

常问问题 • 10/2014

SIMOTION 和 S7-1500 的以太网 TCP 通信

TCP、SIMOTION、S7-1500

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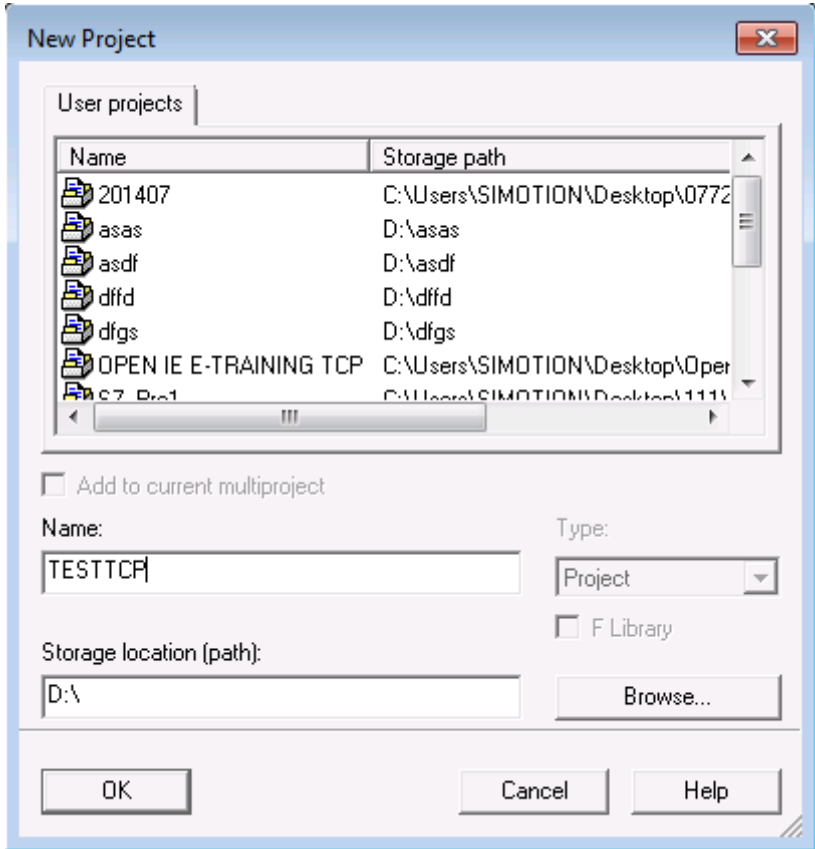
1 概述

在开放的、不同种类的西门子通讯系统内，工业以太网是用于管理和单元级的网络。从物理结构上说，工业以太网是一个使用双绞线的电气网络，或者是一个使用光纤电缆的光学网络。在工厂或者设备间可以使用 TCP 通信进行非实时的数据交换，本文以 S7-1500 和 SIMOTION 为例进行 TCP 通信的介绍和配置的步骤说明。

2 配置步骤

软件安装过程如表 1 所示

表 1.

序号	说明															
	通信说明如下：															
	<table border="1"> <thead> <tr> <th>SIMOTION</th> <th>S7-1500</th> <th>说明</th> </tr> </thead> <tbody> <tr> <td>192.168.214.1</td> <td>192.168.214.10</td> <td>各自的 IP 地址，在同一网段并且不冲突</td> </tr> <tr> <td>2000</td> <td>2200</td> <td>端口号</td> </tr> <tr> <td>客户机</td> <td>服务器</td> <td>TCP 通信时，需要设置一个为客户机一个为服务器</td> </tr> <tr> <td>10bytes 收发</td> <td>10bytes 收发</td> <td>数据长度</td> </tr> </tbody> </table>	SIMOTION	S7-1500	说明	192.168.214.1	192.168.214.10	各自的 IP 地址，在同一网段并且不冲突	2000	2200	端口号	客户机	服务器	TCP 通信时，需要设置一个为客户机一个为服务器	10bytes 收发	10bytes 收发	数据长度
SIMOTION	S7-1500	说明														
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2000	2200	端口号														
客户机	服务器	TCP 通信时，需要设置一个为客户机一个为服务器														
10bytes 收发	10bytes 收发	数据长度														
2.	<p>首先建立一个 SIMOTION 的项目：</p>  <p>The screenshot shows the 'New Project' dialog box. It has a 'User projects' section with a table listing existing projects. Below this, there are fields for 'Name' (containing 'TESTTCP'), 'Type' (set to 'Project'), and 'Storage location (path)' (set to 'D:\'). There are also checkboxes for 'Add to current multiproject' and 'F Library', and buttons for 'OK', 'Cancel', 'Help', and 'Browse...'.</p>															

3.

插入一个 SIMOTION D435:

Insert SIMOTION device

Device

Device family: SIMOTION

Device: SIMOTION D

Device characteristic:

Characteristic	Order no.
D410 DP	6AU1 410-0AA00-0AA0
D410 PN	6AU1 410-0AB00-0AA0
D410-2 DP	6AU1 410-2AA00-0AA0
D410-2 DP/PN	6AU1 410-2AD00-0AA0
D425	6AU1 425-0AA00-0AA0
D425-2 DP	6AU1 425-2AA00-0AA0
D425-2 DP/PN	6AU1 425-2AD00-0AA0
D435	6AU1 435-0AA00-0AA1
D435-2 DP	6AU1 435-2AA00-0AA0
D435-2 DP/PN	6AU1 435-2AD00-0AA0
D445	6AU1 445-0AA00-0AA0
D445-1	6AU1 445-0AA00-0AA1
D445-2 DP/PN	6AU1 445-2AD00-0AA0
D455-2 DP/PN	6AU1 455-2AD00-0AA0

SIMOTION version: V4.3

SINAMICS: SINAMICS S120 Integrated

SINAMICS version: V2.6.2

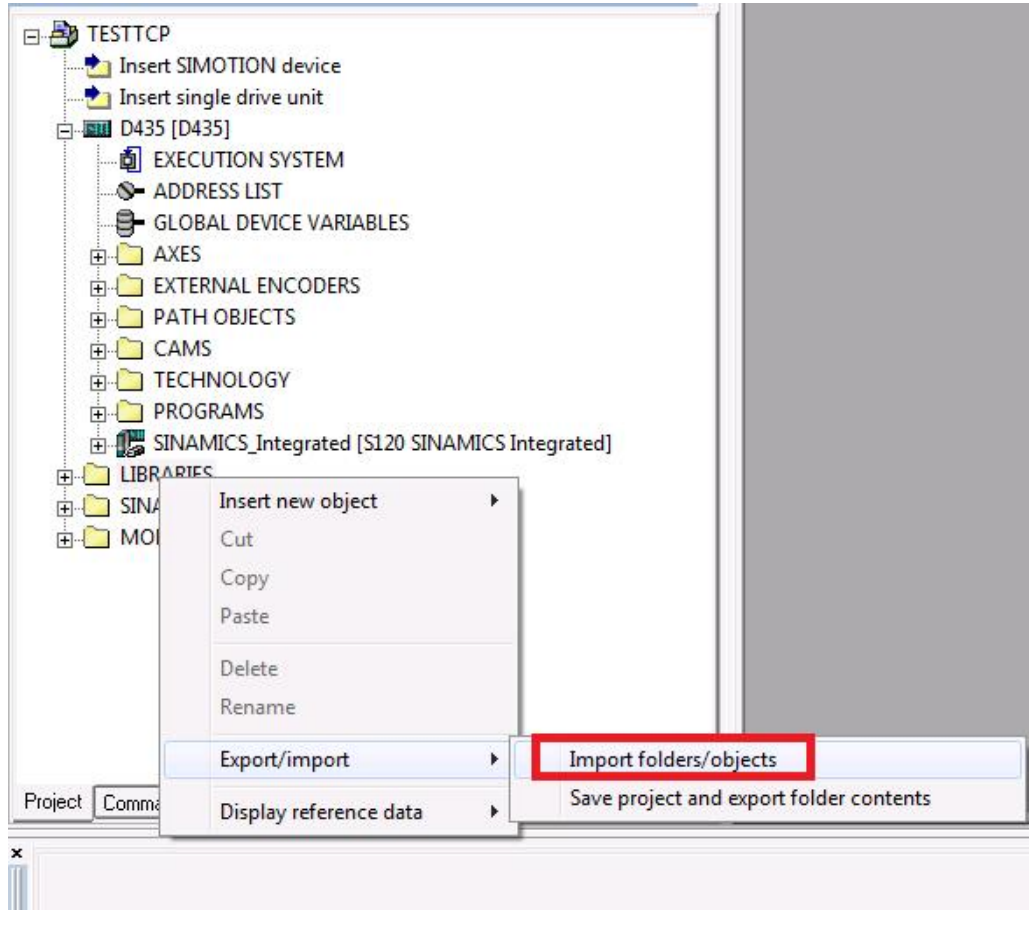
Insert CBE30

Open HW Config

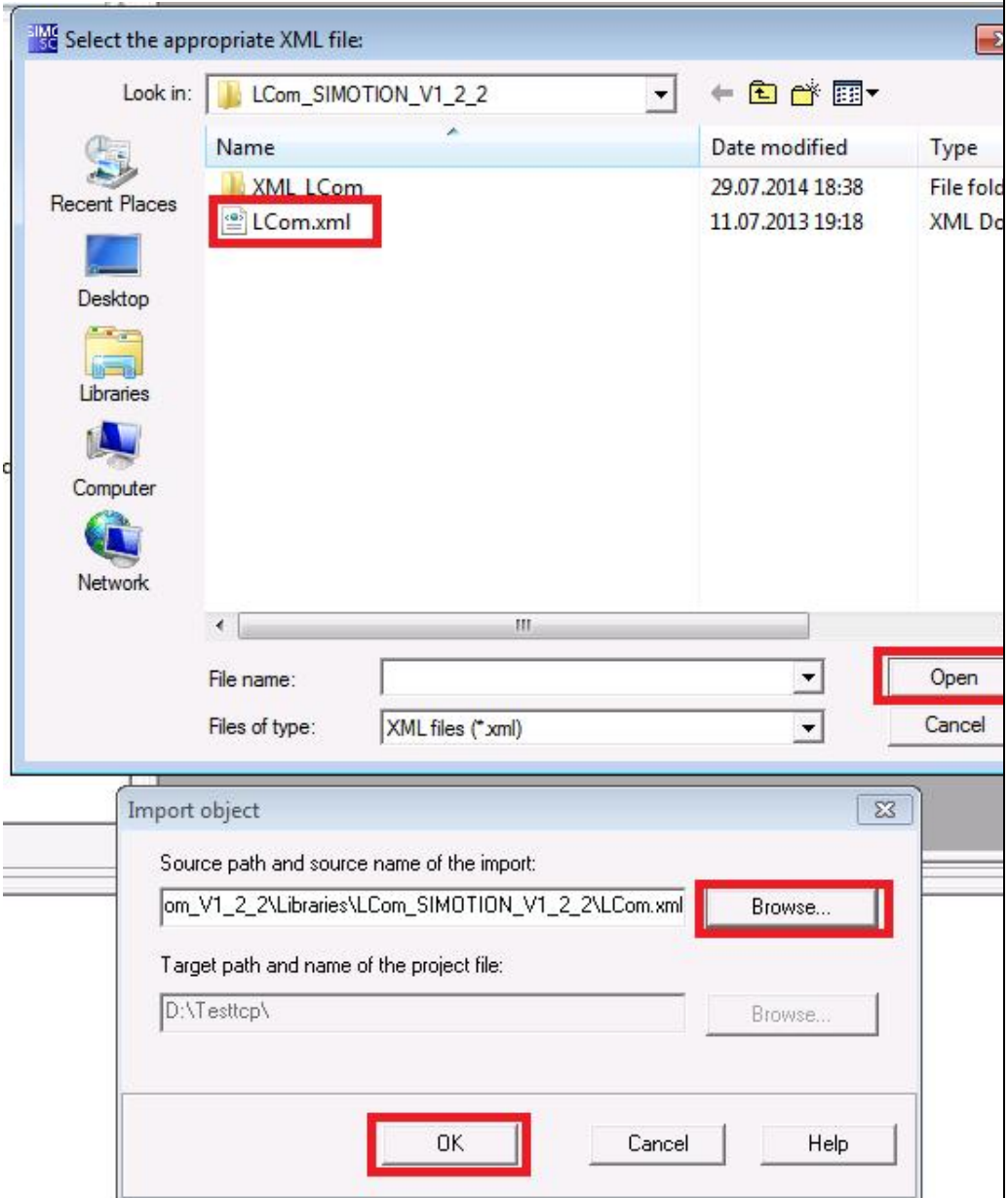
OK Cancel Help

弹出硬件组态界面后保存编译并关闭。

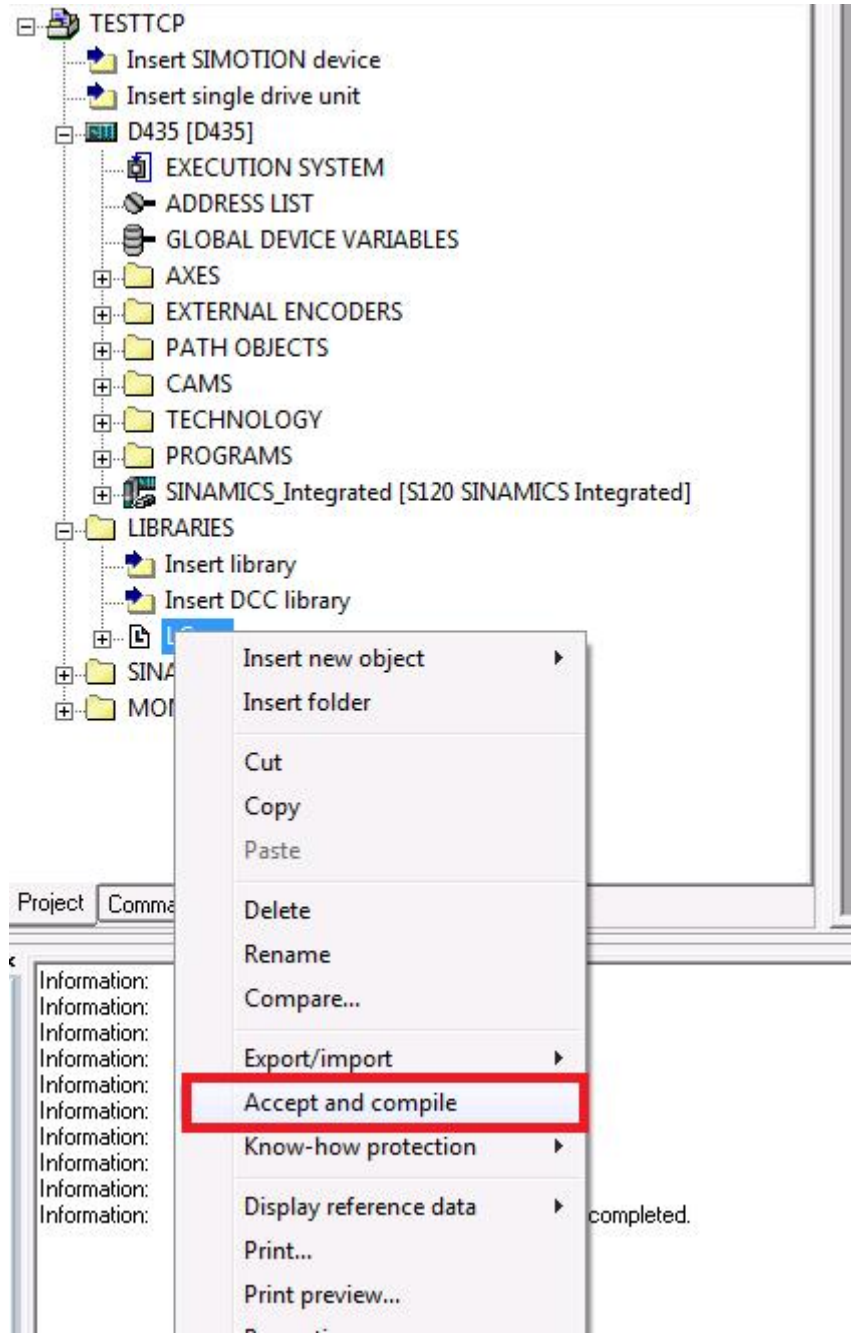
4. 导入通信使用的 LCOM 库 (<http://support.automation.siemens.com/WW/view/cn/48955385>)，如下图所示，在 LIBRARIES 上点击右键，选择 Import folders/objects:



5. 浏览并且导入 LCOM 库:



6. 点击右键并且选择接受并且编译



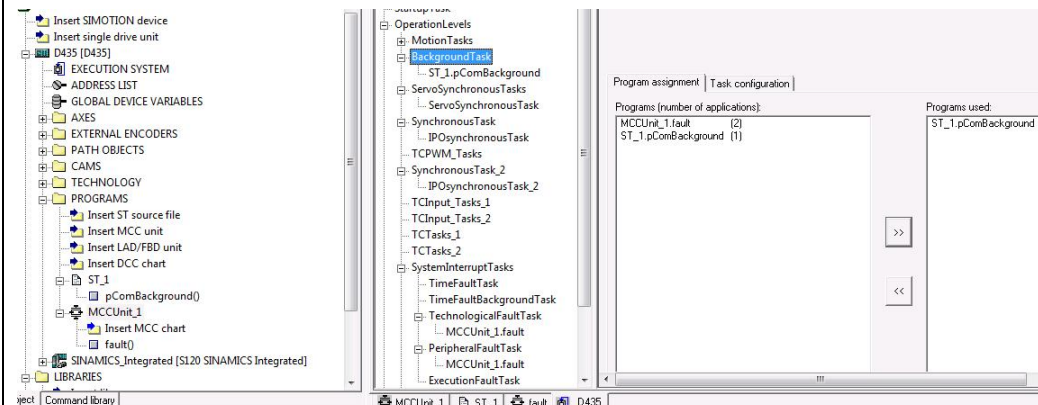
7.

编写如下程序:

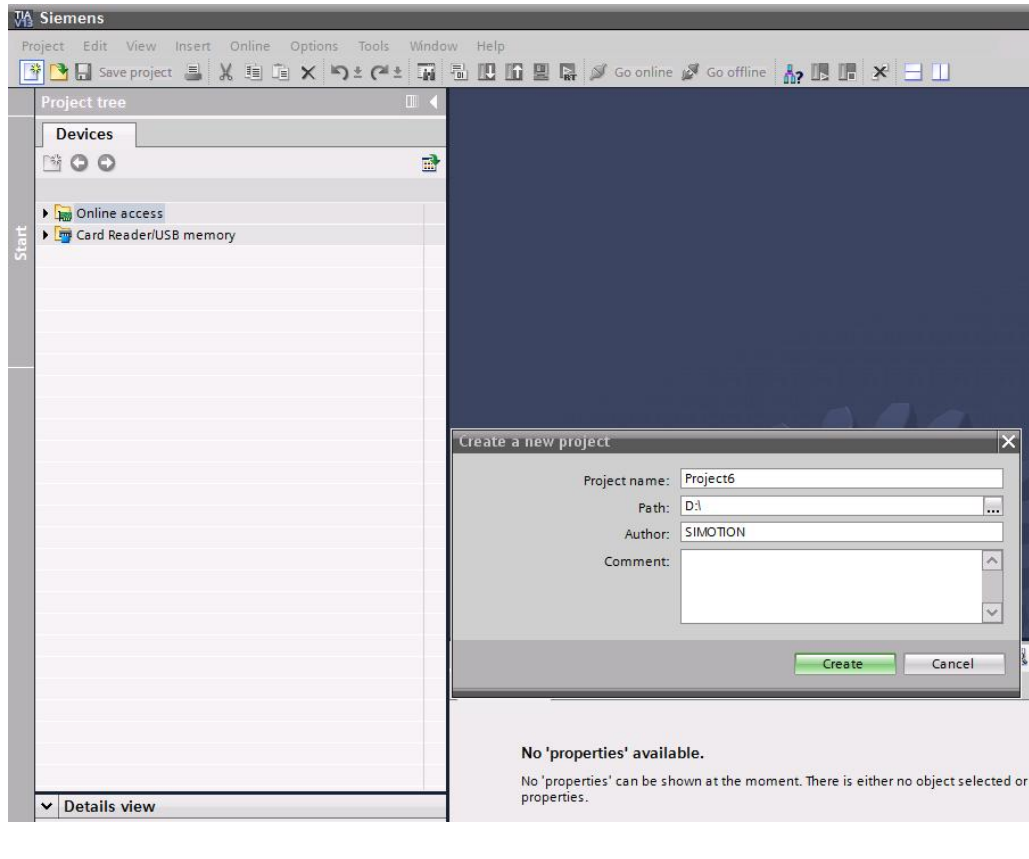
```

INTERFACE
//----- import -----
    USELIB LCom;
//----- global device variables -----
    VAR_GLOBAL
        gab8SendBuffer      : ARRAY[0..LCOM_SEND_DATA_LENGTH-1] OF BYTE;
        gab8ReceiveBuffer   : ARRAY[0..LCOM_RECEIVED_DATA_LENGTH-1] OF BYTE;
        FBCom                : fbLComMachineCom; //instance of FB
    END_VAR
//----- export -----
    PROGRAM pComBackground;
//-----
END_INTERFACE
IMPLEMENTATION
//-----
PROGRAM pComBackground
    VAR
        sComParameter      : sLComParameterType; //parameter for FB
        boFirstCycle       : BOOL := TRUE;
        boEnable            : BOOL := TRUE; //run direct
        boCommunicate       : BOOL := TRUE; //run direct
        u16SendDataLength   : UINT := 10;
        boConnected         : BOOL;
        boError              : BOOL;
        b32ErrorId          : DWORD;
        boDataReceived      : BOOL;
        boSenderActive       : BOOL;
        boReceiverActive    : BOOL;
        u16ReceivedLength   : UINT;
    END_VAR
    IF boFirstCycle THEN //initialization in first cycle
        //connection configuration
        sComParameter.sCfgConnection.boWithLComProtocol := FALSE;
        sComParameter.sCfgConnection.boAcceptUnknownPartner := TRUE;
        sComParameter.sCfgConnection.u16ComService := 1; //1 = TCP
        sComParameter.sCfgConnection.boIsTcpClient := TRUE; //is client
        sComParameter.sCfgConnection.u16LocalPort := 2000;
        sComParameter.sCfgConnection.au8RemoteAddress[0] := 192;
        sComParameter.sCfgConnection.au8RemoteAddress[1] := 168;
        sComParameter.sCfgConnection.au8RemoteAddress[2] := 214;
        sComParameter.sCfgConnection.au8RemoteAddress[3] := 10;
        sComParameter.sCfgConnection.u16RemotePort := 2200;
        sComParameter.sCfgConnection.u16LifeSignCycle := 300; //ms
        //sender parameter
        sComParameter.sCfgSender.u8ComMode := 1; //2: Mode on_change
        sComParameter.sCfgSender.u16CycleTime := 1000; //ms
        sComParameter.sCfgSender.u16AckTimeout := 500; //ms
        sComParameter.sCfgSender.u8SlidingWindow := 1;
        //receiver parameter
        sComParameter.sCfgReceiver.u8ComMode := 1;
        sComParameter.sCfgReceiver.u16CycleTime := 1000;
        sComParameter.sCfgReceiver.u16AckTimeout := 500;
        sComParameter.sCfgReceiver.u8SlidingWindow := 1;
        //time synchronization parameter
        sComParameter.sCfgTimeSync.boUseReceivedTimeStamps := FALSE;
        sComParameter.sCfgTimeSync.u8SendModeTimeSync := 0;
        sComParameter.sCfgTimeSync.u16TimeSyncCycleTime := 0;
        sComParameter.sCfgTimeSync.todTimeSyncAtTime := TOD#00:00:00.0;
        //reset after first cycle
        boFirstCycle := FALSE;
    ELSE

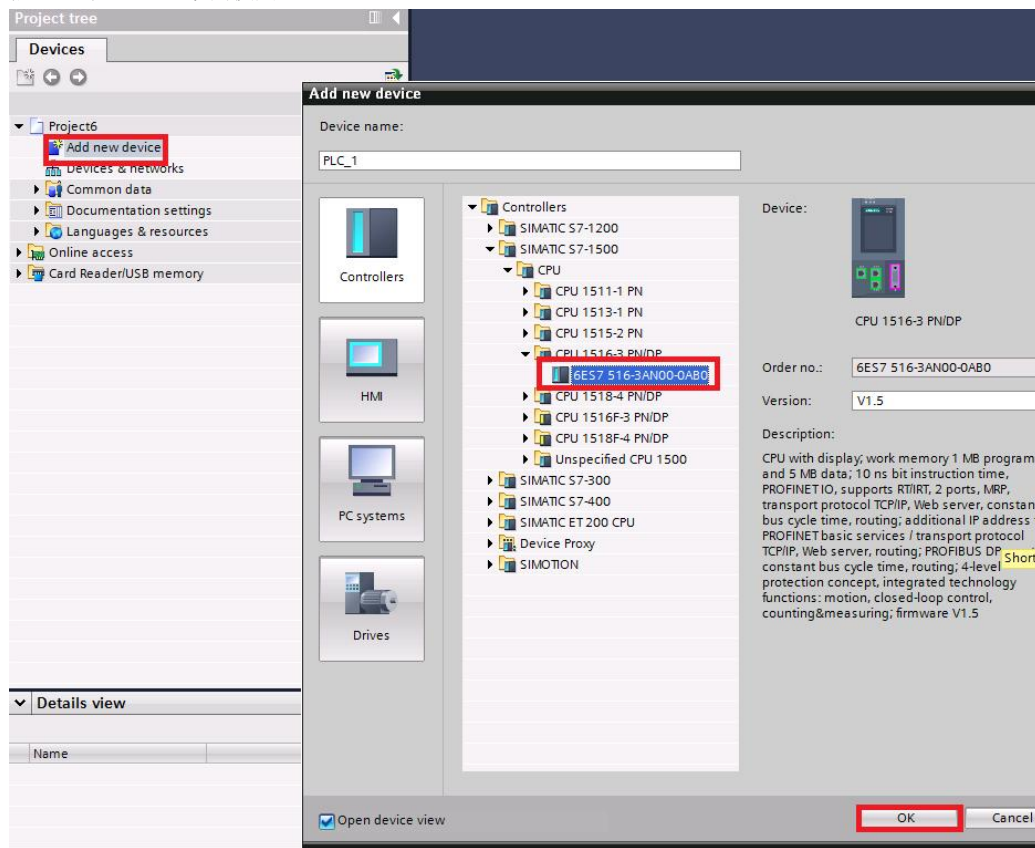
```


	<pre>//call communication function block FBCom(enable := boEnable , communicate := boCommuni cate , sendDataLength := u16SendDataLength , sendData := gab8SendBuffer , receivedData := gab8Recei veBuffer , parameter := sComParameter , connected => boConnected , dataRecei ved => boDataRecei ved , error => boError , errorId => b32ErrorId , senderActi ve => boSenderActi ve , recei verActi ve => boRecei verActi ve , recei vedDataLength => u16Recei vedLength); END_IF; END_PROGRAM END_IMPLEMENTATION</pre>						
<p>8.</p>	<p>分配程序到执行组，并且下载程序，运行 SIMOTION:</p>  <p>The screenshot displays the SIMATIC Manager interface for configuring tasks. On the left, the project tree shows the hierarchy for 'D435 [D435]', including 'EXECUTION SYSTEM', 'ADDRESS LIST', 'GLOBAL DEVICE VARIABLES', 'AXES', 'EXTERNAL ENCODERS', 'PATH OBJECTS', 'CAMS', 'TECHNOLOGY', and 'PROGRAMS'. The 'PROGRAMS' folder is expanded, showing 'ST_1' and 'MCCUnit_1'. The middle pane shows a list of tasks, with 'BackgroundTask' selected. The right pane shows the 'Task configuration' dialog, which has two tabs: 'Program assignment' and 'Task configuration'. The 'Program assignment' tab is active, showing a table with columns 'Programs (number of applications):' and 'Programs used:'. The table contains the following entries:</p> <table border="1"> <thead> <tr> <th>Programs (number of applications):</th> <th>Programs used:</th> </tr> </thead> <tbody> <tr> <td>MCCUnit_1.fault [2]</td> <td>ST_1.pComBackground</td> </tr> <tr> <td>ST_1.pComBackground [1]</td> <td></td> </tr> </tbody> </table> <p>At the bottom of the interface, the 'Symbol browser' shows 'D435.MCCUnit_1: Symbol browser'.</p>	Programs (number of applications):	Programs used:	MCCUnit_1.fault [2]	ST_1.pComBackground	ST_1.pComBackground [1]	
Programs (number of applications):	Programs used:						
MCCUnit_1.fault [2]	ST_1.pComBackground						
ST_1.pComBackground [1]							

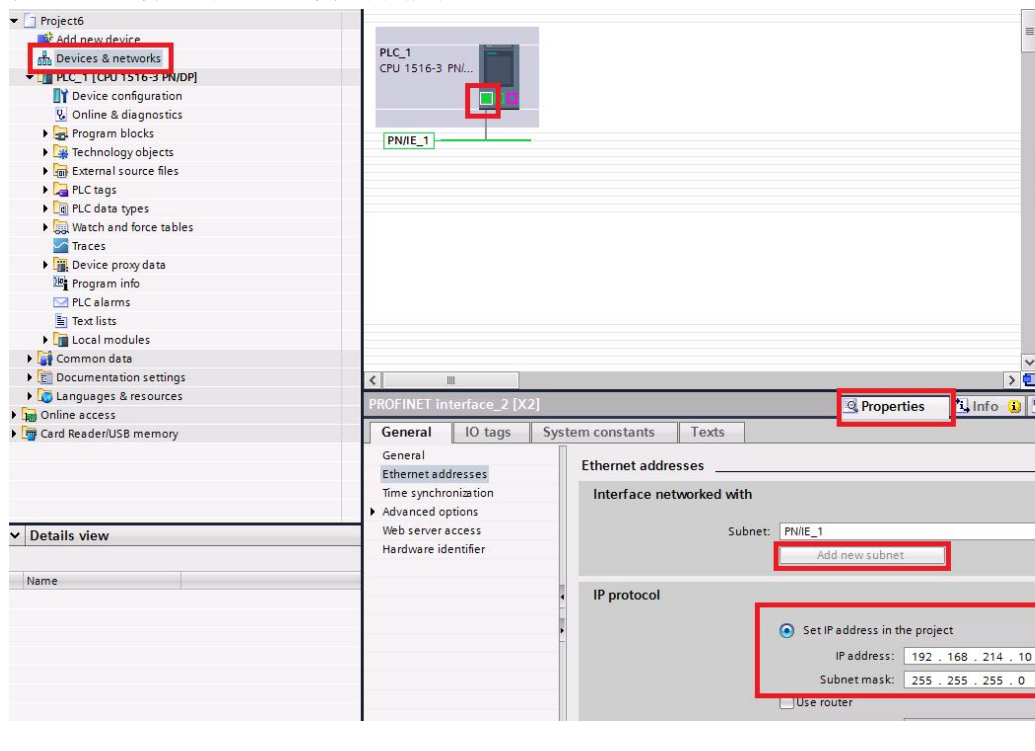
9. 打开博途软件，创建一个新项目：



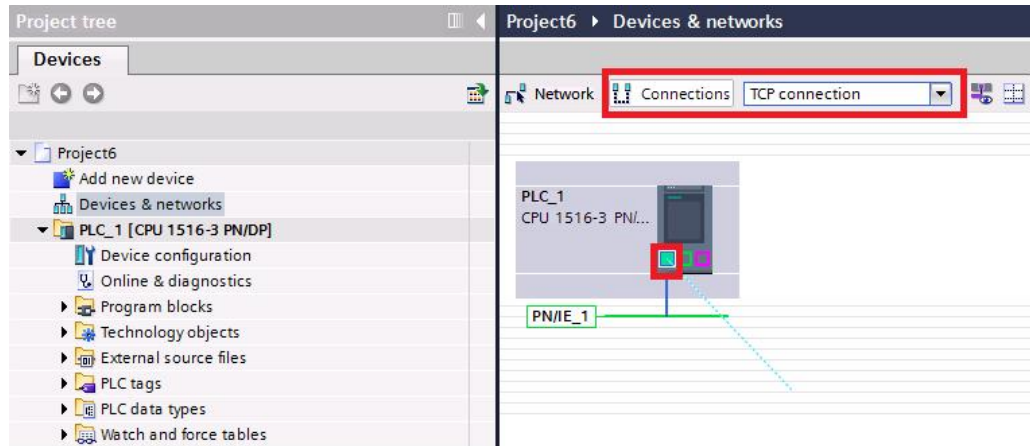
10. 插入一个 PLC ， 本例使用 1516CPU:



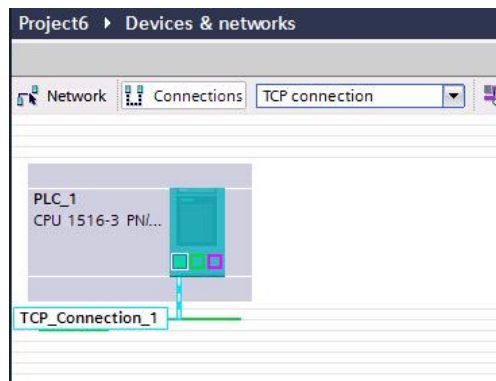
11. 设置 IP 地址并且创建网络连接如下图所示:



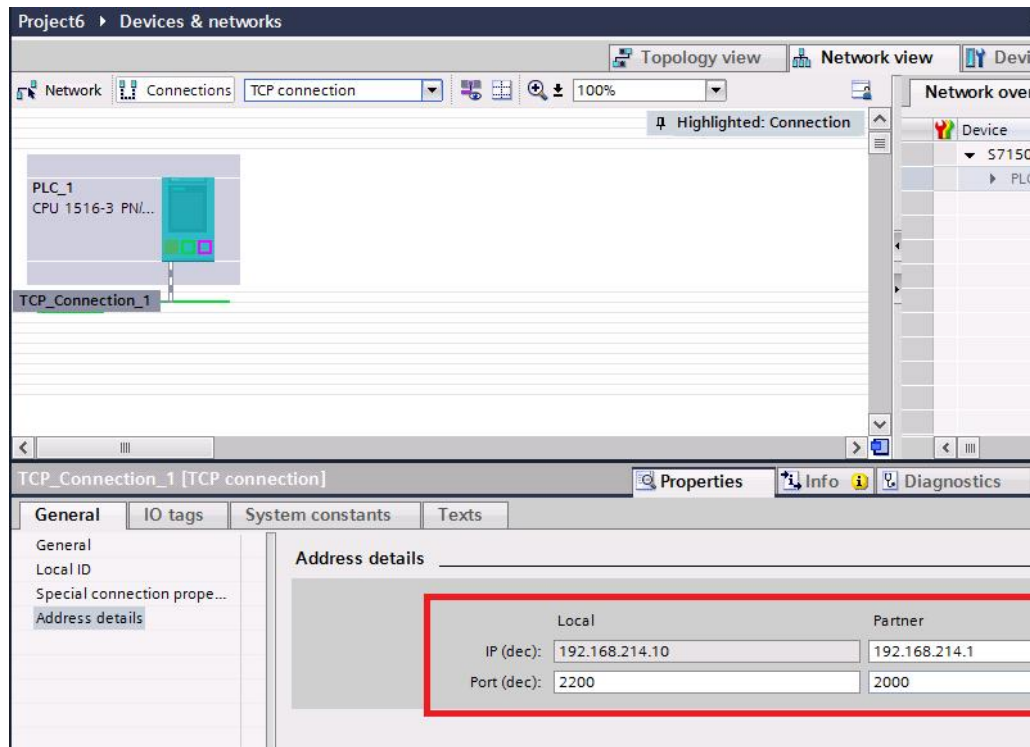
12. 创建 TCP 通信连接，选择“ Connections” ，并且选择 TCP connection，需要注意，在建立连接的时候首先鼠标左键点击端口，显示出一条虚线后，再点击回此端口，即可建立连接：



创建好的连接如下图所示：



13. 点击此连接的属性，并且填写连接的信息，如下图所示：



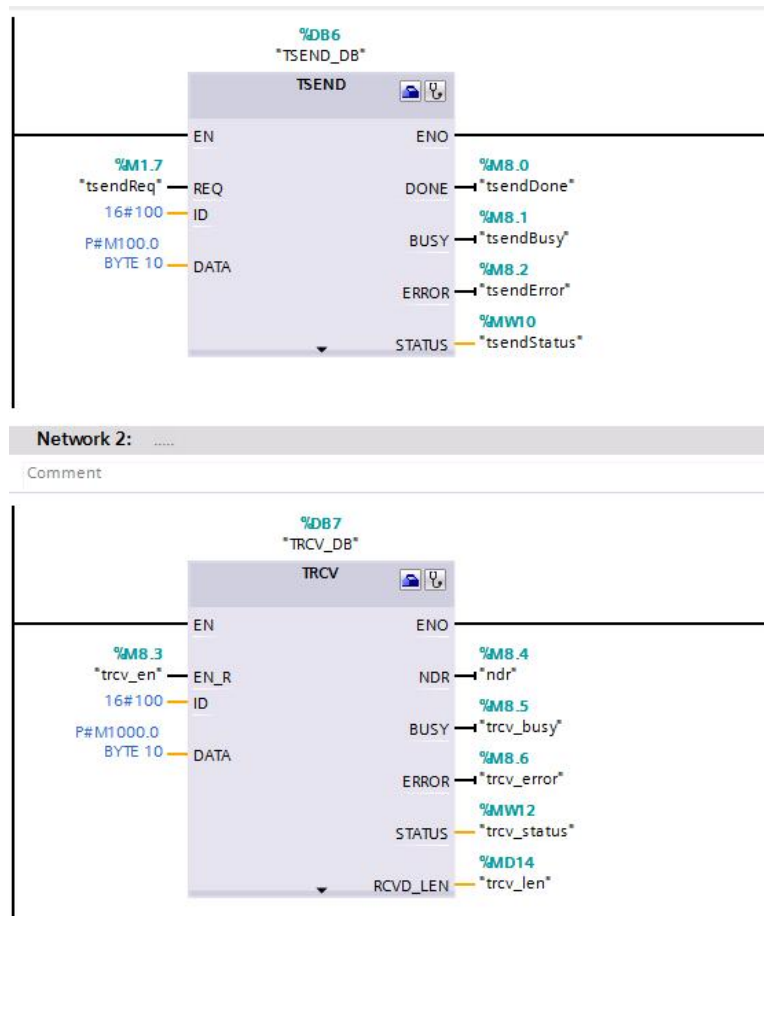
14.

编写程序如下图所示：

使用如下指令：

Communication		
Name	Description	Version
▶ S7 communication		V1.2
▼ Open user communicati...		V3.1
■ TSEND_C	Send data via Ethernet (TCP)	V2.1
■ TRCV_C	Receive data via Ethernet (TCP)	V2.1
■ TMAIL_C	Send e-mail	V2.1
▼ Others		
■ TCON	Establish communication connecti..	V3.0
■ TDISCON	Terminate communication connec...	V2.1
■ TSEND	Send data via communication con...	V3.0
■ TRCV	Receive data via communication c...	V3.0
■ TUSEND	Send data via Ethernet (UDP)	V3.0
■ TURCV	Receive data via Ethernet (UDP)	V3.0
■ T_RESET	Resetting the connection	V1.1
■ T_DIAG	Checking the connection	V1.1
■ T_CONFIG	Configure interface	V1.0

在 OB1 中编写如下程序：



15.

关于 ID 参数的说明，此参数可以在连接的 Local ID 属性中获取：

The screenshot displays the Siemens TIA Portal interface. At the top, the 'Project6' window shows 'Devices & networks' in 'Topology view'. A PLC_1 (CPU 1516-3 PN) is connected to a 'TCP_Connection_1'. The 'Properties' window for 'TCP_Connection_1' is open, showing the 'General' tab. Under 'Block parameters', the 'Local ID (hex)' field is highlighted with a red box and contains the value '100'. Below this, a diagram shows a 'W# 16# FFFFFFFF' address connected to a 'LADDR' input of a block, with a '256' value and an 'ID' label.

16.

从 SIMOTION 发送到 PLC:

D435.ST_1: Symbol browser

Name	Data type	Display format	Initial value	Status value	<input type="checkbox"/>	Control value
All	All	All	All		All	All
gab8SendBuffer	'ARRAY [0..4095] OF BYTE'				<input type="checkbox"/>	
gab8SendBuffer[0]	BYTE	HEX	16#00	16#77	<input checked="" type="checkbox"/>	16
gab8SendBuffer[1]	BYTE	HEX	16#00	16#77	<input checked="" type="checkbox"/>	16
gab8SendBuffer[2]	BYTE	HEX	16#00	16#00	<input type="checkbox"/>	
gab8SendBuffer[3]	BYTE	HEX	16#00	16#00	<input type="checkbox"/>	

PLC 的 watch table:

i	Name	Address	Display format	Monitor value	Modify value
1	"tsendReq"	%M1.7	Bool	<input checked="" type="checkbox"/> TRUE	TRUE
2	"tsendDone"	%M8.0	Bool	<input type="checkbox"/> FALSE	
3	"tsendBusy"	%M8.1	Bool	<input type="checkbox"/> FALSE	
4	"tsendError"	%M8.2	Bool	<input type="checkbox"/> FALSE	
5	"tsendStatus"	%MW10	Hex	16#7000	
6	"trcv_en"	%M8.3	Bool	<input checked="" type="checkbox"/> TRUE	TRUE
7	"ndr"	%M8.4	Bool	<input type="checkbox"/> FALSE	
8	"trcv_busy"	%M8.5	Bool	<input checked="" type="checkbox"/> TRUE	
9	"trcv_error"	%M8.6	Bool	<input type="checkbox"/> FALSE	
10	"trcv_status"	%MW12	Hex	16#7002	
11	"trcv_len"	%MD14	DEC	0	
12		%MW100	Hex	16#1234	16#1234
13		%MW102	Hex	16#5678	16#5678
14		<input type="checkbox"/> %MW1000	Hex	16#7777	
15		<Add new>			

17.

从 PLC 到 SIMOTION:

Project5 ▶ PLC_1 [CPU 1516-3 PN/DP] ▶ Watch and force tables ▶ Watch table_1

	i	Name	Address	Display format	Monitor value	Modify value
1		*tsendReq	%M1.7	Bool	<input checked="" type="checkbox"/> TRUE	TRUE
2		*tsendDone	%M8.0	Bool	<input type="checkbox"/> FALSE	
3		*tsendBusy	%M8.1	Bool	<input type="checkbox"/> FALSE	
4		*tsendError	%M8.2	Bool	<input type="checkbox"/> FALSE	
5		*tsendStatus	%MW10	Hex	16#7000	
6		*trcv_en	%M8.3	Bool	<input checked="" type="checkbox"/> TRUE	TRUE
7		*ndr	%M8.4	Bool	<input type="checkbox"/> FALSE	
8		*trcv_busy	%M8.5	Bool	<input checked="" type="checkbox"/> TRUE	
9		*trcv_error	%M8.6	Bool	<input type="checkbox"/> FALSE	
10		*trcv_status	%MW12	Hex	16#7002	
11		*trcv_len	%MD14	DEC	0	
12			%MW100	Hex	16#1234	16#1234
13			%MW102	Hex	16#5678	16#5678
14		%MW1000		Hex	16#7777	
15		<Add new>				

SIMOTION 观察到的接收数据:

	Name	Data type	Display format	Initial value	Status value	<input checked="" type="checkbox"/>	Control val
	All	All	All	All		All	All
1	gab8SendBuffer	'ARRAY [0..4095] OF BYTE'				<input checked="" type="checkbox"/>	
2	gab8ReceiveBuffer	'ARRAY [0..4095] OF BYTE'				<input type="checkbox"/>	
3	gab8ReceiveBuffer[0]	BYTE	HEX	16#00	16#12	<input type="checkbox"/>	
4	gab8ReceiveBuffer[1]	BYTE	HEX	16#00	16#34	<input type="checkbox"/>	
5	gab8ReceiveBuffer[2]	BYTE	HEX	16#00	16#56	<input type="checkbox"/>	
6	gab8ReceiveBuffer[3]	BYTE	HEX	16#00	16#78	<input type="checkbox"/>	
7	gab8ReceiveBuffer[4]	BYTE	HEX	16#00	16#00	<input type="checkbox"/>	
8	gab8ReceiveBuffer[5]	BYTE	HEX	16#00	16#00	<input type="checkbox"/>	