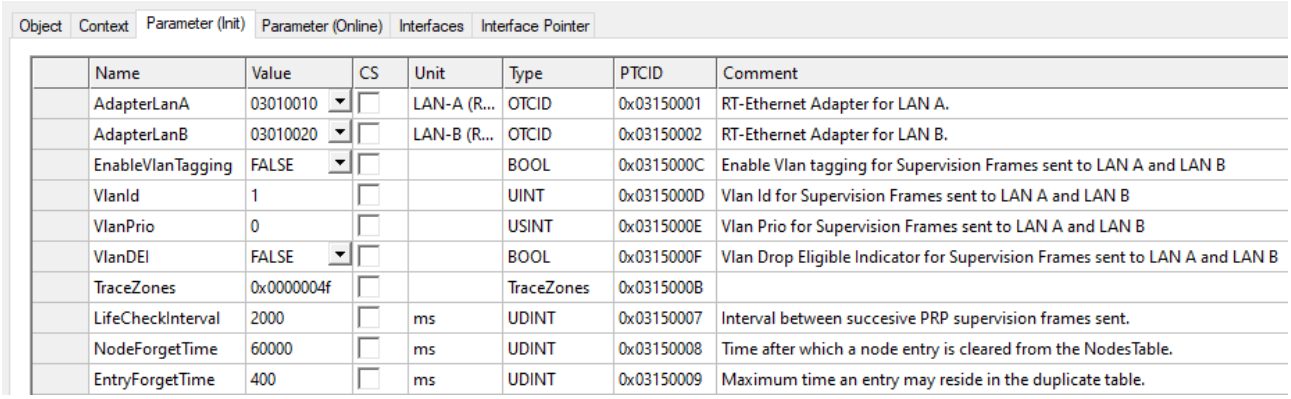
EAP-SAN (EtherCAT Automation Protocol):



5.1 PRP adapter parameters

The configuration of the PRP adapter is done via the "Parameters (Init)".

These parameters are based on the standard "IEC 62439-3:2018", from chapter 4.5, table 8.



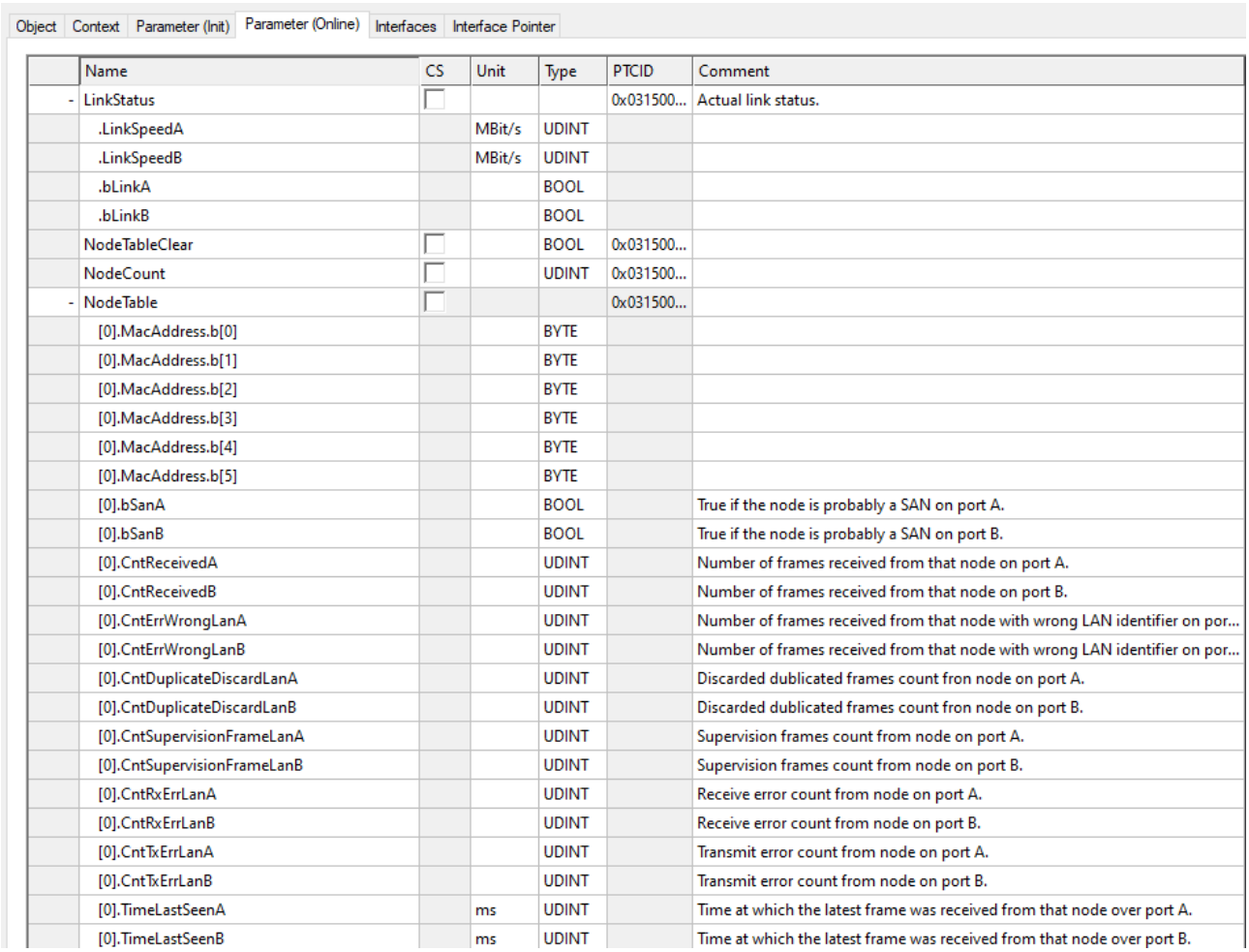
Name	Value	CS	Unit	Type	PTCID	Comment
AdapterLanA	03010010		LAN-A (R...	OTCID	0x03150001	RT-Ethernet Adapter for LAN A.
AdapterLanB	03010020		LAN-B (R...	OTCID	0x03150002	RT-Ethernet Adapter for LAN B.
EnableVlanTagging	FALSE			BOOL	0x0315000C	Enable Vlan tagging for Supervision Frames sent to LAN A and LAN B
VlanId	1			UINT	0x0315000D	Vlan Id for Supervision Frames sent to LAN A and LAN B
VlanPrio	0			USINT	0x0315000E	Vlan Prio for Supervision Frames sent to LAN A and LAN B
VlanDEI	FALSE			BOOL	0x0315000F	Vlan Drop Eligible Indicator for Supervision Frames sent to LAN A and LAN B
TraceZones	0x0000004f			TraceZones	0x0315000B	
LifeCheckInterval	2000		ms	UDINT	0x03150007	Interval between succesive PRP supervision frames sent.
NodeForgetTime	60000		ms	UDINT	0x03150008	Time after which a node entry is cleared from the NodesTable.
EntryForgetTime	400		ms	UDINT	0x03150009	Maximum time an entry may reside in the duplicate table.

Name	Type	Default	Description
AdapterLanA	OTCID		Defines the network interface for LAN-A by means of the Object ID from the corresponding RT-Ethernet Adapter.
AdapterLanB	OTCID		Defines the network interface for LAN-B by means of the Object ID from the corresponding RT-Ethernet Adapter
EnableVlanTagging	BOOL	FALSE	Enables adding VLAN tags for the PRP supervision frames over LAN-A and LAN-B.
VlanId	UINT	1	Defines the VLAN ID for the VLAN tags in the PRP supervision frames.
VlanPrio	USINT	0	Defines the VLAN priority for the VLAN tags in the PRP supervision frames.
Vlan DEI	BOOL	FALSE	Defines the "VLAN Drop Eligible Indicator" for the VLAN tags in the PRP supervision frames.
TraceZones	UDINT		Reserved for later configuration of the trace.
LifeCheckInterval	UDINT	2000	Defines the interval in milliseconds for sending PRP supervision frames.
NodeForgetTime	UDINT	60000	Defines the time in milliseconds after which a supposedly obsolete entry is removed from the list of nodes.
EntryForgetTime	UDINT	400	Defines the time in milliseconds after which an entry was removed from the list of received frames used to detect duplicates.

5.2 PRP Adapter Diagnosis

The diagnosis of the PRP adapter is done via the "Parameters (Online)".

These parameters and values are based on the standard "IEC 62439-3:2018" from chapter 4.2.7, table 2 and 3.



	Name	CS	Unit	Type	PTCID	Comment
-	LinkStatus	☐			0x031500...	Actual link status.
	.LinkSpeedA		MBit/s	UDINT		
	.LinkSpeedB		MBit/s	UDINT		
	.bLinkA			BOOL		
	.bLinkB			BOOL		
	NodeTableClear	☐		BOOL	0x031500...	
	NodeCount	☐		UDINT	0x031500...	
-	NodeTable	☐			0x031500...	
	[0].MacAddress.b[0]			BYTE		
	[0].MacAddress.b[1]			BYTE		
	[0].MacAddress.b[2]			BYTE		
	[0].MacAddress.b[3]			BYTE		
	[0].MacAddress.b[4]			BYTE		
	[0].MacAddress.b[5]			BYTE		
	[0].bSanA			BOOL		True if the node is probably a SAN on port A.
	[0].bSanB			BOOL		True if the node is probably a SAN on port B.
	[0].CntReceivedA			UDINT		Number of frames received from that node on port A.
	[0].CntReceivedB			UDINT		Number of frames received from that node on port B.
	[0].CntErrWrongLanA			UDINT		Number of frames received from that node with wrong LAN identifier on por...
	[0].CntErrWrongLanB			UDINT		Number of frames received from that node with wrong LAN identifier on por...
	[0].CntDuplicateDiscardLanA			UDINT		Discarded dublicated frames count fron node on port A.
	[0].CntDuplicateDiscardLanB			UDINT		Discarded dublicated frames count fron node on port B.
	[0].CntSupervisionFrameLanA			UDINT		Supervision frames count from node on port A.
	[0].CntSupervisionFrameLanB			UDINT		Supervision frames count from node on port B.
	[0].CntRxErrLanA			UDINT		Receive error count from node on port A.
	[0].CntRxErrLanB			UDINT		Receive error count from node on port B.
	[0].CntTxErrLanA			UDINT		Transmit error count from node on port A.
	[0].CntTxErrLanB			UDINT		Transmit error count from node on port B.
	[0].TimeLastSeenA		ms	UDINT		Time at which the latest frame was received from that node over port A.
	[0].TimeLastSeenB		ms	UDINT		Time at which the latest frame was received from that node over port B.

Name	Type	Description
LinkStatus	TcPrpAdapterLinkStatus	Specifies information about the network interface. See at TcPrpAdapterLinkStatus structure [▶ 17] the subelements.
NodeTableClear	BOOL	Allows emptying the "NodeTable".
NodeCount	UDINT	Indicates the current number of entries in the "NodeTable".
NodeTable	TcPrpNodeEntry[512]	Provides a table with information about all detected nodes in the network. See TcPrpNodeEntry structure [▶ 17] for the details and subelements of this table.

TcPrpAdapterLinkStatus structure

The diagnosis from the network interfaces to LAN-A and LAN-B is done by the following structure via the parameter "LinkStatus".

Name	Type	Description
LinkSpeedA	UDINT	Specifies the transfer rate from the network interface to the LAN-A.
LinkSpeedB	UDINT	Specifies the transfer rate from the network interface to LAN-B.
bLinkA	BOOL	Indicates whether a connection was detected on the network interface to the LAN-A.
bLinkB	BOOL	Indicates whether a connection was detected on the network interface to LAN-B.

TcPrpNodeEntry structure

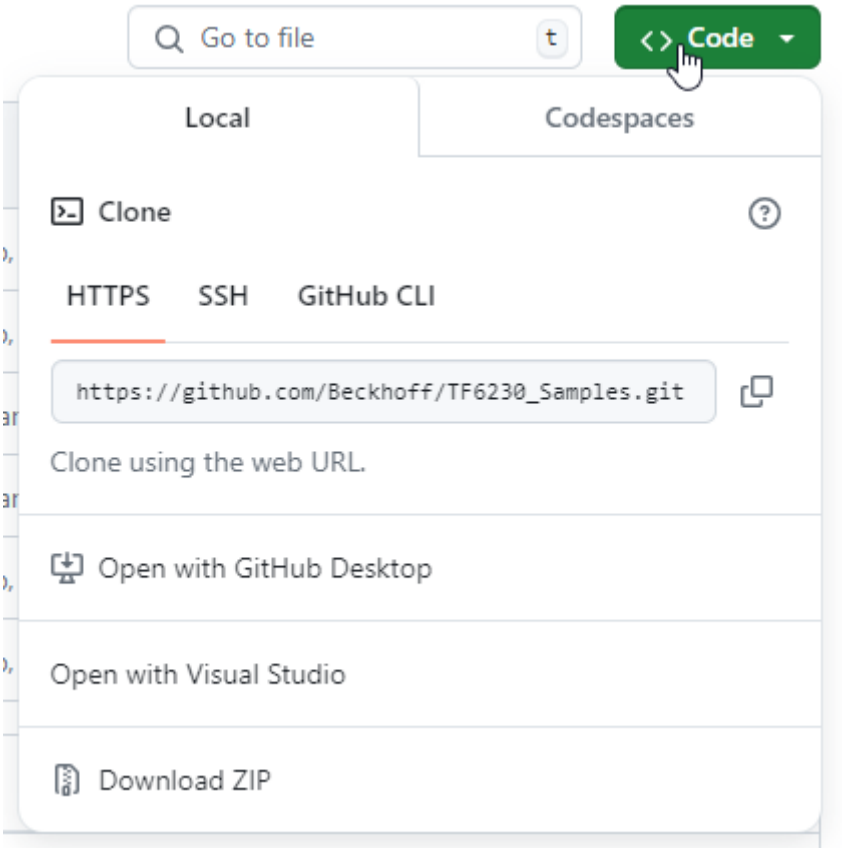
The diagnosis of the detected nodes in the network is done via the "NodeTable". This "NodeTable" consists of an array of structures with up to 1024 entries. A maximum of 64 entries are displayed in the TwinCAT XAE. The complete list can be retrieved via ADS. The current number of entries in this list is specified by the "NodeCount" parameter. The following describes the structure of the entries and its values.

Name	Type	Description
MacAddress	MAC_ADDRESS	Specifies the MAC address to the entry of the node.
bSanA	BOOL	Indicates whether the node was detected as a SAN (Single Attached Node) on the LAN-A.
bSanB	BOOL	Indicates whether the node was detected as a SAN (Single Attached Node) on the LAN-B.
CntReceivedA	UDINT	Specifies the number of frames received from LAN-A.
CntReceivedB	UDINT	Specifies the number of frames received from LAN-B.
CntErrWrongLanA	UDINT	Specifies the number of frames received from LAN-A indicating a wrong LAN indicator.
CntErrWrongLanB	UDINT	Specifies the number of frames received from LAN-B indicating a wrong LAN indicator.
CntDuplicateDiscardLanA	UDINT	Specifies the number of received duplicates and thus discarded frames from LAN-A.
CntDuplicateDiscardLanB	UDINT	Specifies the number of received duplicates and thus discarded frames from LAN-B.
CntSupervisionFrameLanA	UDINT	Specifies the number of PRP supervision frames received from LAN-A.
CntSupervisionFrameLanB	UDINT	Indicates the number of received PRP supervision frames from LAN-B.
CntRxErrLanA	UDINT	Specifies the number of errors when receiving frames from LAN-A.
CntRxErrLanB	UDINT	Specifies the number of errors when receiving frames from LAN-B.
CntTxErrLanA	UDINT	Specifies the number of errors when sending frames in LAN-A.
CntTxErrLanB	UDINT	Specifies the number of errors when sending frames in LAN-B.
TimeLastSeenA	UDINT	Specifies the time in milliseconds before which a frame was last received from these nodes on the LAN-A.
TimeLastSeenB	UDINT	Specifies the time in milliseconds before which a frame was last received from these nodes on the LAN-B.

6 Samples

These examples demonstrate the diagnosis of a PRP connection.

Sample code and configurations for this product can be obtained from the corresponding repository on GitHub: https://github.com/Beckhoff/TF6230_Samples. You have the option of cloning the repository or downloading a ZIP file with the sample.



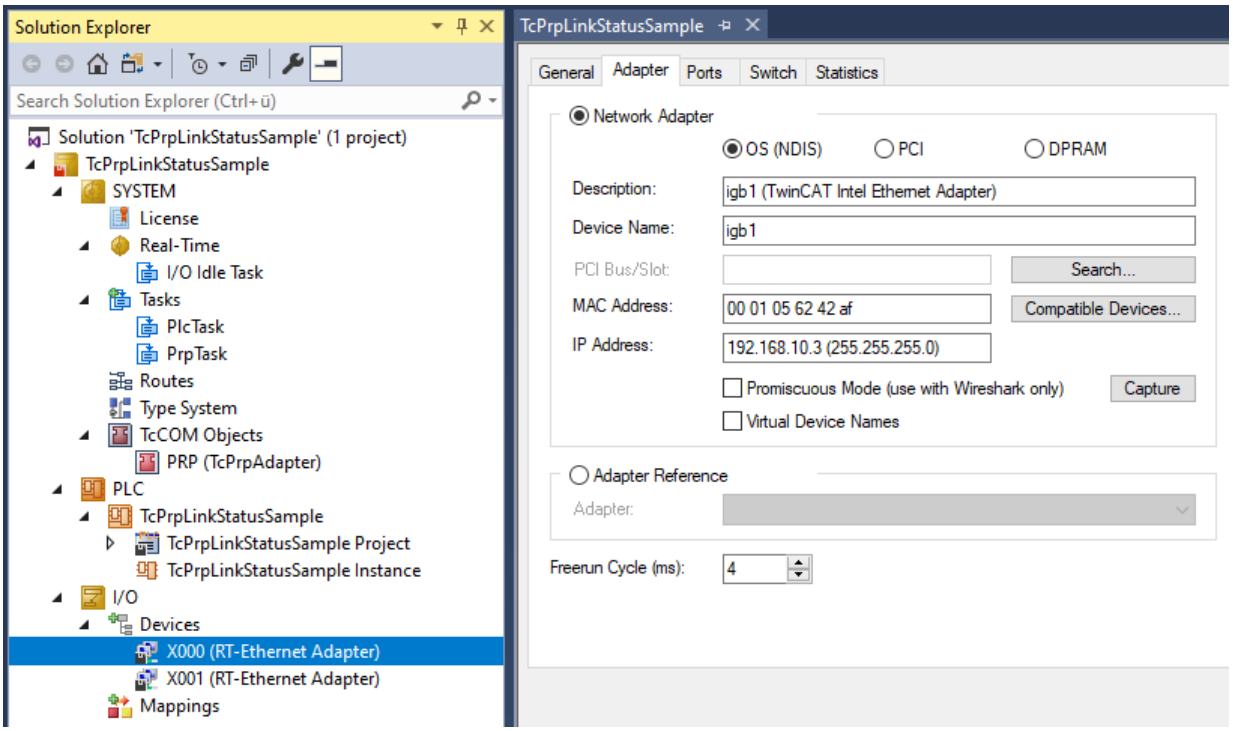
6.1 Reading the link status

Download: https://github.com/Beckhoff/TF6230_Samples/tree/main/TcPrpLinkStatusSample

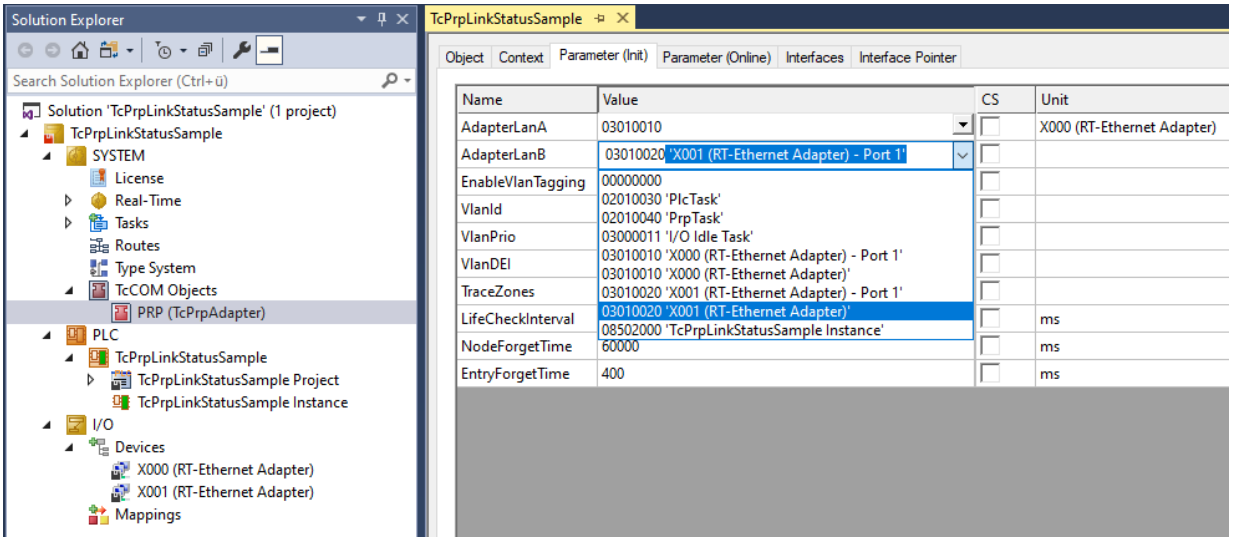
In this sample the TcPrpAdapterLinkStatus structure [▶ 17] is queried by TwinCAT PRP module to evaluate the link status of the two RT-Ethernet Adapters used. In this way, it can be determined whether there is an active connection on the respective adapter to the next node in the network, such as to a switch. A single active connection should be sufficient to continue to reach the other devices in the PRP network. However, the inactive connection should already be an indication of an error in the network.

✓ To put the sample into operation, the adapters for the two RT-Ethernet Adapters must first be configured.

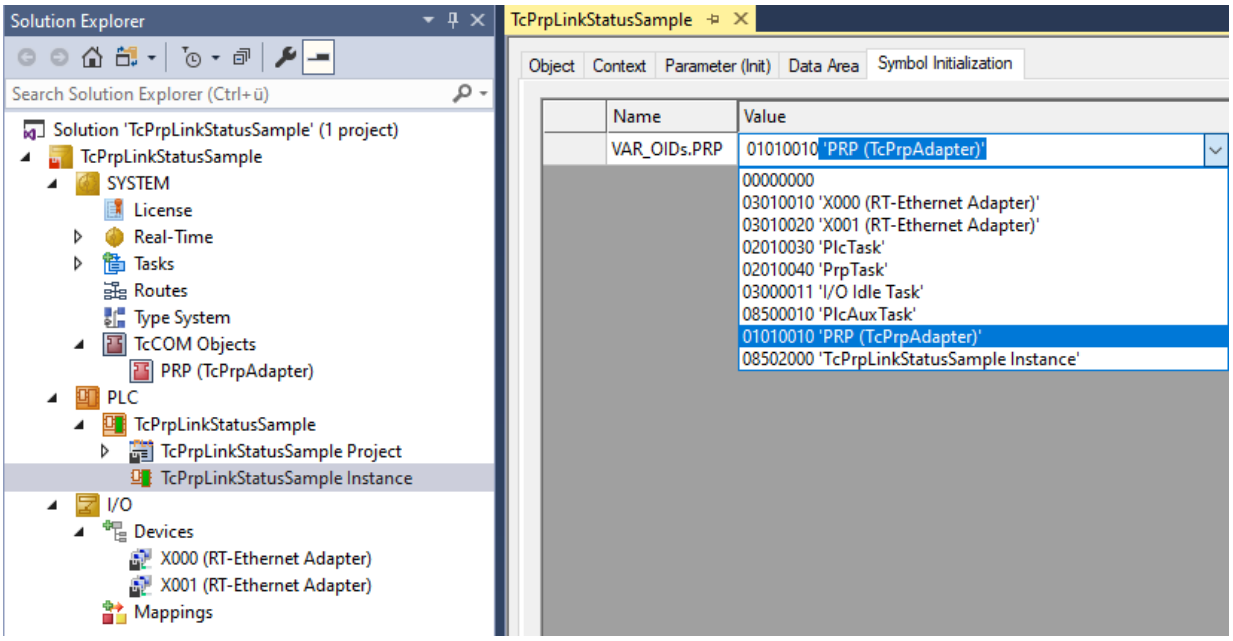
1. At **Adapter**, set the compatible **Network Adapter** on both the **X000** and **X001** I/O devices.



2. On the TwinCAT PRP module, here with the name **PRP**, select the two RT-Ethernet Adapters at **Parameters (Init)** for the LAN-A and LAN-B

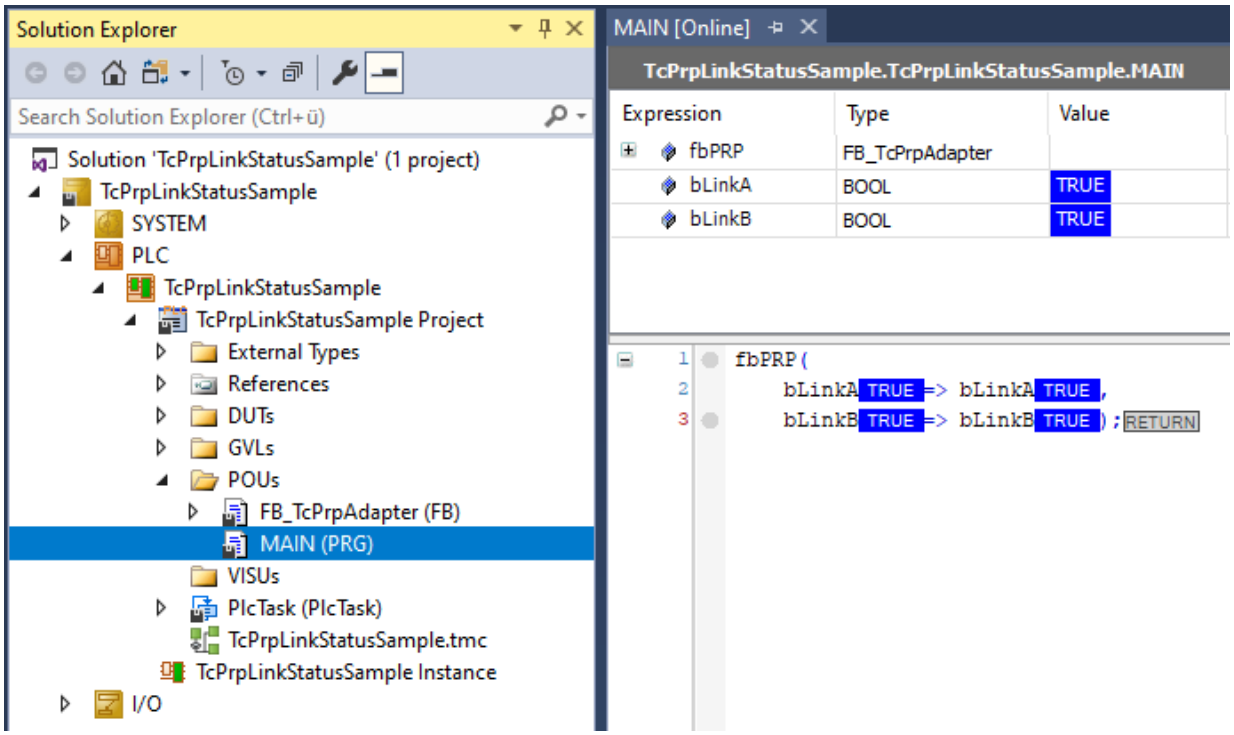


3. In the PLC project an interface pointer to the TwinCAT PRP module is used. Configure this interface pointer with the **Symbol Initialization** to select and assign the Object ID from the TwinCAT PRP module.

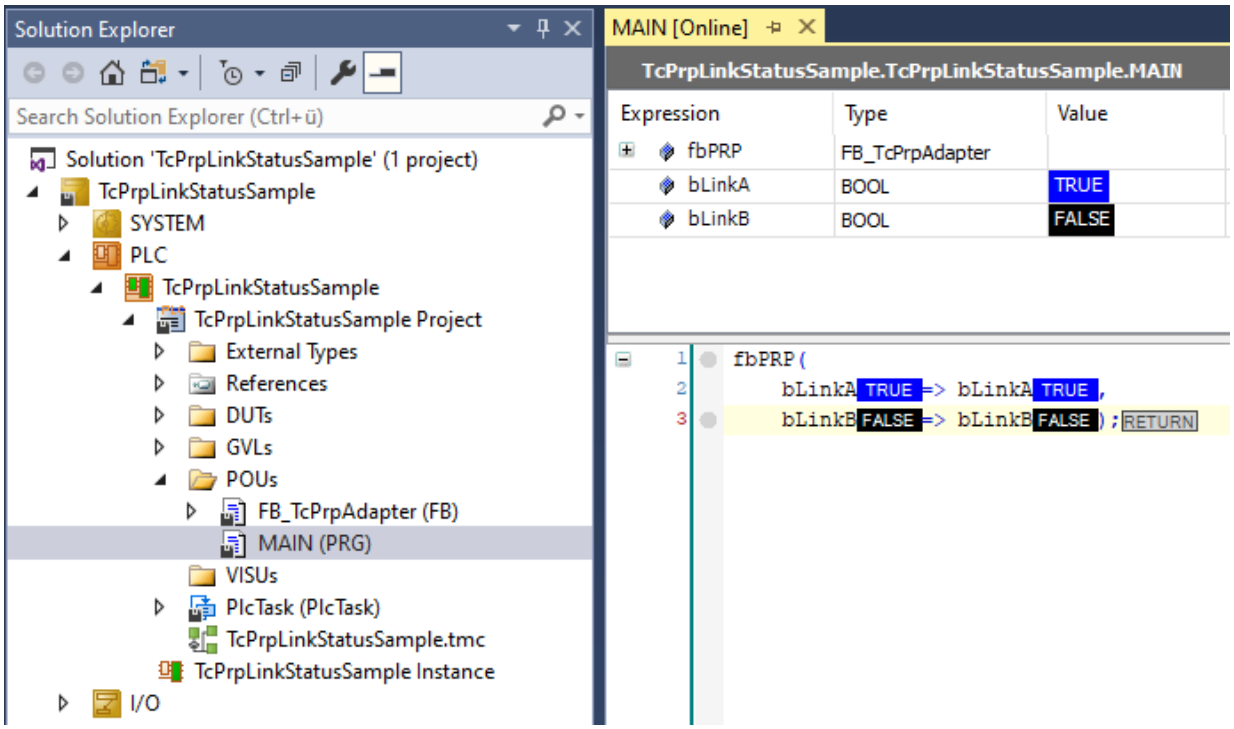


4. Activate the TwinCAT project and start the PLC project.

⇨ Both adapters should indicate an active link by having the variables **bLinkA** and **bLinkB** both TRUE.



⇨ For example, if you now disconnect the Ethernet cable from the adapter **X001**, this is immediately detected and indicated by a change of the variable **bLinkB** to FALSE.

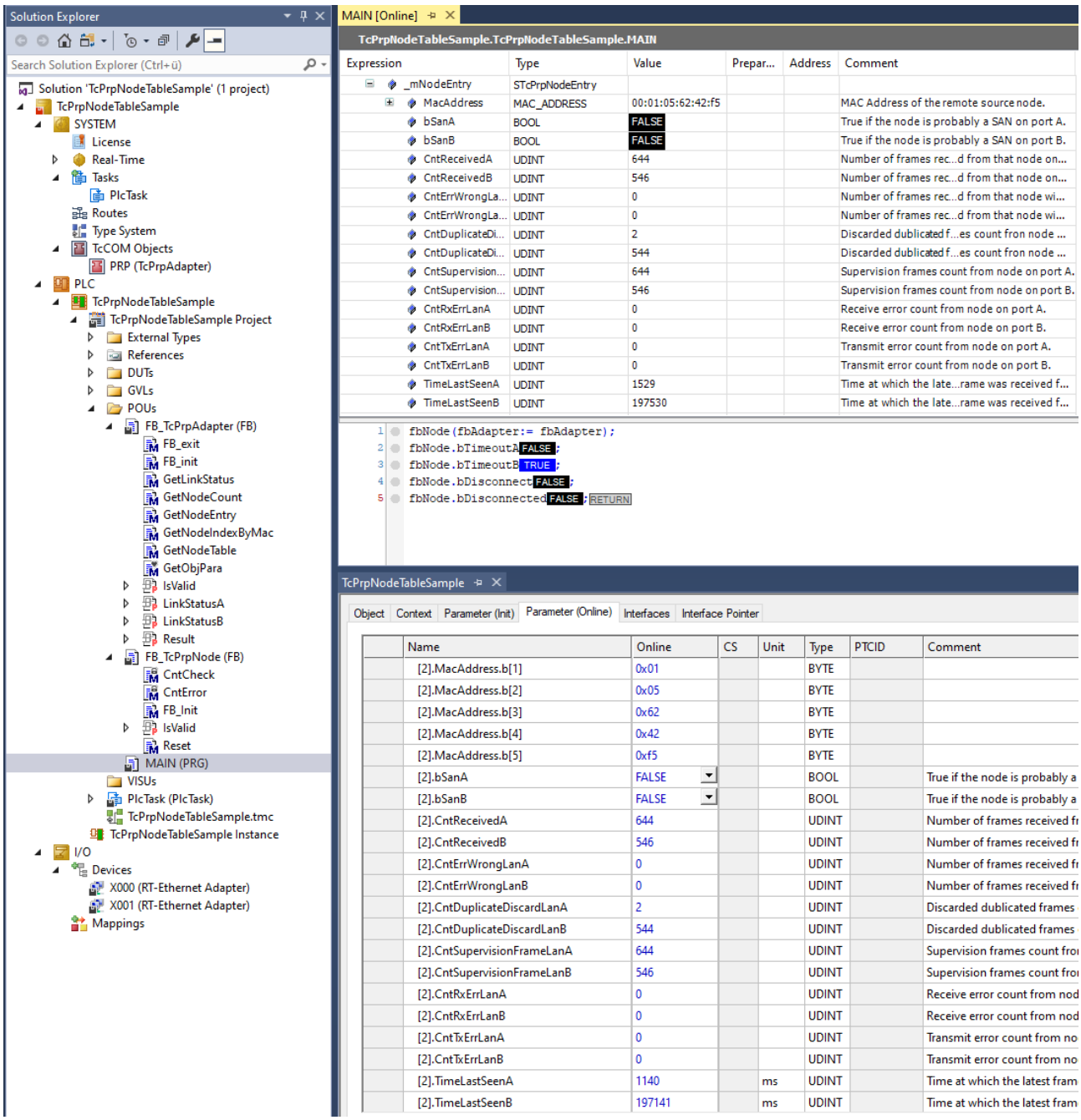


6.2 Evaluate the Node Table

Download: https://github.com/Beckhoff/TF6230_Samples/tree/main/TcPrpNodeTableSample

Building on the previous sample, the "Node Table" with the TcPrpNodeEntry structure [▶ 17] is also queried here. The table of nodes in the network is read from the TwinCAT PRP module using ADS Read (see FB_TcPrpAdapter.GetNodeTable) and a specific node in the list is searched for and evaluated on the basis of a defined MAC address (see FB_TcPrpAdapter.GetNodeIndexByMac and FB_TcPrpAdapter.GetNodeEntry).

The various values from the "Node Entry" are summarized using LAN-A and LAN-B to determine whether communication to the node has been interrupted. If no frames from the respective LAN were received by this node for more than two seconds, this is recognized as a "Timeout" (see FB_TcPrpNode.bTimeout{A,B}). If neither frames on LAN-A nor on LAN-B are detected, this is indicated as "Disconnect" (see FB_TcPrpNode.bDisconnect).


Solution Explorer
Search Solution Explorer (Ctrl+ü)
Solution 'TcPrpNodeTableSample' (1 project)
TcPrpNodeTableSample
SYSTEM
License
Real-Time
Tasks
PlcTask
Routes
Type System
TcCOM Objects
PRP (TcPrpAdapter)
PLC
TcPrpNodeTableSample
TcPrpNodeTableSample Project
External Types
References
DUTs
GVLs
POUs
FB_TcPrpAdapter (FB)
FB_exit
FB_init
GetLinkStatus
GetNodeCount
GetNodeEntry
GetNodeIndexByMac
GetNodeTable
GetObjPara
IsValid
LinkStatusA
LinkStatusB
Result
FB_TcPrpNode (FB)
CntCheck
CntError
FB_Init
IsValid
Reset
MAIN (PRG)
VISUs
PlcTask (PlcTask)
TcPrpNodeTableSample.tmc
TcPrpNodeTableSample Instance
I/O
Devices
X000 (RT-Ethernet Adapter)
X001 (RT-Ethernet Adapter)
Mappings
MAIN [Online]
TcPrpNodeTableSample.TcPrpNodeTableSample.MAIN
Expression
Type
Value
Prepar...
Address
Comment
_mNodeEntry
STcPrpNodeEntry
MacAddress
MAC_ADDRESS
00:01:05:62:42:f5
MAC Address of the remote source node.
bSanA
BOOL
FALSE
True if the node is probably a SAN on port A.
bSanB
BOOL
FALSE
True if the node is probably a SAN on port B.
CntReceivedA
UDINT
644
Number of frames rec...d from that node on...
CntReceivedB
UDINT
546
Number of frames rec...d from that node on...
CntErrWrongLa...
UDINT
0
Number of frames rec...d from that node wi...
CntErrWrongLa...
UDINT
0
Number of frames rec...d from that node wi...
CntDuplicateDi...
UDINT
2
Discarded dublicated f...es count fron node ...
CntDuplicateDi...
UDINT
544
Discarded dublicated f...es count fron node ...
CntSupervision...
UDINT
644
Supervision frames count from node on port A.
CntSupervision...
UDINT
546
Supervision frames count from node on port B.
CntRxErrLanA
UDINT
0
Receive error count from node on port A.
CntRxErrLanB
UDINT
0
Receive error count from node on port B.
CntTxErrLanA
UDINT
0
Transmit error count from node on port A.
CntTxErrLanB
UDINT
0
Transmit error count from node on port B.
TimeLastSeenA
UDINT
1529
Time at which the late...rame was received f...
TimeLastSeenB
UDINT
197530
Time at which the late...rame was received f...
1 fbNode(fbAdapter:= fbAdapter);
2 fbNode.bTimeoutA FALSE;
3 fbNode.bTimeoutB TRUE;
4 fbNode.bDisconnect FALSE;
5 fbNode.bDisconnected FALSE; RETURN
TcPrpNodeTableSample
Object
Context
Parameter (Init)
Parameter (Online)
Interfaces
Interface Pointer
Name
Online
CS
Unit
Type
PTCID
Comment
[2].MacAddress.b[1]
0x01
BYTE
[2].MacAddress.b[2]
0x05
BYTE
[2].MacAddress.b[3]
0x62
BYTE
[2].MacAddress.b[4]
0x42
BYTE
[2].MacAddress.b[5]
0xf5
BYTE
[2].bSanA
FALSE
BOOL
True if the node is probably a
[2].bSanB
FALSE
BOOL
True if the node is probably a
[2].CntReceivedA
644
UDINT
Number of frames received fr
[2].CntReceivedB
546
UDINT
Number of frames received fr
[2].CntErrWrongLanA
0
UDINT
Number of frames received fr
[2].CntErrWrongLanB
0
UDINT
Number of frames received fr
[2].CntDuplicateDiscardLanA
2
UDINT
Discarded dublicated frames
[2].CntDuplicateDiscardLanB
544
UDINT
Discarded dublicated frames
[2].CntSupervisionFrameLanA
644
UDINT
Supervision frames count fro
[2].CntSupervisionFrameLanB
546
UDINT
Supervision frames count fro
[2].CntRxErrLanA
0
UDINT
Receive error count from nod
[2].CntRxErrLanB
0
UDINT
Receive error count from nod
[2].CntTxErrLanA
0
UDINT
Transmit error count from no
[2].CntTxErrLanB
0
UDINT
Transmit error count from no
[2].TimeLastSeenA
1140
ms
UDINT
Time at which the latest fram
[2].TimeLastSeenB
197141
ms
UDINT
Time at which the latest fram

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