Technical Instructions for Configuring an ISO-on-TCP Connection
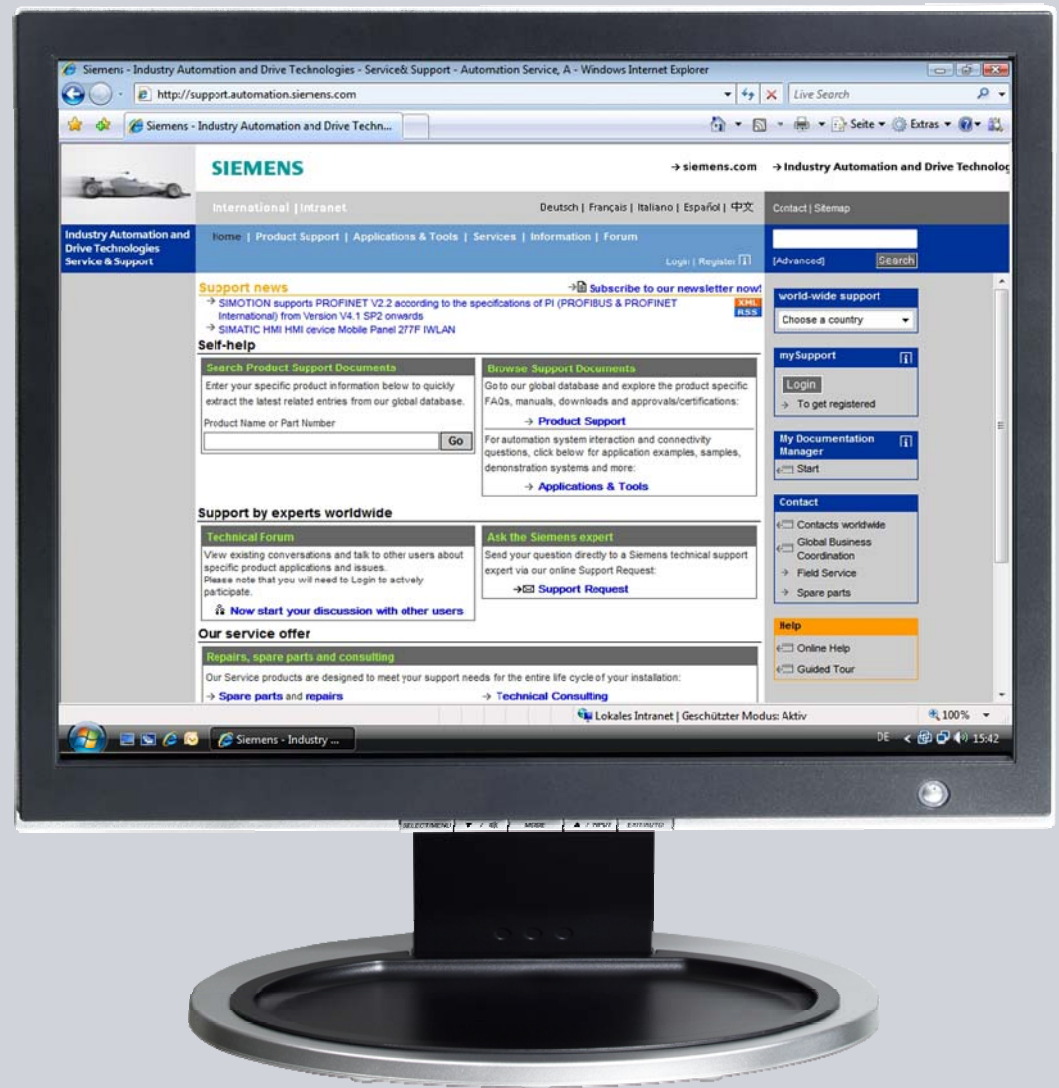
S7-300 / S7-400 Industrial Ethernet CPs

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Question

How do you configure an ISO-on-TCP connection for data exchange between S7-300 and / or S7-400 over Industrial Ethernet CPs?

Answer

The instructions and notes listed in this document provide a detailed answer to this question.

Technical instructions on configuring an ISO-on-TCP connection
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2   400 over Industrial Ethernet CPs?

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1 Introduction

You can use the open communication through ISO-on-TCP connections for data exchange by way of the Industrial Ethernet CPs of S7-300 and S7-400.

In this example an S7-300 is connected over the PROFINET interface of the CP343-1 on the subnetwork 172.16.0.0. The S7-400 on the other hand is connected over the GBIT interface of the CP443-1 Advanced on the subnetwork 172.16.0.0. The PROFINET interface of the CP443-1 Advanced is connected on the subnetwork 192.168.99.0.

Configuration overview

Figure 1-1 shows an overview of the configuration.

Figure 1-1
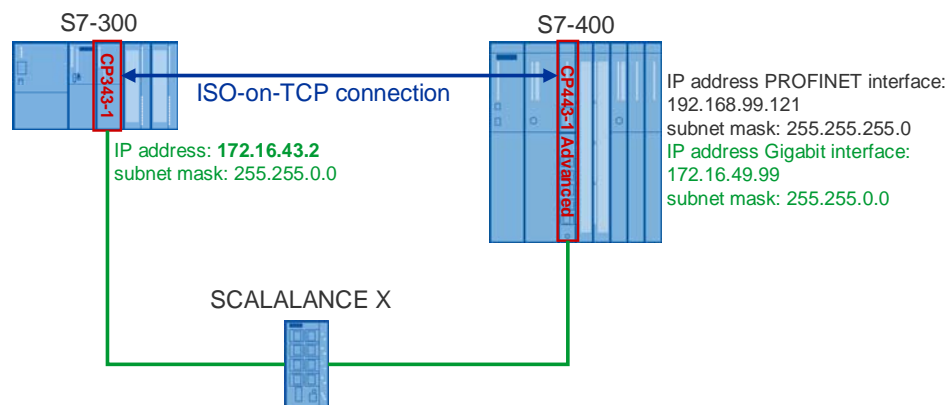
2 Configuration

Below we describe how to configure an ISO-on-TCP connection for sending and receiving data by way of an Industrial Ethernet CP of S7-300 and S7-400.

2.1 Configuring CP343-1 and CP443-1 Advanced

2.1.1 Assigning IP addresses to CP343-1 and CP443-1 Advanced
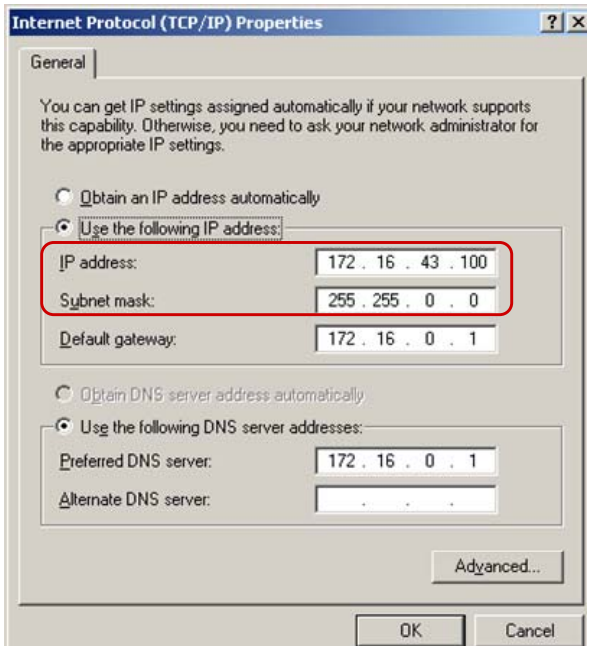
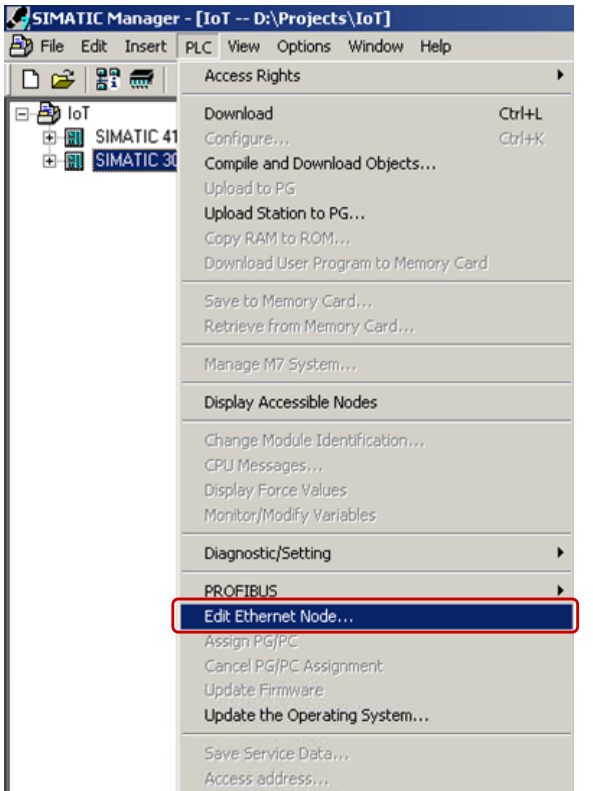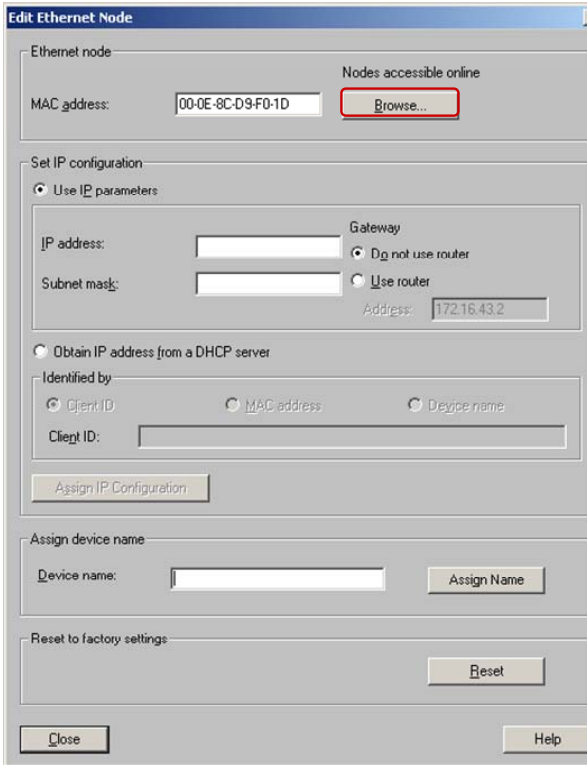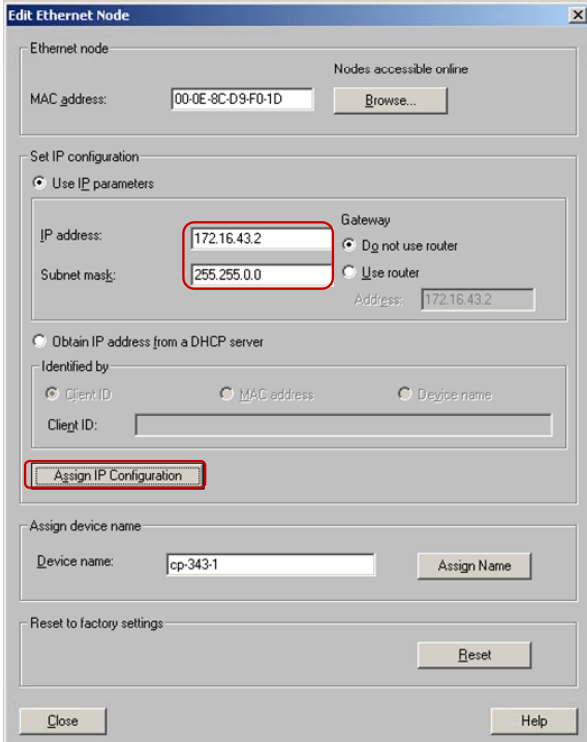The following IP addresses are used in this configuration.

Table 2-1

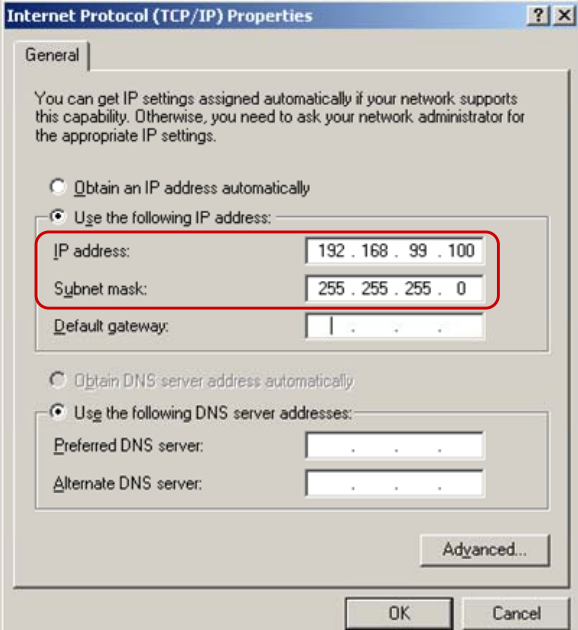| Industrial Ethernet CP	Interface	IP address	Subnet mask
CP343-1	PROFINET	172.16.43.2	255.255.0.0
CP443-1 Advanced	PROFINET	192.168.99.121	255.255.255.0
CP443-1 Advanced	GBIT	172.16.49.99	255.255.0.0

Assign the IP addresses to CP343-1 and CP443-1 Advanced.

Follow the instructions below for assigning the IP addresses.

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Table 2-2

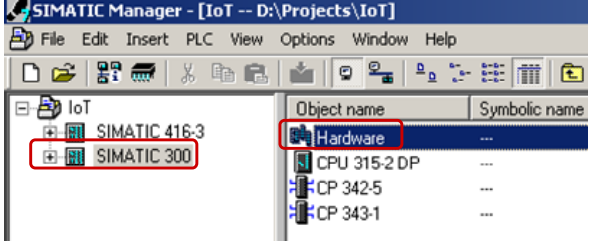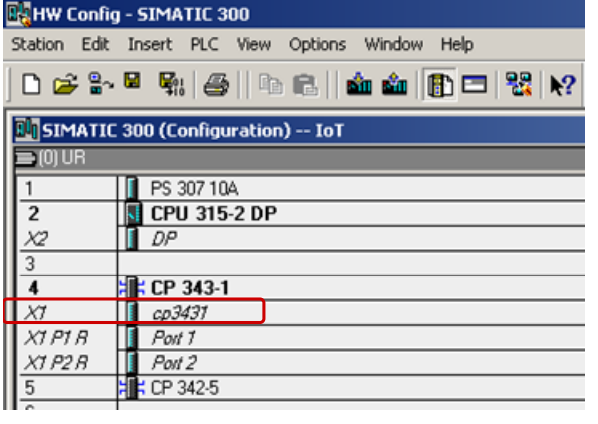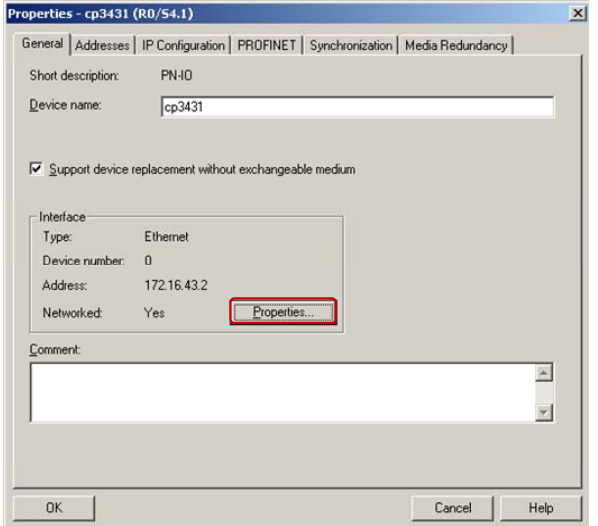| No.	Configuration step	Note
1.	Connect the SIMATIC Field PG on which the configuration created with STEP 7 is stored to the PROFINET interface of CP343-1. In `Windows network settings` → `LAN` (Local Area Network) of the SIMATIC Field PG you enter an IP address that is in the same subnetwork as that of CP343-1. In this example the IP address 172.16.43.100 and subnetwork mask 255.255.0.0 are used for the SIMATIC Field PG.	
2.	In the SIMATIC Manager you open the STEP 7 project that contains the configurations of S7-300 and S7-400 between which the data is to be exchanged over an ISO-on-TCP connection. By means of the menu `PLC` → `Edit Ethernet Node` you open the "Edit Ethernet Node" dialog.	

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6   400 over Industrial Ethernet CPs?

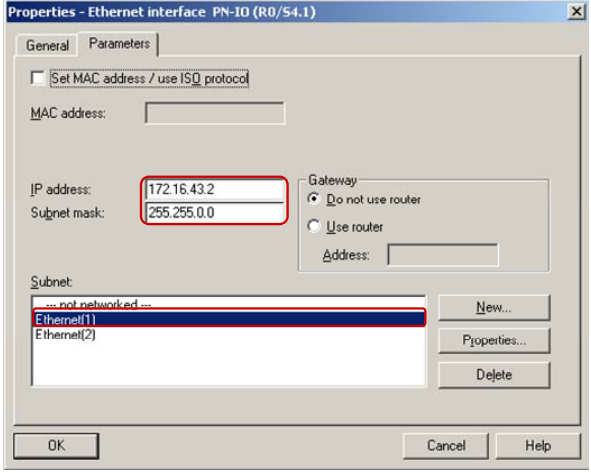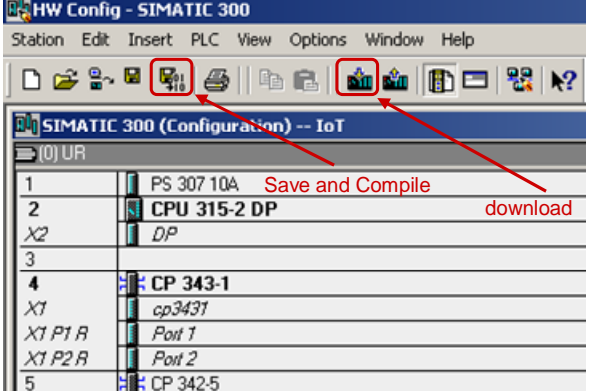| No.	Configuration step	Note
3.	In the "Edit Ethernet Node" dialog you click the "Browse..." button and select the MAC address of CP343-1.	
4.	Enter the IP address and subnet mask of CP343-1. Click the "Assign IP Configuration" button to assign the IP address entered to CP343-1. Then click the "Close" button to close the "Edit Ethernet Node" dialog.	
5.	Enter the assigned IP address in the Hardware Configuration of the S7-300 station and download the configuration into the S7-300 CPU.	See section 2.1.2.

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No.	Configuration step	Note
6.	Connect the SIMATIC Field PG on which the configuration created with STEP 7 is stored to the PROFINET interface of CP443-1 Advanced. In `Windows network settings` → `LAN` (Local Area Network) of the SIMATIC Field PG you enter an IP address that is in the same subnetwork as that of CP443-1. In this example the IP address 192.168.99.100 and subnetwork mask 255.255.255.0 are used for the SIMATIC Field PG.	
7.	Repeat configuration steps 2 to 4 to assign the IP address 192.168.99.121 and subnet mask 255.255.255.0 to CP443-1 Advanced.	
8.	Enter the assigned IP address in the Hardware Configuration of the S7-400 station and download the configuration into the S7-400 CPU.	See section 2.1.3.

2.1.2 Entering the IP address of CP343-1 in the Hardware Configuration and downloading the configuration into the CPU

After you have assigned the IP address 172.16.43.2 and subnet mask 255.255.0.0 to CP343-1 you enter the assigned IP address in the Hardware Configuration.
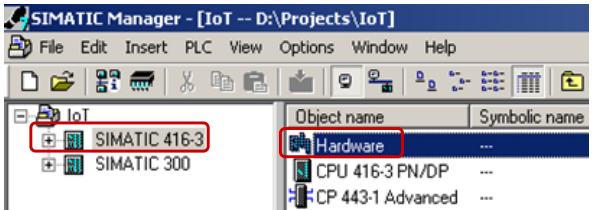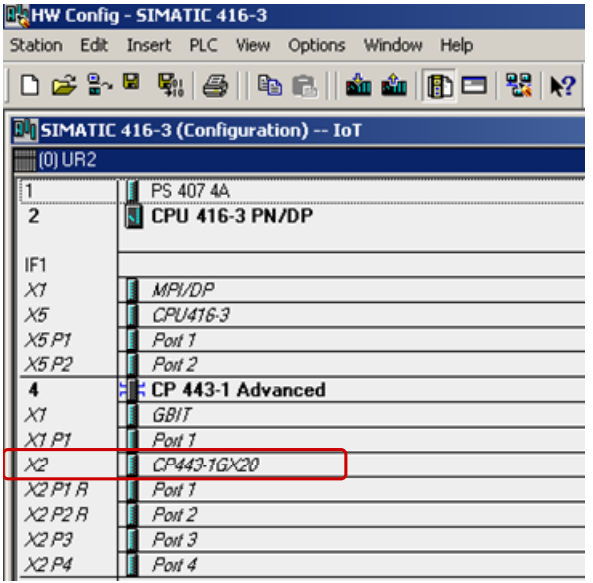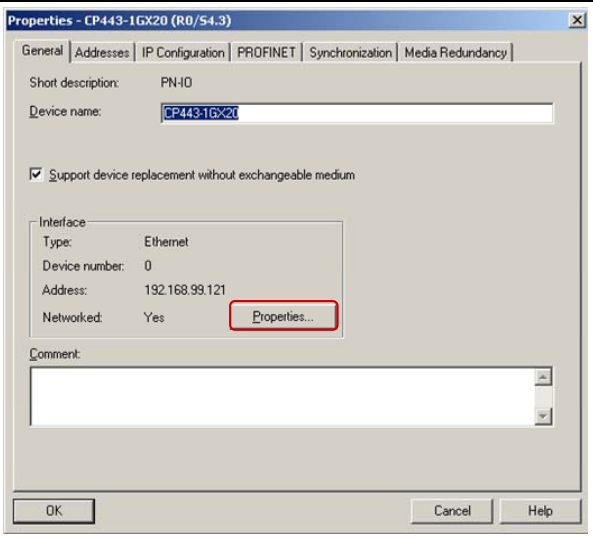
Table 2-3

No.	Configuration step	Note
1.	In the SIMATIC Manager you mark the SIMATIC S7 300 station and double-click "Hardware" in order to open the Hardware Configuration of the S7-300 station.	
2.	In the Hardware Configuration of S7-300 you double-click the PROFINET interface of CP343-1. The Properties dialog of the PROFINET interface opens.	
3.	In the Properties dialog of the PROFINET interface you click the "Properties..." button to open the "Properties - Ethernet interface PN-IO" dialog.	

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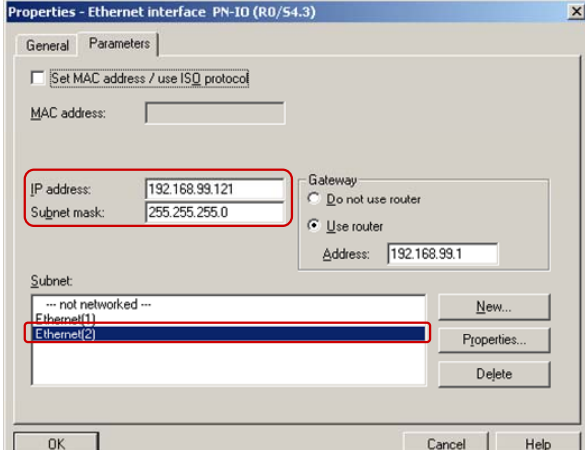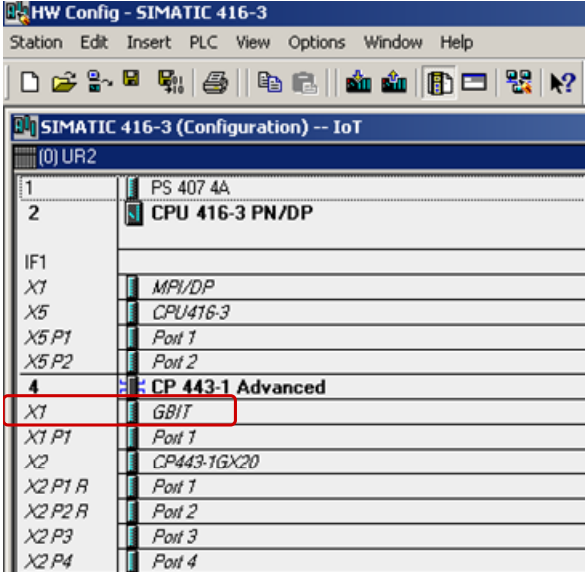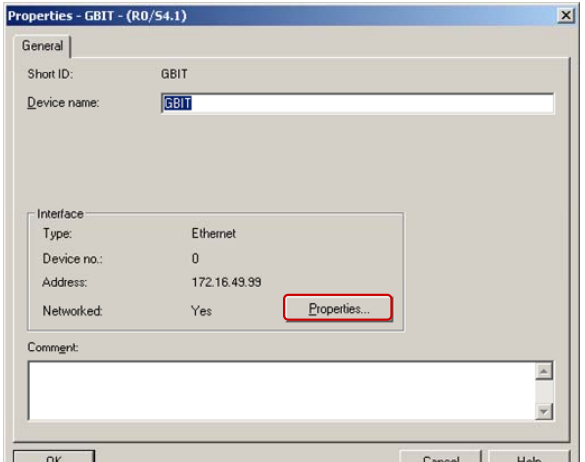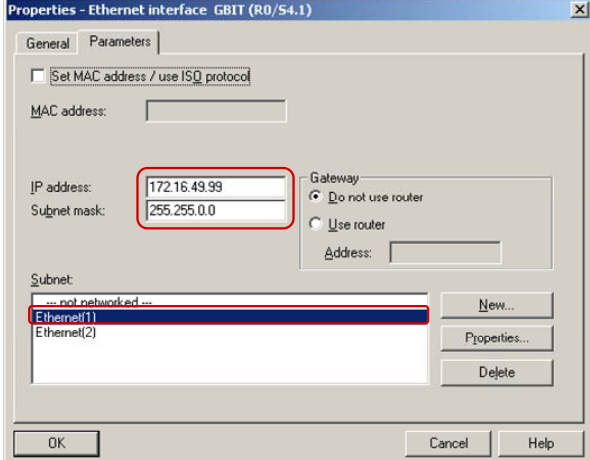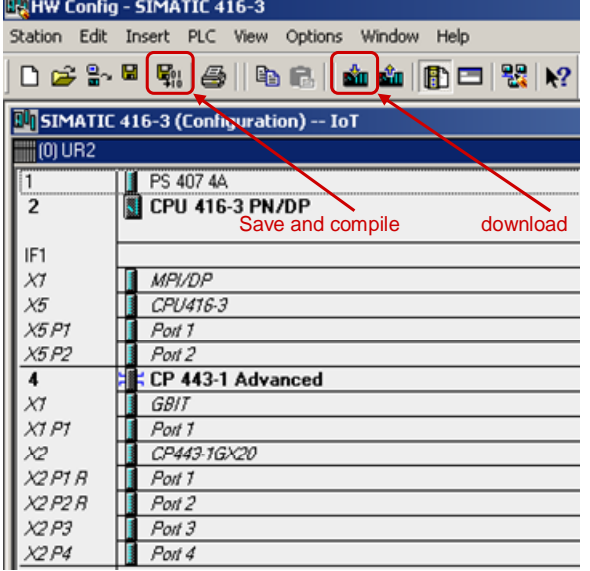| No.	Configuration step	Note
4.	Enter the IP address 172.16.43.2 and subnet mask 255.255.0.0, which you have already assigned to CP343-1. Assign an existing subnet to CP343-1 or click the "New..." button to create a new subnet. Apply the settings with "OK".	
5.	Save and compile the hardware configuration of the S7-300 and then load the configuration into the S7-300 CPU.	

2.1.3 Entering the IP address of CP443-1 Advanced in the Hardware Configuration and downloading the configuration into the CPU

After you have assigned the IP address 192.168.99.121 and subnet mask 255.255.255.0 to CP343-1 you enter the assigned IP address in the Hardware Configuration.

Table 2-4

No.	Configuration step	Note
1.	In the SIMATIC Manager you mark the SIMATIC S7 400 station and double-click "Hardware" in order to open the Hardware Configuration of the S7-400 station.	
2.	In the Hardware Configuration of S7-400 you double-click the PROFINET interface of CP443-1 Advanced. The Properties dialog of the PROFINET interface opens.	
3.	In the Properties dialog of the PROFINET interface you click the "Properties..." button to open the "Properties - Ethernet interface PN-IO" dialog.	

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No.	Configuration step	Note
4.	Enter the IP address 192.168.99.121 and subnet mask 255.255.255.0, which you have already assigned to CP443-1 Advanced. Assign a subnet to the PROFINET interface of CP443-1 Advanced. In this example the subnet assigned to the PROFINET interface of CP443-1 Advanced is different to that assigned to the PROFINET interface of CP343-1. Apply the settings with "OK".	
5.	In the Hardware Configuration of S7-400 you double-click the GBIT interface of CP443-1 Advanced. The Properties dialog of the GBIT interface opens.	
6.	In the Properties dialog of the GBIT interface you click the "Properties..." button to open the "Properties - Ethernet interface GBIT" dialog.	

No.	Configuration step	Note
7.	Enter the IP address 172.16.49.99 and the subnet mask 255.255.0.0. Assign the same subnet to the GBIT interface of CP443-1 Advanced as to the PROFINET interface of CP343-1. Apply the settings with "OK".	
8.	Save and compile the hardware configuration of the S7-400 and then load the configuration into the S7-400 CPU.	

2.2   Configuring an ISO-on-TCP Connection

Once you have completed configuration of CP343-1 and CP443-1 Advanced and have downloaded the hardware configuration into the S7-300 CPU and the S7-400 CPU, then you configure the ISO-on-TCP connection for data exchange between S7-300 and S7-400 by way of Industrial Ethernet CPs. The ISO-on-TCP connection is configured bilaterally in the S7-300 and in the S7-400.

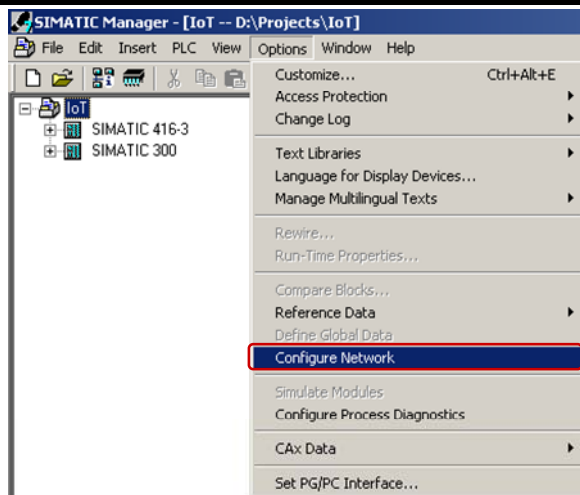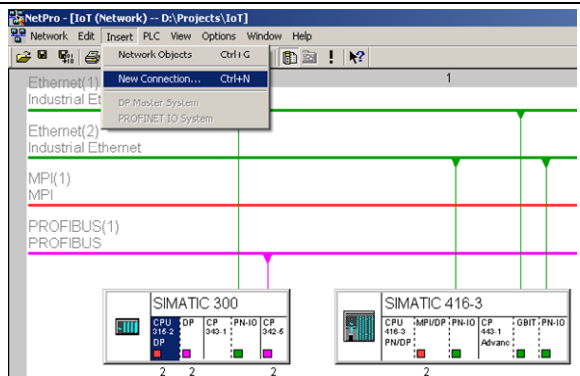### 2.2.1   Configuring specified ISO-on-TCP connections

If the S7-300 and S7-400 between which there is data exchange are configured in the same STEP 7 project, then you configure a specified ISO-on-TCP connection.

Below we describe how to configure a specified ISO-on-TCP connection for data exchange between an S7-300 and S7-400 by way of Industrial Ethernet CPs using the connection parameters below.
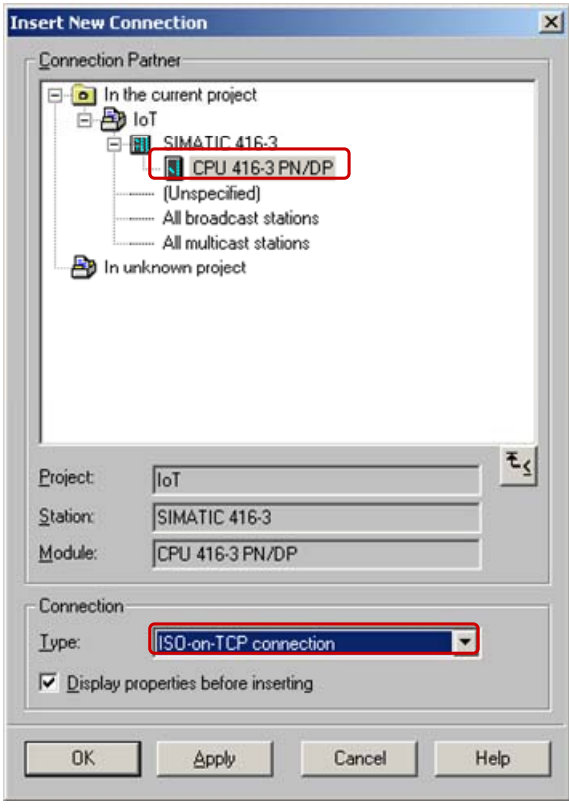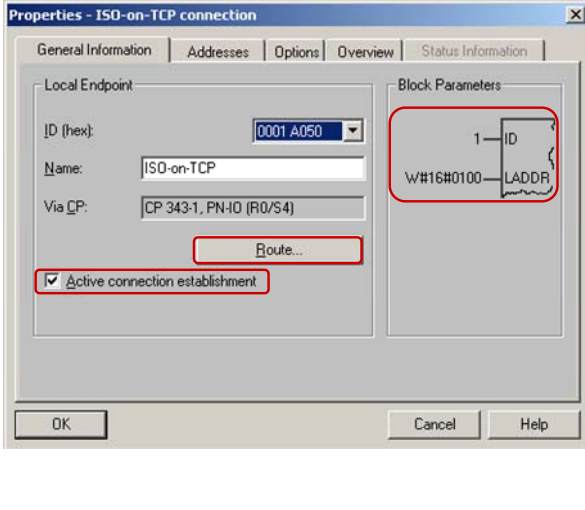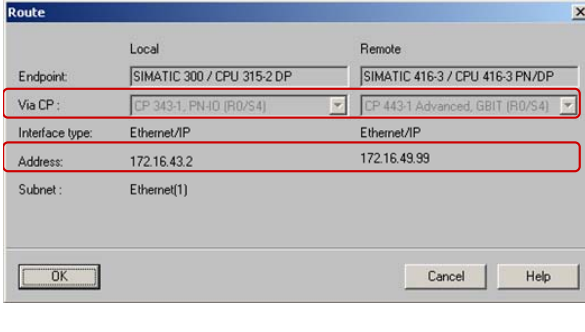
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Table 2-5

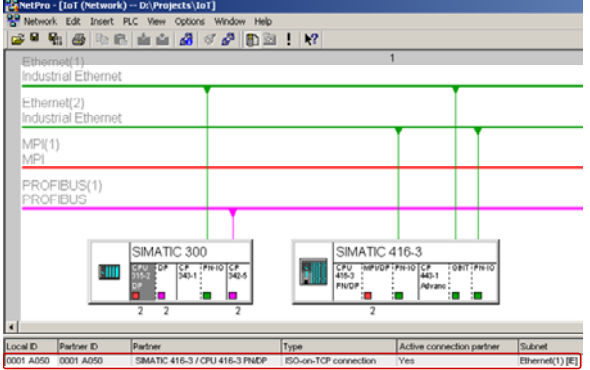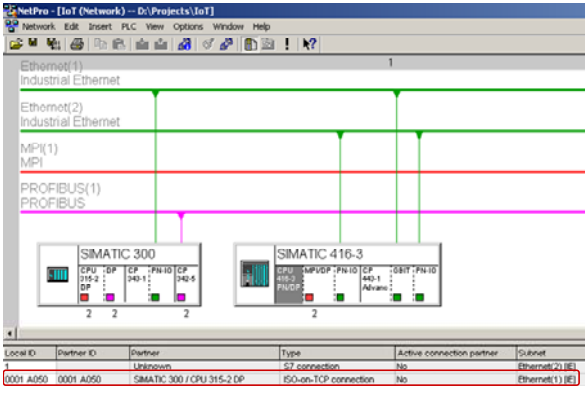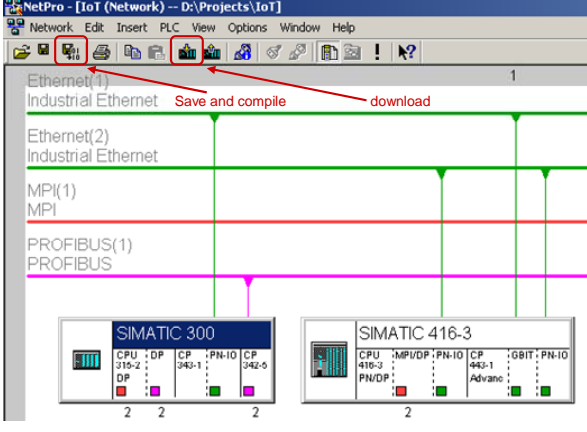| Connection parameters	S7-300	S7-400
Connection partners	S7-400 CPU	S7-300 CPU
Connection type	ISO-on-TCP connection	ISO-on-TCP connection
IP address	172.16.43.2	172.16.49.99
Connection setup	Active	Passive
ID (connection number)	1	1
LADDR (module start address)	W#16#0100	W#16#3FFA
Local TSAP (ASCI)	TCP-1	TCP-1
Local TSAP (HEX)	54.43.50.2D.31	54.43.50.2D.31
Partner TSAP (ASCI)	TCP-1	TCP-1
Partner TSAP (HEX)	54.43.50.2D.31	54.43.50.2D.31
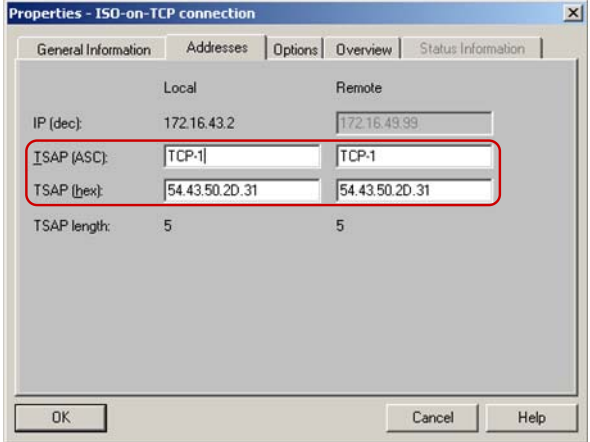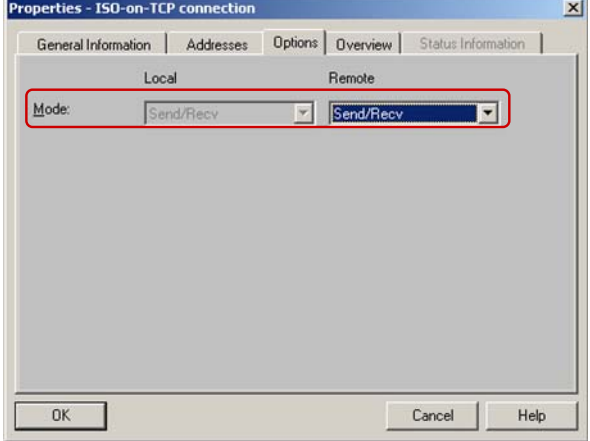
Table 2-6

No.	Configuration step	Note
1.	In the SIMATIC Manager you open the STEP 7 project that contains the configurations of S7-300 and/or S7-400 between which the data is to be exchanged over an ISO-on-TCP connection. By means of the menu Options → Configure Network you open NetPro where you configure the ISO-on-TCP connection.	
2.	Mark the CPU of the SIMATIC 300 station and create a new connection by means of the menu Insert → New Connection….	

No.	Configuration step	Note
3.	In the "Insert New Connection" dialog you select the S7-400 CPU as connection partner. Select "ISO-on-TCP connection" as the connection type. Then click the "Apply" button to open the Properties dialog of the ISO-on-TCP connection.	
4.	In the Properties dialog of the ISO-on-TCP connection → "General" tab you determine the connection number and module start address of CP343-1 via the block parameters "ID" and "LADDR". You specify the values at the input parameters "ID" and "LADDR" when you call the functions FC5 "AG_SEND" and FC6 "AG_RECV". These functions are called in the user program of the CPU and are for sending and receiving data. Activate the function "Active connection establishment" because the S7-300 actively establishes the ISO-on-TCP connection. Double-click the "Route..." button.	
5.	In the "Route" dialog you see that the ISO-on-TCP connection is established between the IP addresses 172.16.43.2 and 172.16.49.99, i.e. the data is exchanged between S7-300 and S7-400 via CP343-1 and the GBIT interface of CP443-1. Close the dialog with "OK" and switch to the "Addresses" tab in the Properties dialog of the ISO-on-TCP connection.	

No.	Configuration step	Note
6.	In the Properties dialog of the ISO-on-TCP connection → "Addresses" tab you enter the local TSAP and the partner TSAP. This defines the local connection end point in the S7-300 and the connection end point in the communication partner. In the Properties dialog of the ISO-on-TCP connection you switch to the "Options" tab.	
7.	In the Properties dialog of the ISO-on-TCP connection → "Options" tab you select the "Send/Recv" mode locally in the S7-300 and in the communication partner. Apply the settings with "OK".	
8.	Mark the CPU of the SIMATIC 300 station. The configured ISO-on-TCP connection is now displayed in the connection table.	

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16   400 over Industrial Ethernet CPs?

No.	Configuration step	Note
9.	Mark the CPU of the SIMATIC 400 station. The configured ISO-on-TCP connection is now displayed in the connection table.	
10.	Once you have completed the connection configuration, you save and compile the configuration. Mark the SIMATIC 300 station and download the configuration into the S7-300 CPU. Then mark the SIMATIC 400 station and download the configuration into the S7-400 CPU.	
11.	In the user program of the S7-300 you call the functions FC5 "AG_SEND" and FC6 "AG_RECV".	You will find the functions FC5 "AG_SEND" and FC6 "AG_RECV" in the library "SIMATIC_NET_CP → CP 300 → Blocks". At the link below is a sample program for the S7-300 with the call of the functions FC5 "AG_SEND" and FC6 "AG_RECV". http://support.automation.siemens.com/WW/view/de/17853532
12.	In the user program of the S7-400 you call the functions FC50 "AG_LSEND" and FC60 "AG_LRECV".	You will find the functions FC50 "AG_LSEND" and FC60 "AG_LRECV" in the library "SIMATIC_NET_CP → CP 400 → Blocks". At the link below is a sample program for the S7-400 with the call of the functions FC50 "AG_LSEND" and FC60 "AG_LRECV". http://support.automation.siemens.com/WW/view/de/24693800

2.2.2 Configuring unspecified ISO-on-TCP connections

If the S7-300 and S7-400 between which there is data exchange are configured in different STEP 7 projects, then you configure an unspecified ISO-on-TCP connection.

Below we describe how to configure an **unspecified** ISO-on-TCP connection for data exchange between an S7-300 and S7-400 by way of Industrial Ethernet CPs using the connection parameters below.
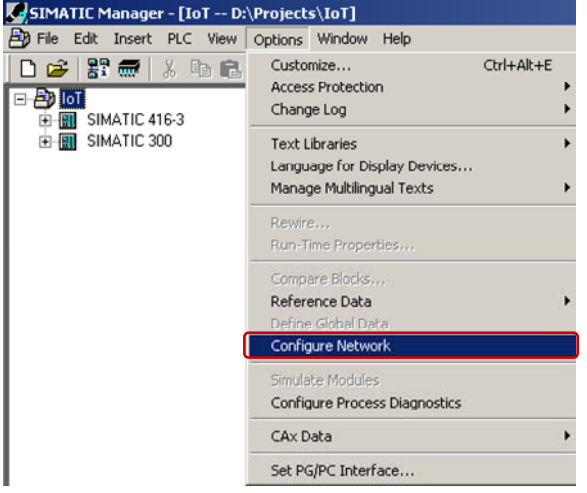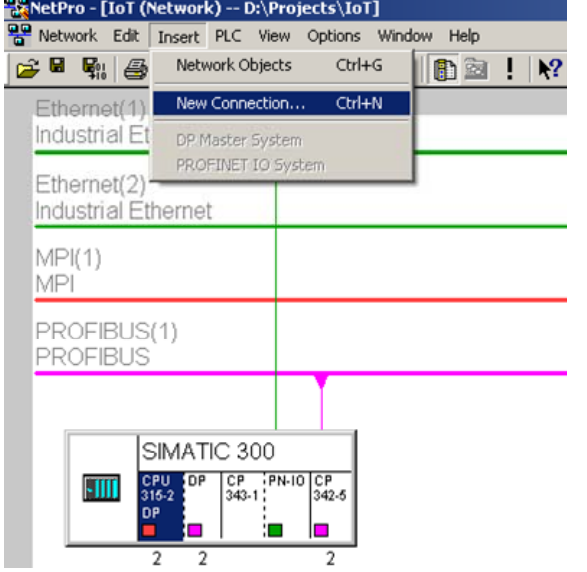
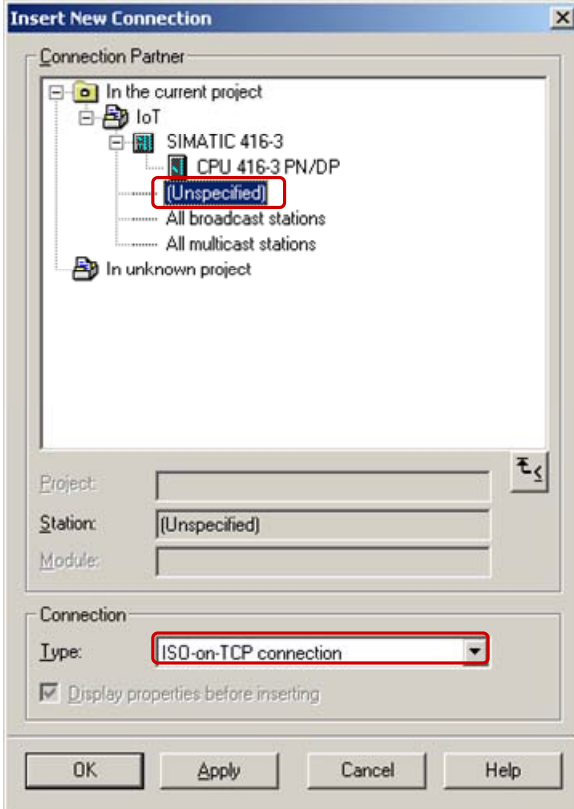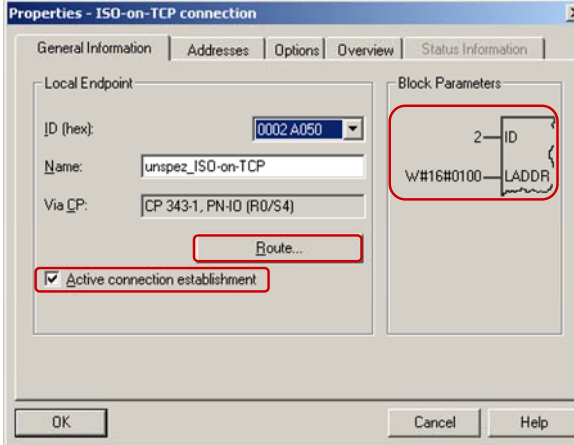Technical instructions on configuring an ISO-on-TCP connection
V1.0 , Entry ID: How do you configure an ISO-on-TCP connection for data exchange between S7-300 and/or
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Table 2-7

Connection parameters	S7-300	S7-400
Connection partners	S7-400 CPU	S7-300 CPU
Connection type	ISO-on-TCP	ISO-on-TCP
IP address	172.16.43.2	172.16.49.99
Connection setup	Active	Passive
ID (connection number)	2	2
LADDR (module start address)	W#16#0100	W#16#3FFA
Local TSAP (ASCI)	TCP-2	TCP-3
Local TSAP (HEX)	54.43.50.2D.32	54.43.50.2D.33
Partner TSAP (ASCI)	TCP-3	TCP-2
Partner TSAP (HEX)	54.43.50.2D.33	54.43.50.2D.32

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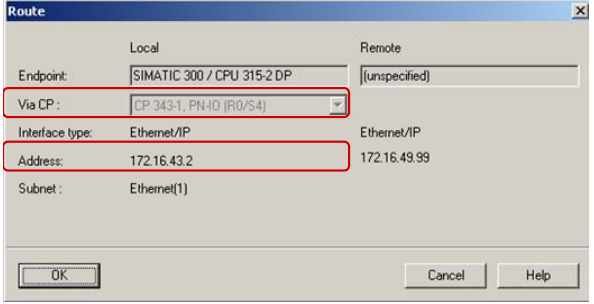18   400 over Industrial Ethernet CPs?
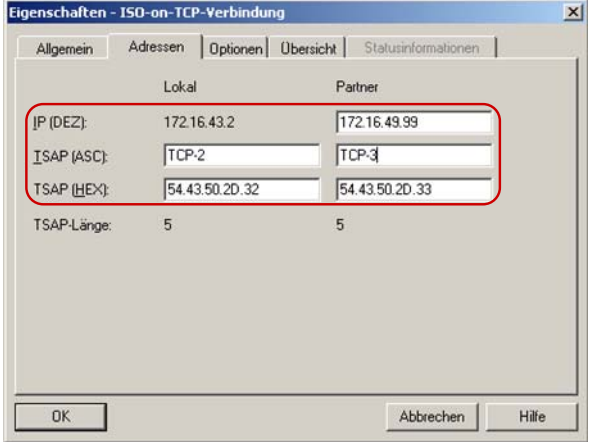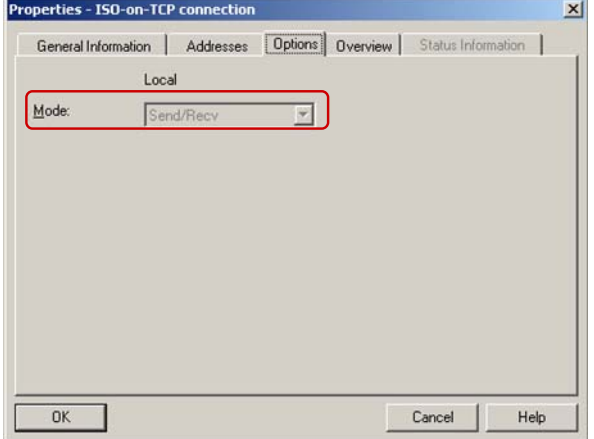
Configuring an unspecified ISO-on-TCP connection for the S7-300

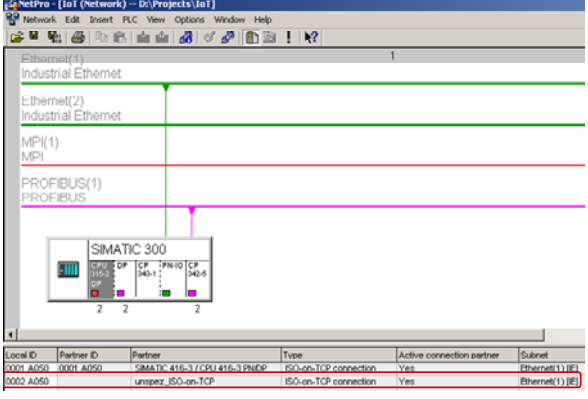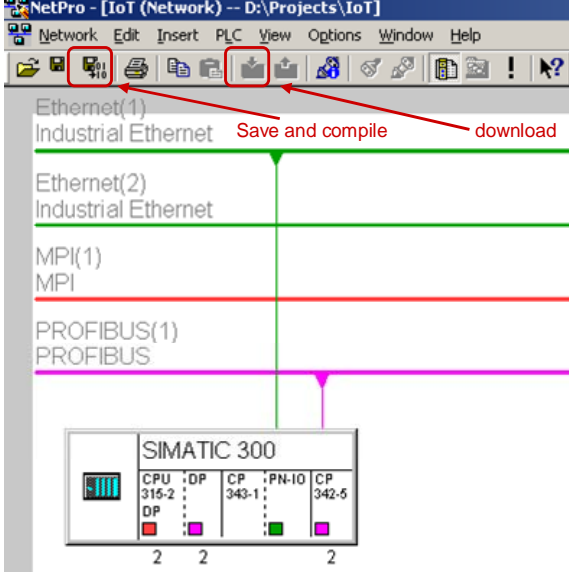Follow the instructions below to configure an unspecified ISO-on-TCP connection for the S7-300.

Table 2-8

No.	Configuration step	Note
1.	In the SIMATIC Manager you open the STEP 7 project that contains the configuration of S7-300 which is to send and receive the data over an ISO-on-TCP connection. By means of the menu `Options →` `Configure Network` you open NetPro where you configure the ISO-on-TCP connection.	
2.	Mark the CPU of the SIMATIC 300 station and create a new connection by means of the menu `Insert →` `New Connection....`	

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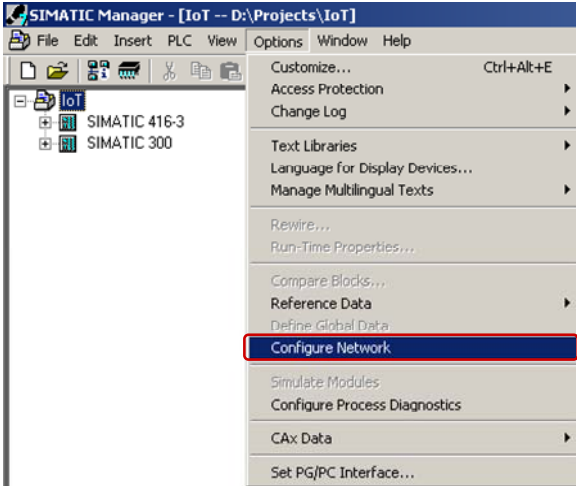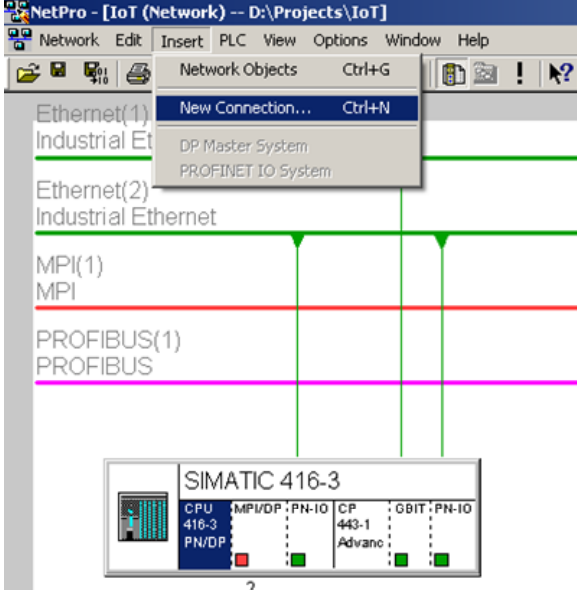| No.	Configuration step	Note
3.	In the "Insert New Connection" dialog you select the item "unspecified" as connection partner. Select "ISO-on-TCP connection" as the connection type. Then click the "Apply" button to open the Properties dialog of the ISO-on-TCP connection.	
4.	In the Properties dialog of the ISO-on-TCP connection → "General" tab you determine the block parameters "ID" and "LADDR". The block parameter ID provides the connection number. The block parameter LADDR provides the module start address of CP343-1. You specify the connection number and the module start address at the input parameters "ID" and "LADDR" respectively when you call the functions FC5 "AG_SEND" and FC6 "AG_RECV". These functions are called in the user program of the CPU and are for sending and receiving data. Activate the function "Active connection establishment" because the S7-300 actively establishes the ISO-on-TCP connection. Double-click the "Route..." button.	

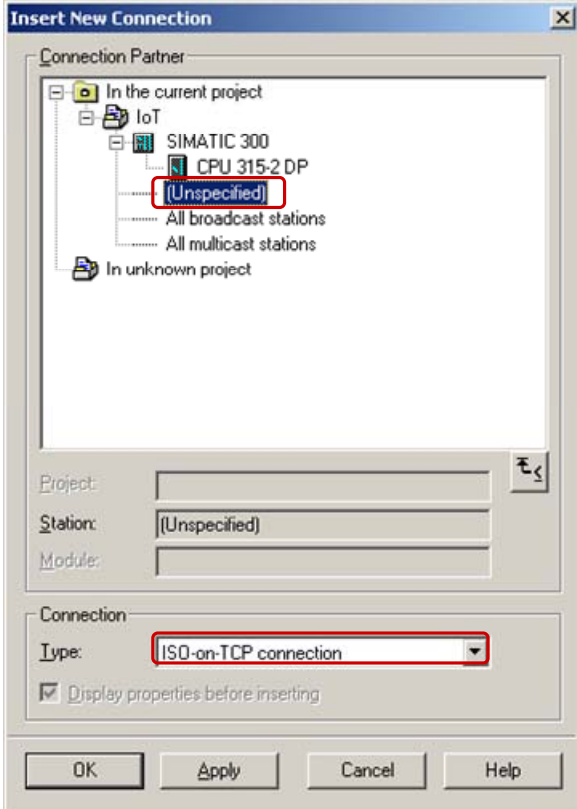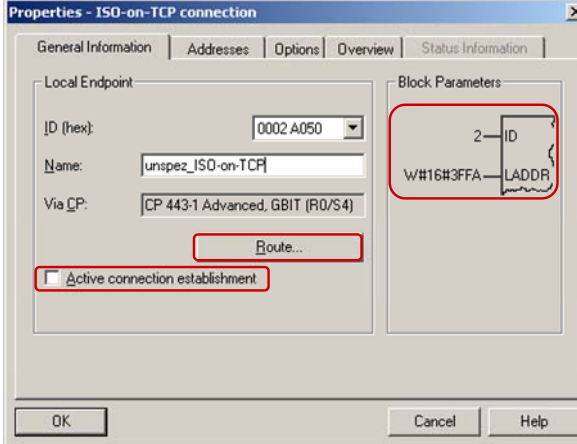| No.	Configuration step	Note
5.	In the "Route" dialog you see that the ISO-on-TCP connection to the communication partner is established by way of the IP address 172.16.43.2, i.e. the data is exchanged with the communication partner by way of the CP343-1. Close the dialog with "OK" and switch to the "Addresses" tab in the Properties dialog of the ISO-on-TCP connection.	
6.	In the Properties dialog of the ISO-on-TCP connection → "Addresses" tab you enter the IP address of the communication partner, i.e. in this example you enter the IP address 172.16.49.99 of CP443-1 Advanced. Then you enter the local TSAP and the partner TSAP. This defines the local connection end point in the S7-300 and the connection end point in the communication partner. In the Properties dialog of the ISO-on-TCP connection you switch to the "Options" tab. **Note:** In the SIMATIC 300 station you enter the local TSAP of the SIMATIC S7-400 as the partner TSAP.	
7.	In the Properties dialog of the ISO-on-TCP connection → "Options" tab you select the "Send/Recv" mode. Apply the settings with "OK".	

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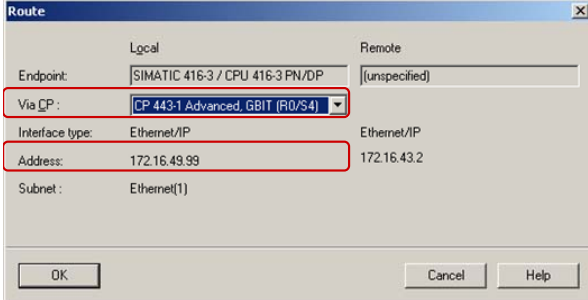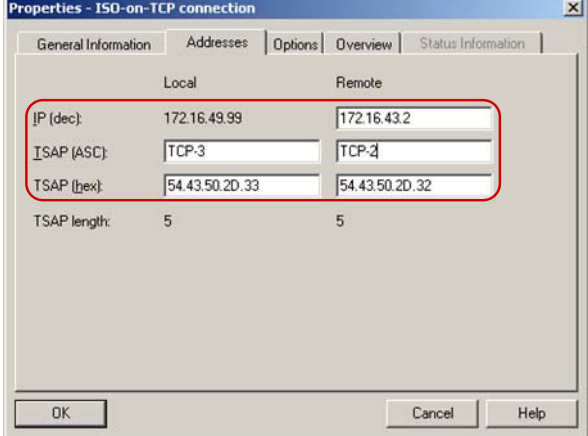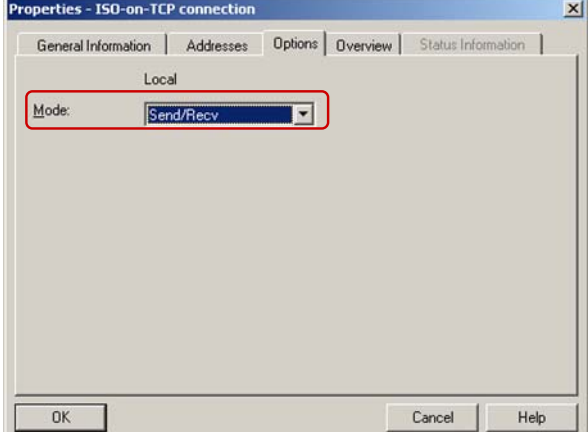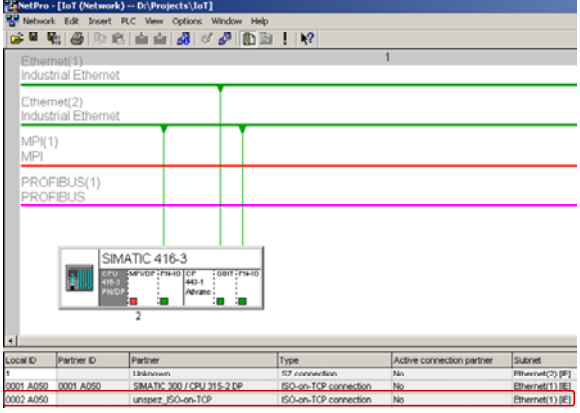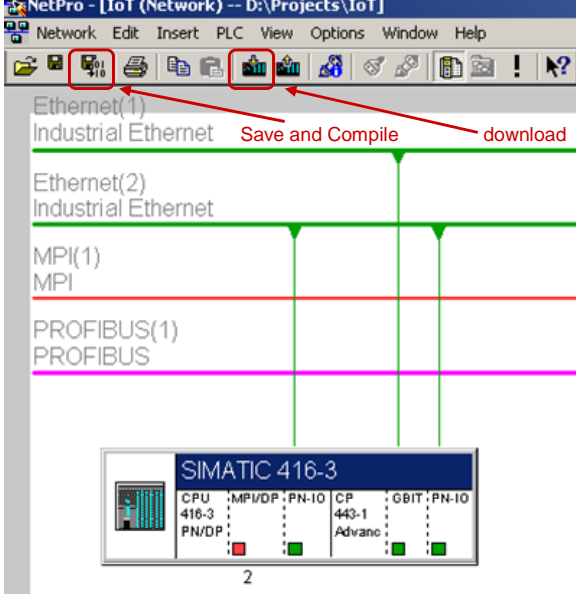| No.	Configuration step	Note
8.	Mark the CPU of the SIMATIC 300 station. The configured ISO-on-TCP connection is now displayed in the connection table.	
9.	Once you have completed the connection configuration, you save and compile the configuration. Mark the SIMATIC 300 station and download the configuration into the S7-300 CPU.	
10.	In the user program of the S7-300 you call the functions FC5 "AG_SEND" and FC6 "AG_RECV".	You will find the functions FC5 "AG_SEND" and FC6 "AG_RECV" in the library "SIMATIC_NET_CP → CP 300 → Blocks". At the link below is a sample program for the S7-300 with the call of the functions FC5 "AG_SEND" and FC6 "AG_RECV". http://support.automation.siemens.com/WW/view/de/17853532

Configuring an unspecified ISO-on-TCP connection for the S7-400

Follow the instructions below to configure an unspecified ISO-on-TCP connection for the S7-400.

Table 2-9

No.	Configuration step	Note
1.	In the SIMATIC Manager you open the STEP 7 project that contains the configuration of S7-400 which is to send and receive the data over an ISO-on-TCP connection. By means of the menu Options → Configure Network you open NetPro where you configure the ISO-on-TCP connection.	
2.	Mark the CPU of the SIMATIC 400 station and create a new connection by means of the menu Insert → New Connection….	

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No.	Configuration step	Note
3.	In the "Insert New Connection" dialog you select the item "unspecified" as connection partner. Select "ISO-on-TCP connection" as the connection type. Then click the "Apply" button to open the Properties dialog of the ISO-on-TCP connection.	
4.	In the Properties dialog of the ISO-on-TCP connection → "General" tab you determine the block parameters "ID" and "LADDR". The block parameter ID provides the connection number. The block parameter LADDR provides the module start address of CP443-1 Advanced. You specify the connection number and the module start address at the input parameters "ID" and "LADDR" respectively when you call the functions FC50 "AG_LSEND" and FC60 "AG_LRECV". These functions are called in the user program of the CPU and are for sending and receiving data. Deactivate the function "Active connection establishment" because the S7-400 is passively involved in establishing the ISO-on-TCP connection. Double-click the "Route..." button.	

No.	Configuration step	Note
5.	In the "Route" dialog you select the GBIT interface of CP443-1 Advanced. The ISO-on-TCP connection to the communication partner is established by way of the IP address 172.16.49.99, i.e. the data is exchanged with the communication partner by way of the GBIT interface of CP443-1 Advanced. Close the dialog with "OK" and switch to the "Addresses" tab in the Properties dialog of the ISO-on-TCP connection.	
6.	In the Properties dialog of the ISO-on-TCP connection → "Addresses" tab you enter the IP address of the communication partner, i.e. in this example you enter the IP address 172.16.43.2 of CP343-1. Then you enter the local TSAP and the partner TSAP. This defines the local connection end point in the S7-400 and the connection end point in the communication partner. In the Properties dialog of the ISO-on-TCP connection you switch to the "Options" tab. **Note:** In the SIMATIC 400 station you enter the local TSAP of the SIMATIC S7-300 as the partner TSAP.	
7.	In the Properties dialog of the ISO-on-TCP connection → "Options" tab you select the "Send/Recv" mode. Apply the settings with "OK".	

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No.	Configuration step	Note
8.	Mark the CPU of the SIMATIC 400 station. The configured ISO-on-TCP connection is now displayed in the connection table.	
9.	Once you have completed the connection configuration, you save and compile the configuration. Mark the SIMATIC 400 station and download the configuration into the S7-400 CPU.	
10.	In the user program of the S7-400 you call the functions FC50 "AG_LSEND" and FC60 "AG_LRECV".	You will find the functions FC50 "AG_LSEND" and FC60 "AG_LRECV" in the library "SIMATIC_NET_CP → CP 400 → Blocks". At the link below is a sample program for the S7-400 with the call of the functions FC50 "AG_LSEND" and FC60 "AG_LRECV". http://support.automation.siemens.com/WW/view/de/24693800

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