Application Note

FESTO

ProfiNet Communication between CPX-E-CEC-C1-PN with S7-1200/1500 PLC

Brief explanation on how to communicate CPX-E-CEC-P1-PN with Siemens S7-1200 PLC.

100211

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1 Components/Software used

Type/Name	Version Software/Firmware	Date of manufacture
GSDML File for CPX-E-CEC	V 2.32	04-03-2018
Siemens TIA Portal	V 15	--
Codesys SP10 Patch 4	V 3.5	--

Table 1.1: 1 Components/Software used

2 Application description

This document explain how to establish Profinet communication between CPX-E-CEC-C1-PN with Siemens S7-1200/1500 PLC .

The supported systems are:

- S71500
- S71200

Supported Field Bus :

- Profinet IO

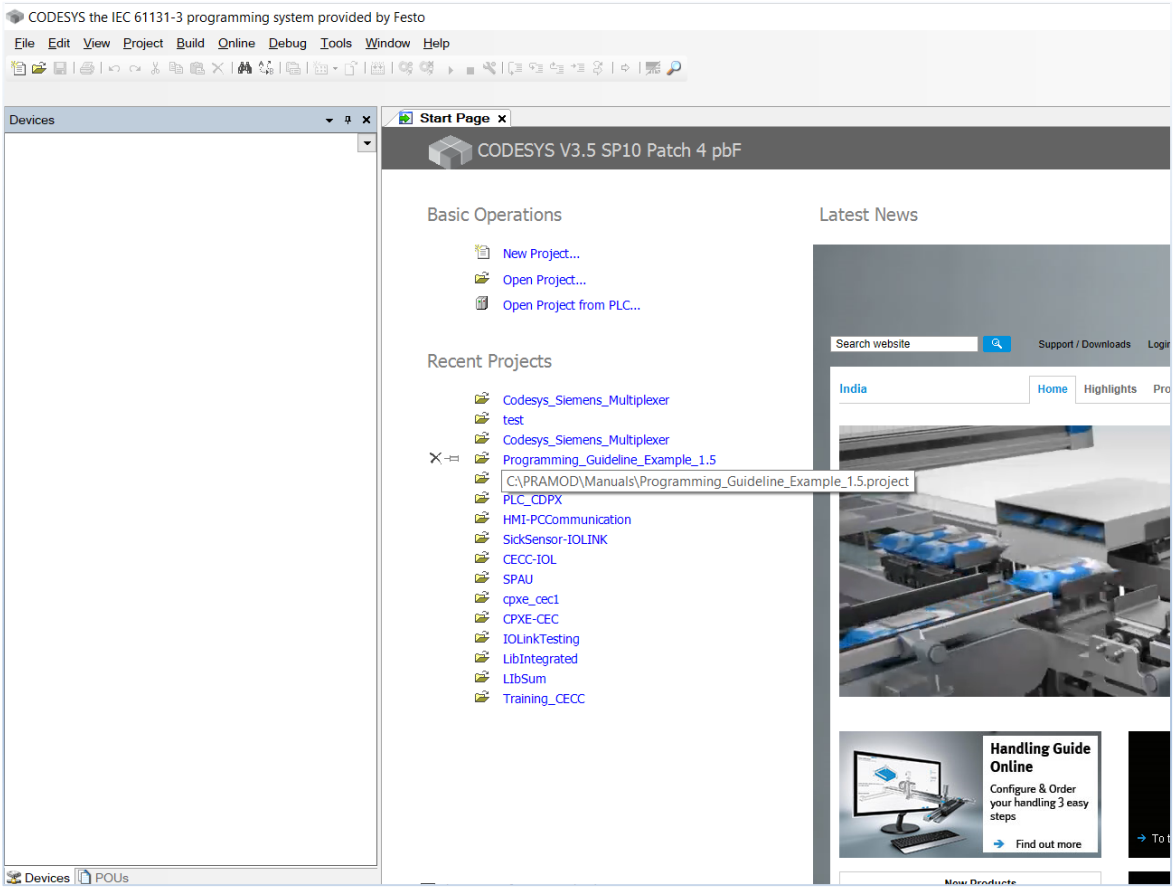
The application note has the description for the following:

- S7-1200/1500 Setup in SIEMENS TIA Portal.
- Installing the GSDML File for CPX-E-CEC-C1-PN.
- Configuration of CPX-E-CEC-C1-PN in TIA Portal.
- Configuration of CPX-E-CEC-C1-PN in Codesys .

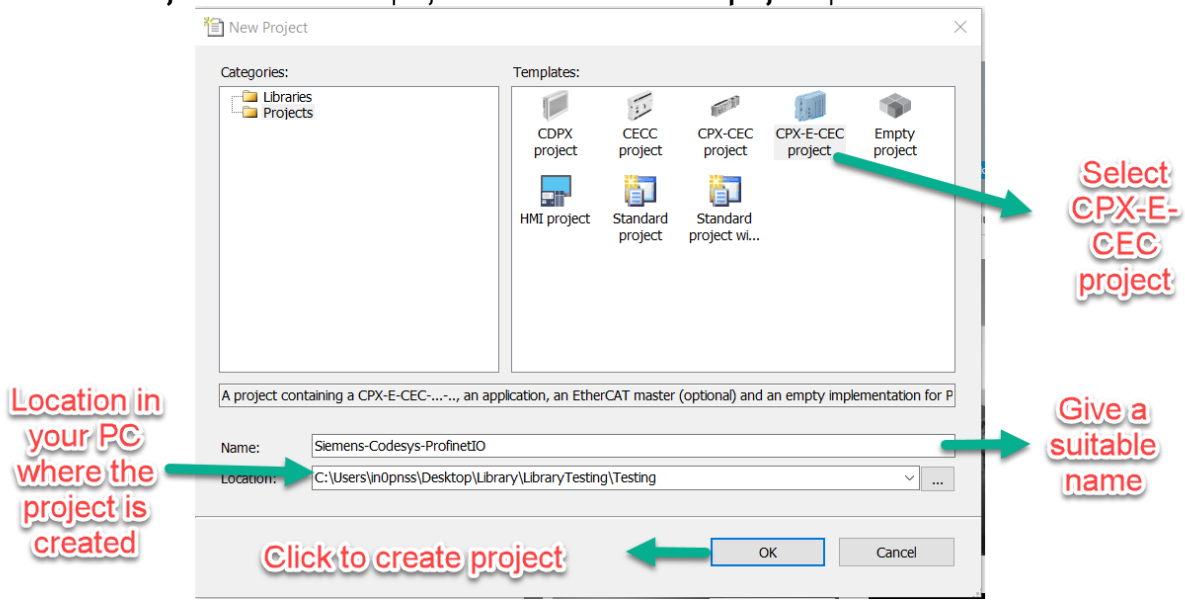
3 CPX-E-CEC-C1-PN controller setup in Codesys

3.1 Creating a new project in Codesys

- Start the Codesys software by double clicking on the Codesys icon in the desktop. The following image is viewed once you start the Codesys.

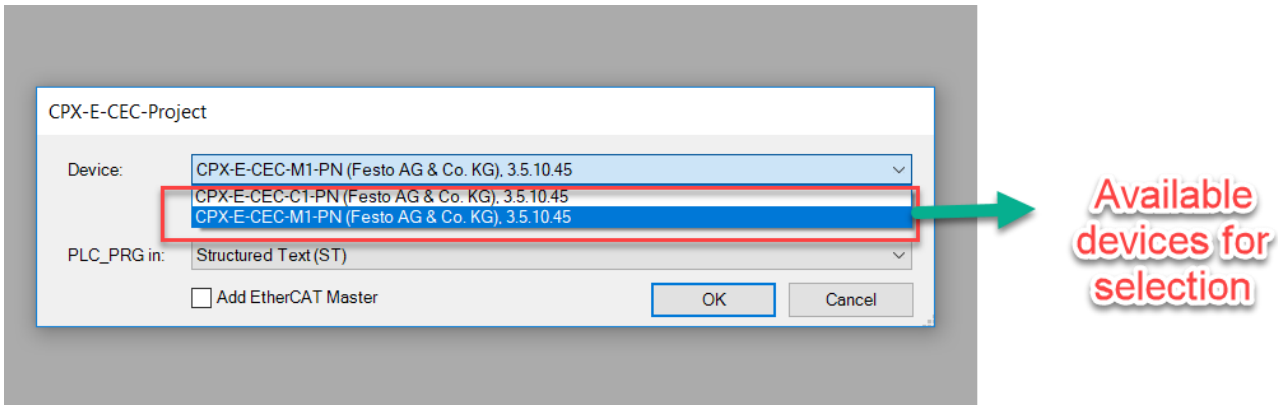


- Click on **New Project** to create a new project. Select **the CPX-E-CEC project** option as shown below.

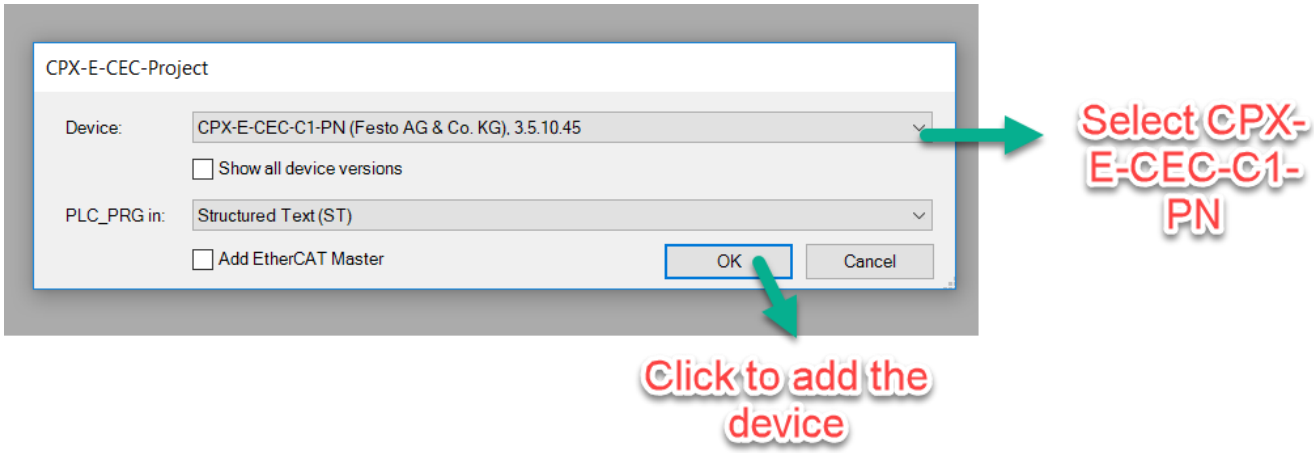


- Select a device for the project. Once the **CPX-E-CEC project** is selected there are 2 devices available for selection as shown below.

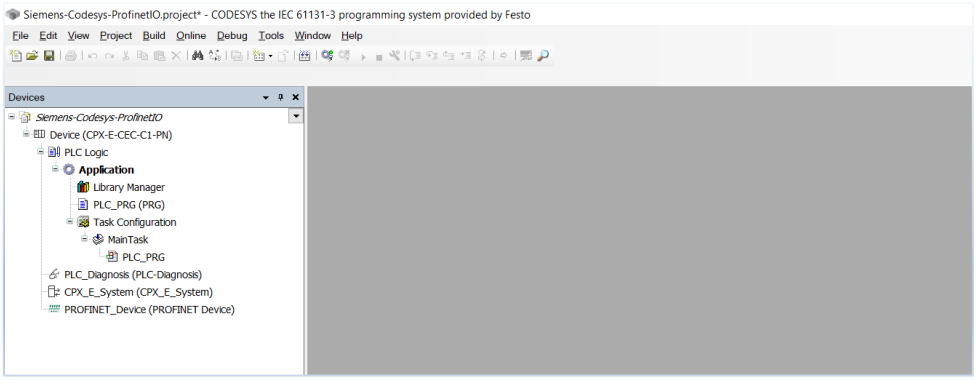
  The 2 devices are:
  CPX-E-CEC-C1-PN
  CPX-E-CEC-M1-PN



- We will use **CPX-E-CEC-C1-PN** as we have to establish Profinet communication with S71200/1500 PLC. Select the **CPX-E-CEC-C1-PN** option from the drop down list**.**



- Once you select the device the Project view in Codesys will appear as shown below.

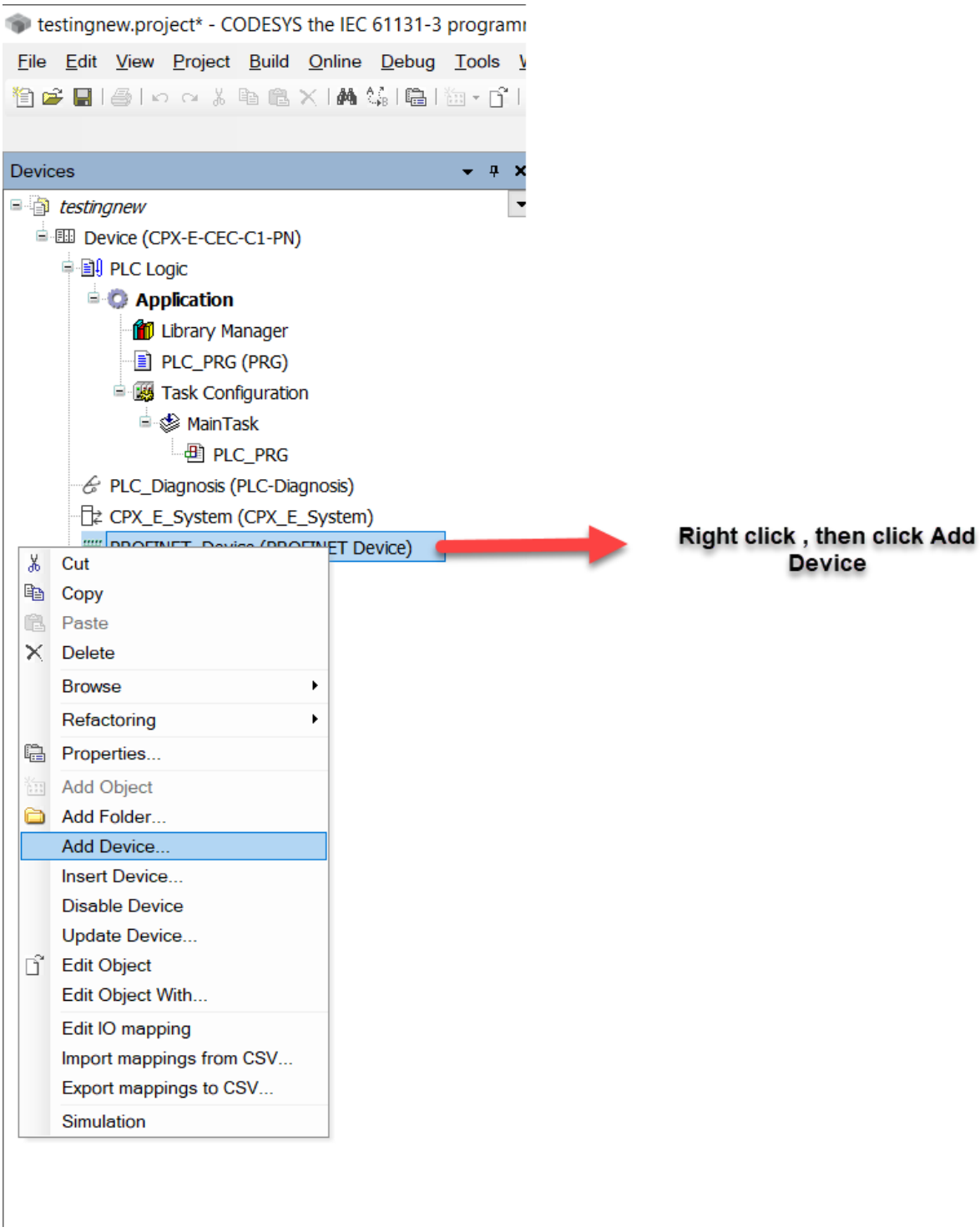


3.2 Adding Profinet Device

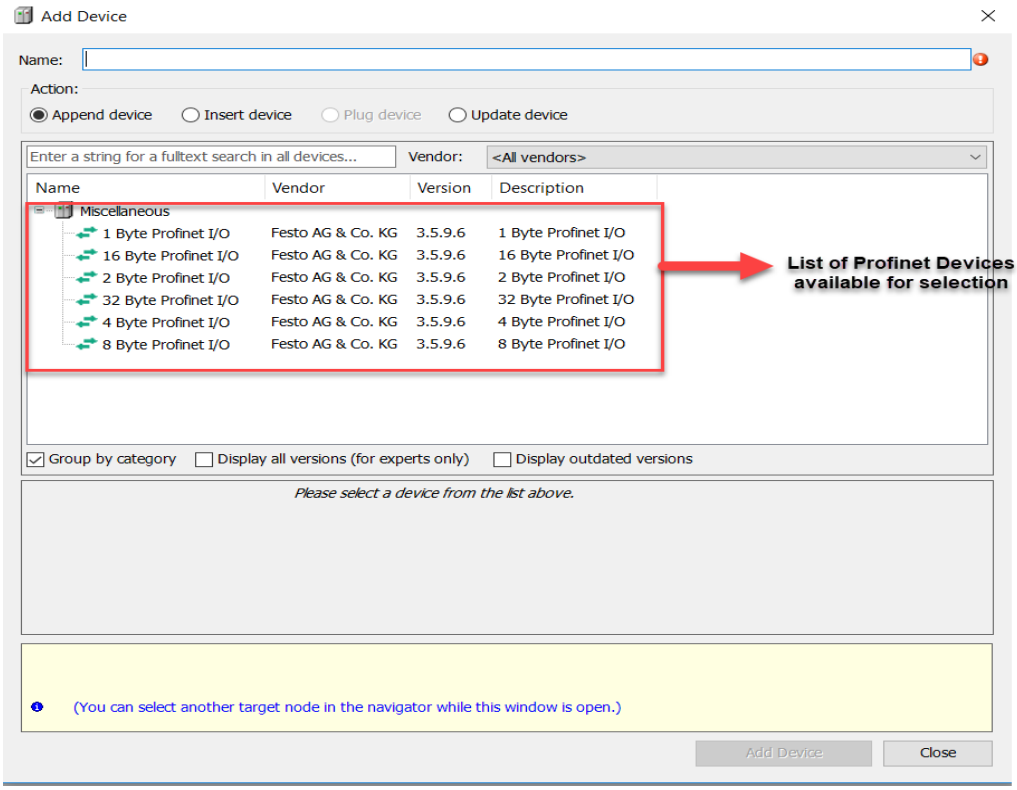
There are 6 Profinet IO devices available for selection. They are:

- 1 Byte Profinet I/O.
- 2 Byte Profinet I/O.
- 4 Byte Profinet I/O.
- 8 Byte Profinet I/O.
- 16 Byte Profinet I/O.
- 32 Byte Profinet I/O.

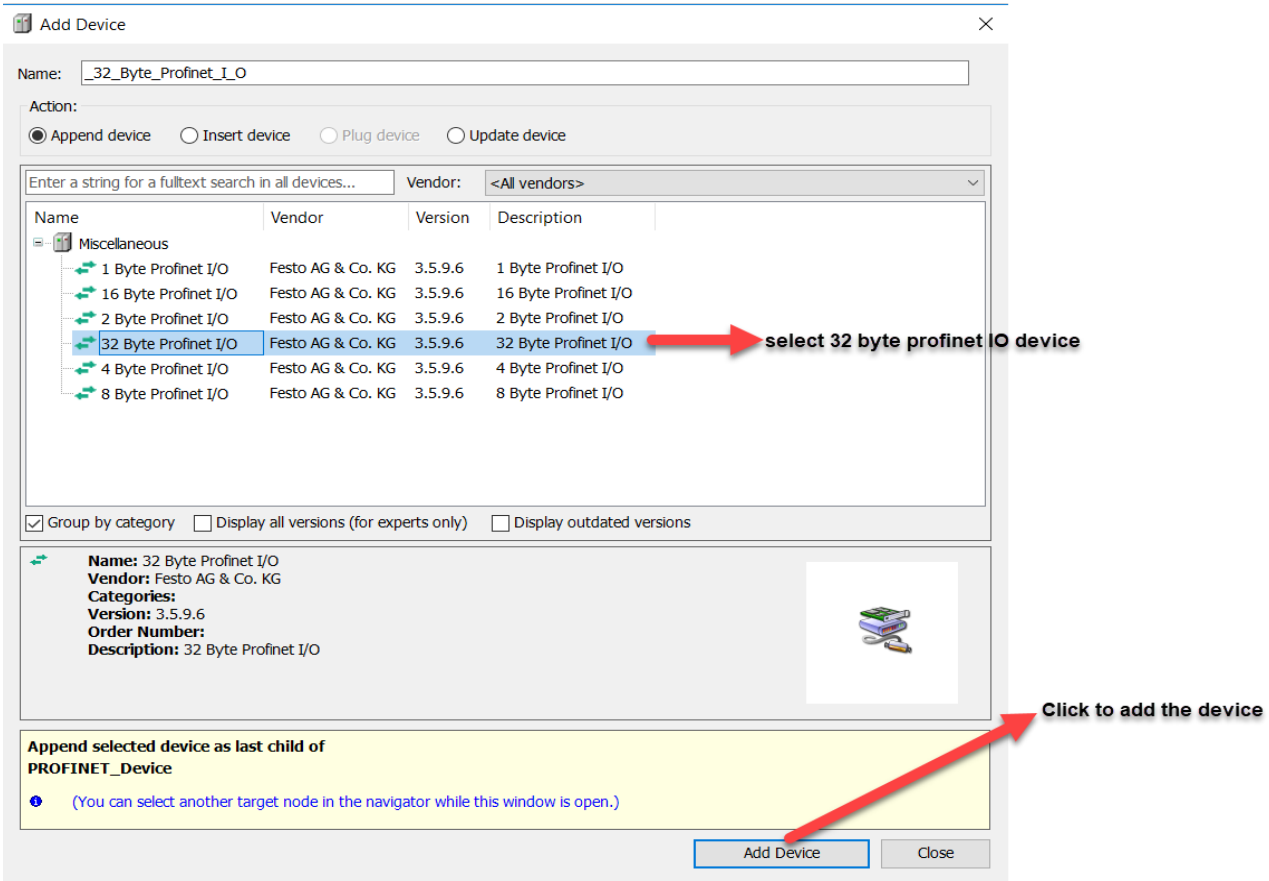
1. Right click on the Profinet Device. Click **Add Device** to get the list of available Profinet Devices.



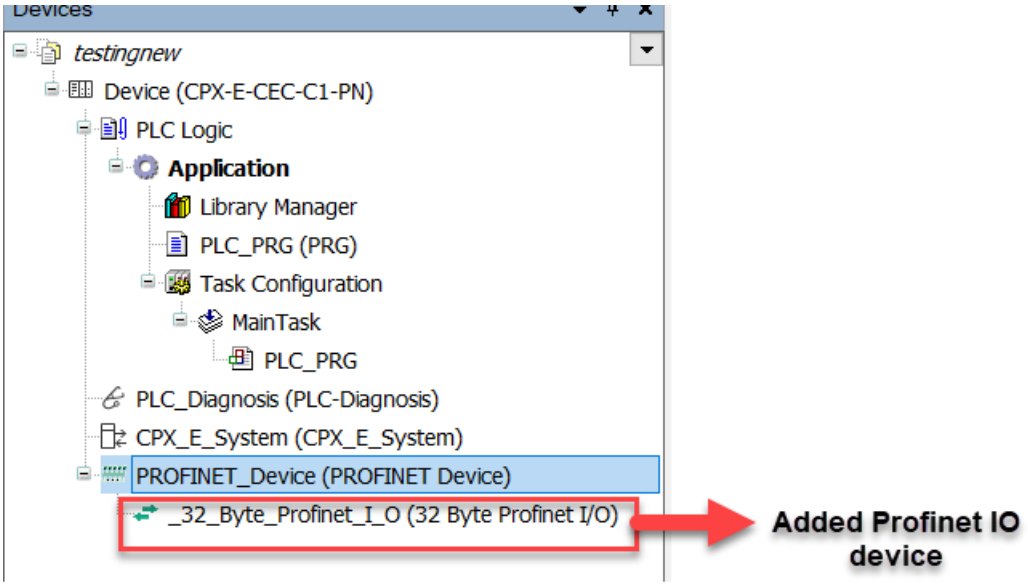
2. Once you click **Add Device** the following list of **Profinet Devices** will be displayed as shown below**:**



3. Click On the needed Profinet Device and Click on **Add Device.** In this example we are considering selection of **32 Byte Profinet I/O**.



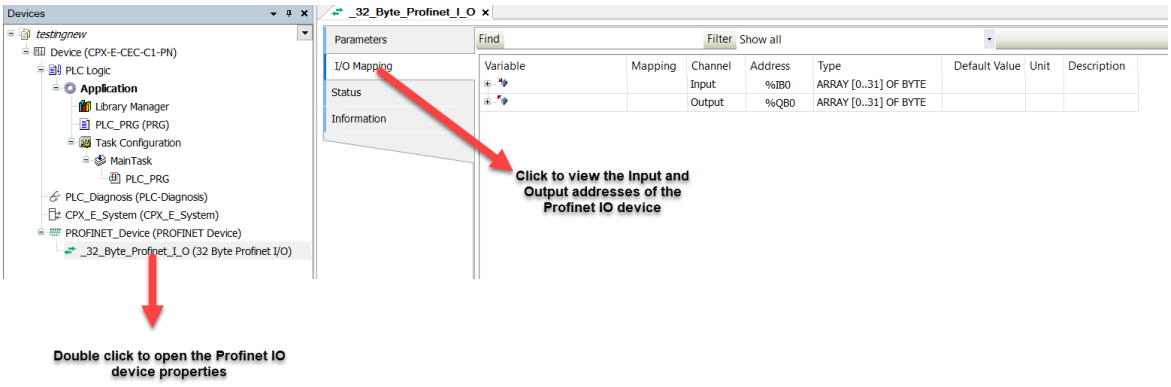
4. Once the profinet device is added the Project Tree will have the below view:



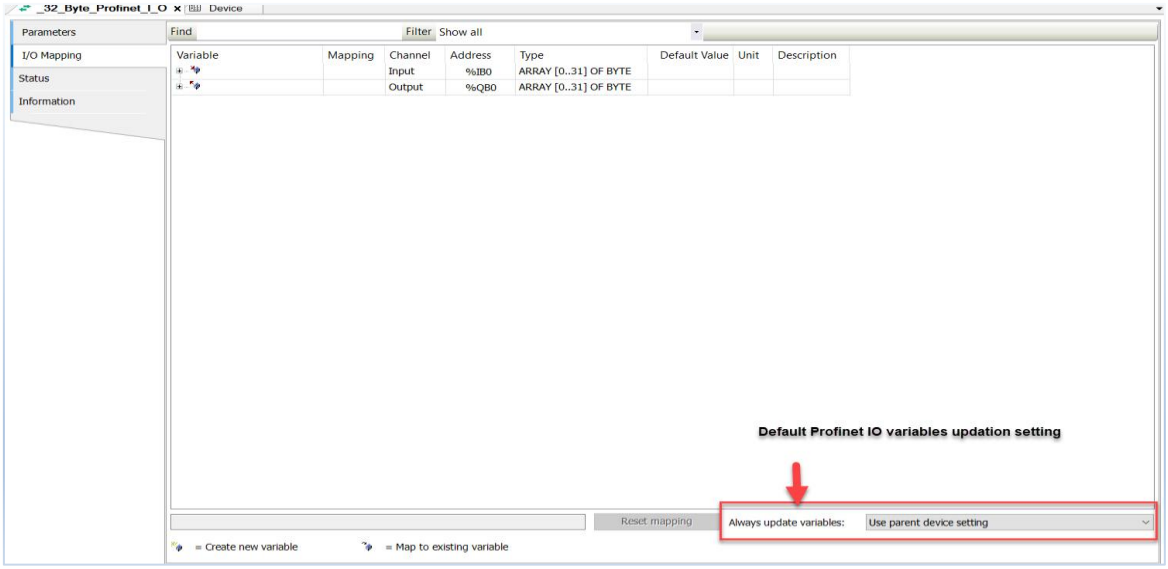
NOTE

- Maximum of 512 bytes of data can be communicated at a time using the ProfinetIO devices.
- This means that 32 different _32_Byte_Profinet_I_O devices can be configured at a time.

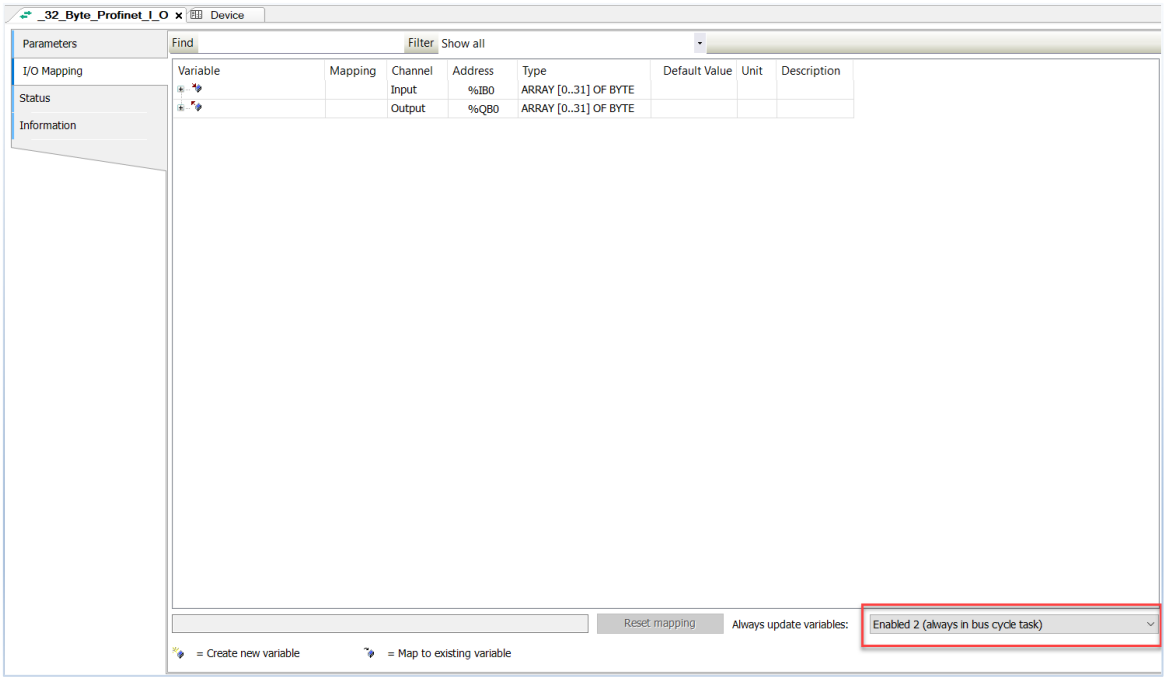
5. Double click on the **_32_Byte_Profinet_I_O** to view the input and output addresses of the added Profinet device.



6. The profinet IO variables updation setting will be by default **“ Use parent device setting”**.

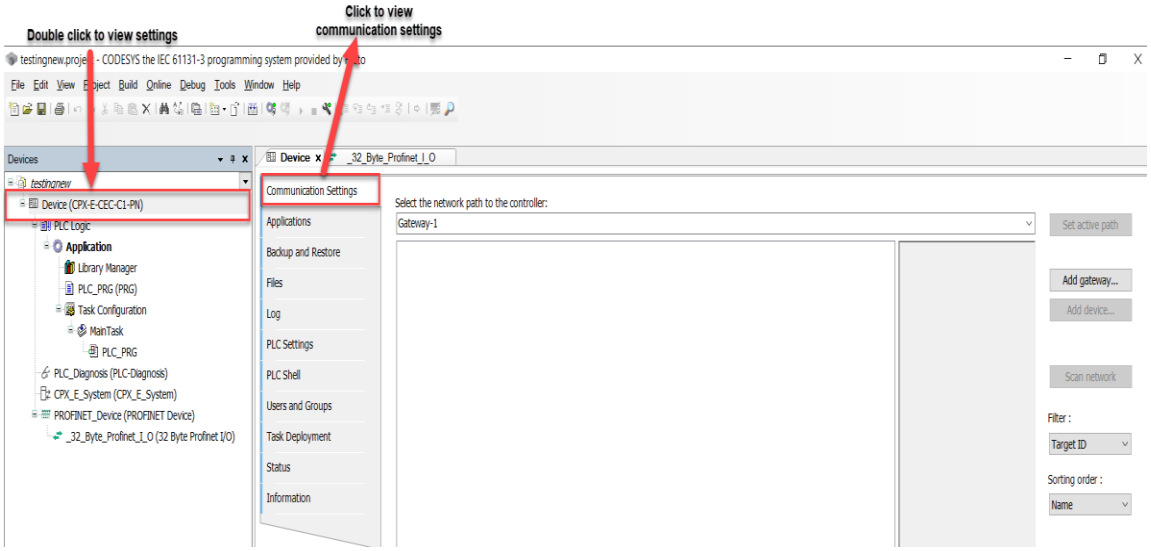


7. Change this setting to **“Enabled 2(always in bus task cycle)”**.

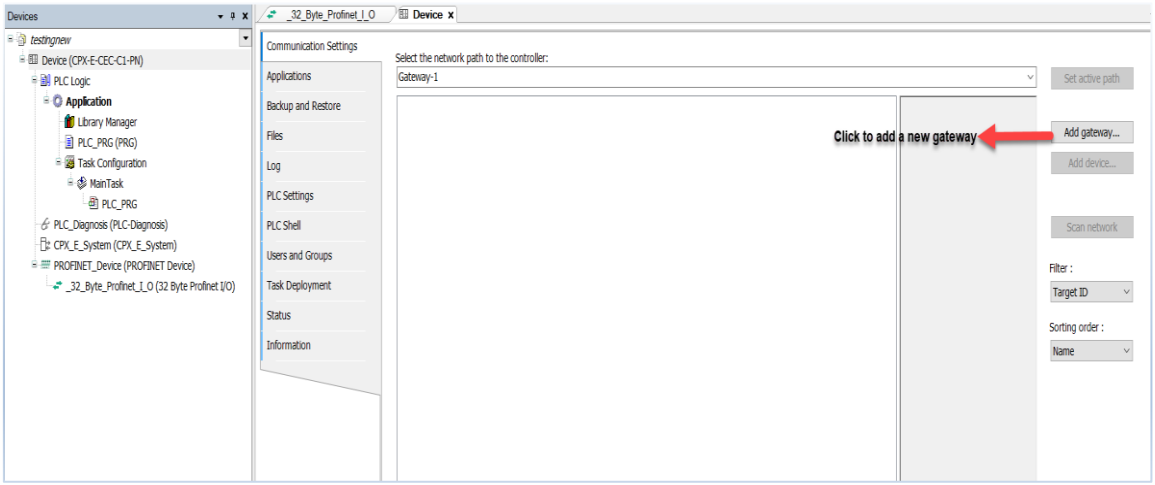


3.3 Creating a gateway for CPX-E-CEC-C1-PN PLC

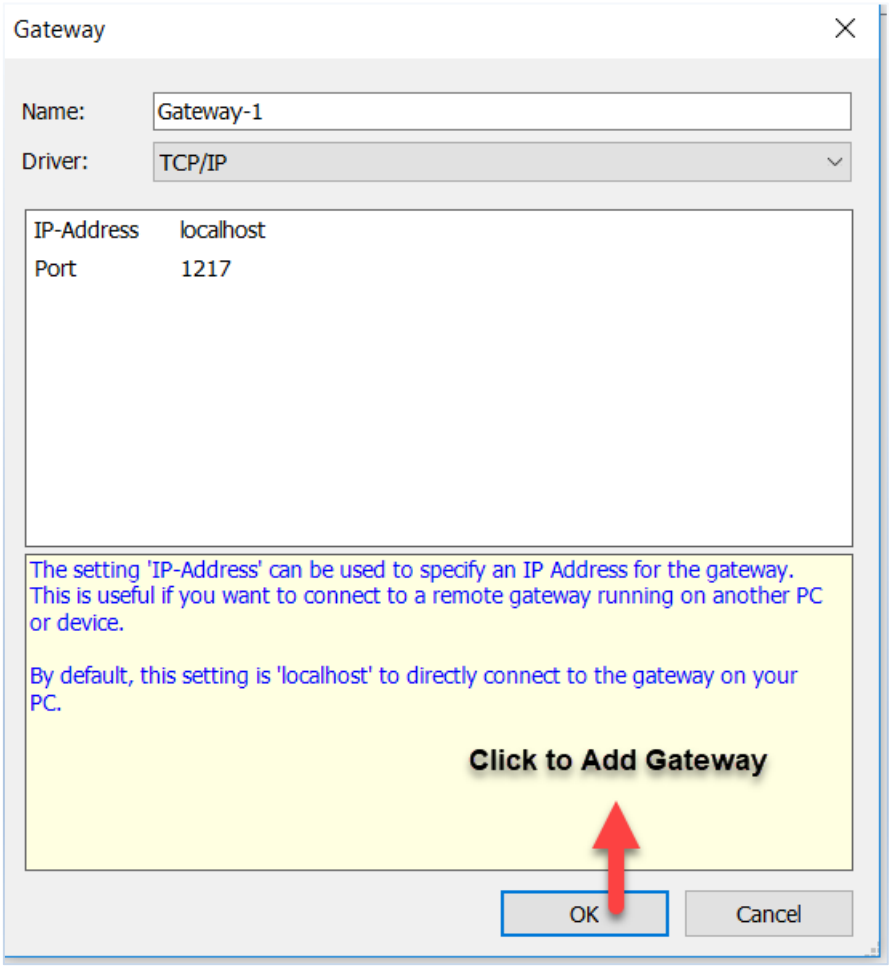
1. Double click on **Device(CPX-E-CEC-C1-PN)** as shown below :



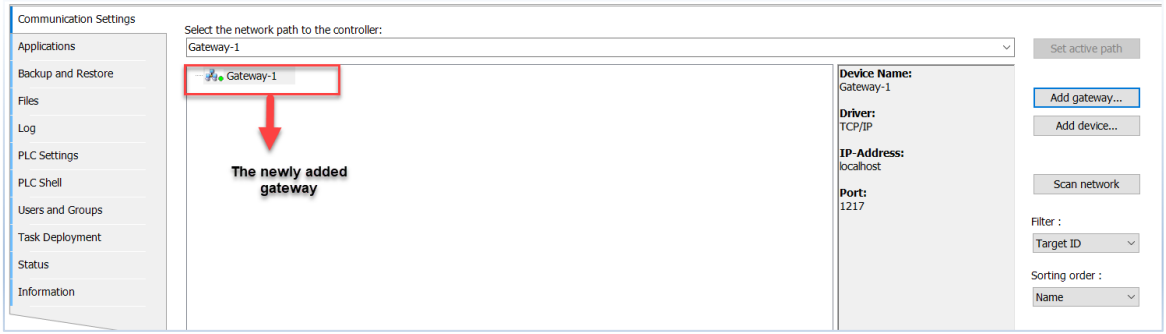
2. Click on **Add Gateway** to create a new gateway.



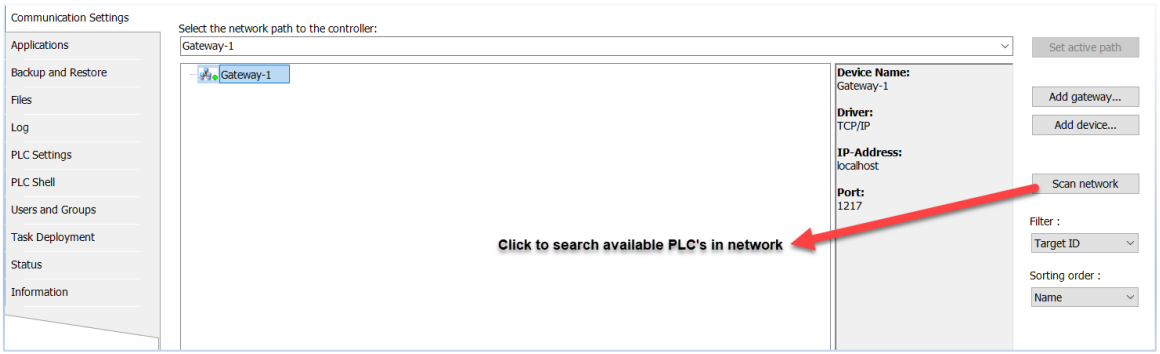
3. Once you click Add Gateway , the below display is viewed.



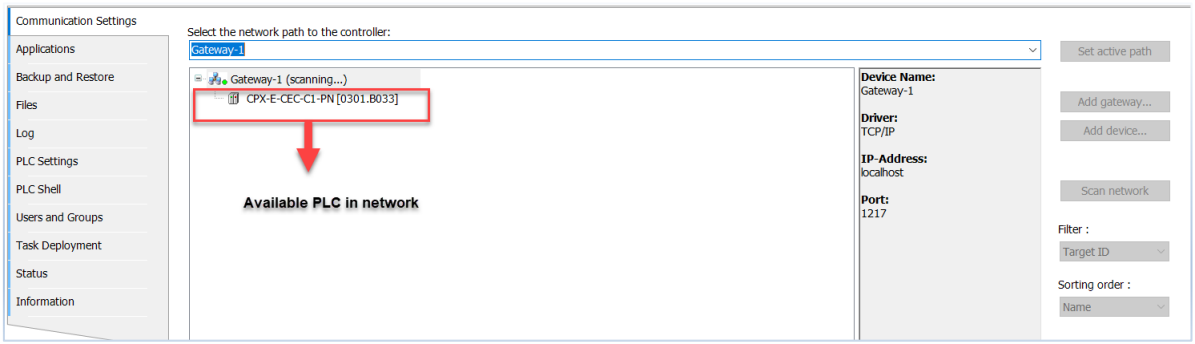
4. Click on **OK as shown above to create a new Gateway.**



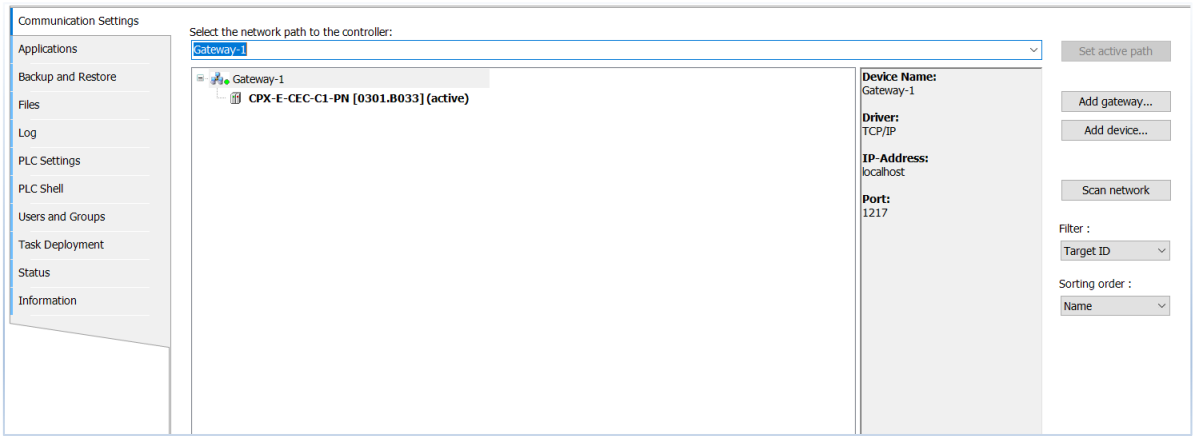
5. Click on **Scan Network** to find the PLC's available in the network.



6. If the PLC is connected to the network the PLC will be listed in the gateway as shown below.



7. Double click on the available PLC to set the path active. Once the path is active the selected PLC will be bolded as shown below.



3.4 Downloading the project to CPX-E-CEC-C1-PN PLC

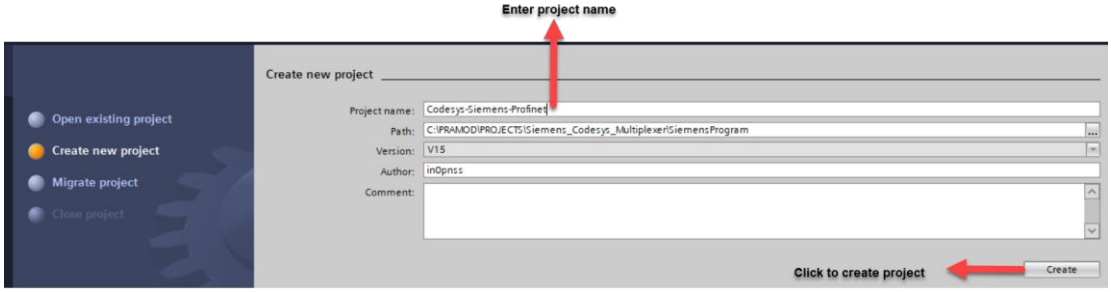
1. Build the Project before downloading. Use the shortcut **F11** for building the project.
2. Download the project to the PLC using the shortcut **Alt + F8**.

4 S7-1200 PLC setup in TIA Portal 15

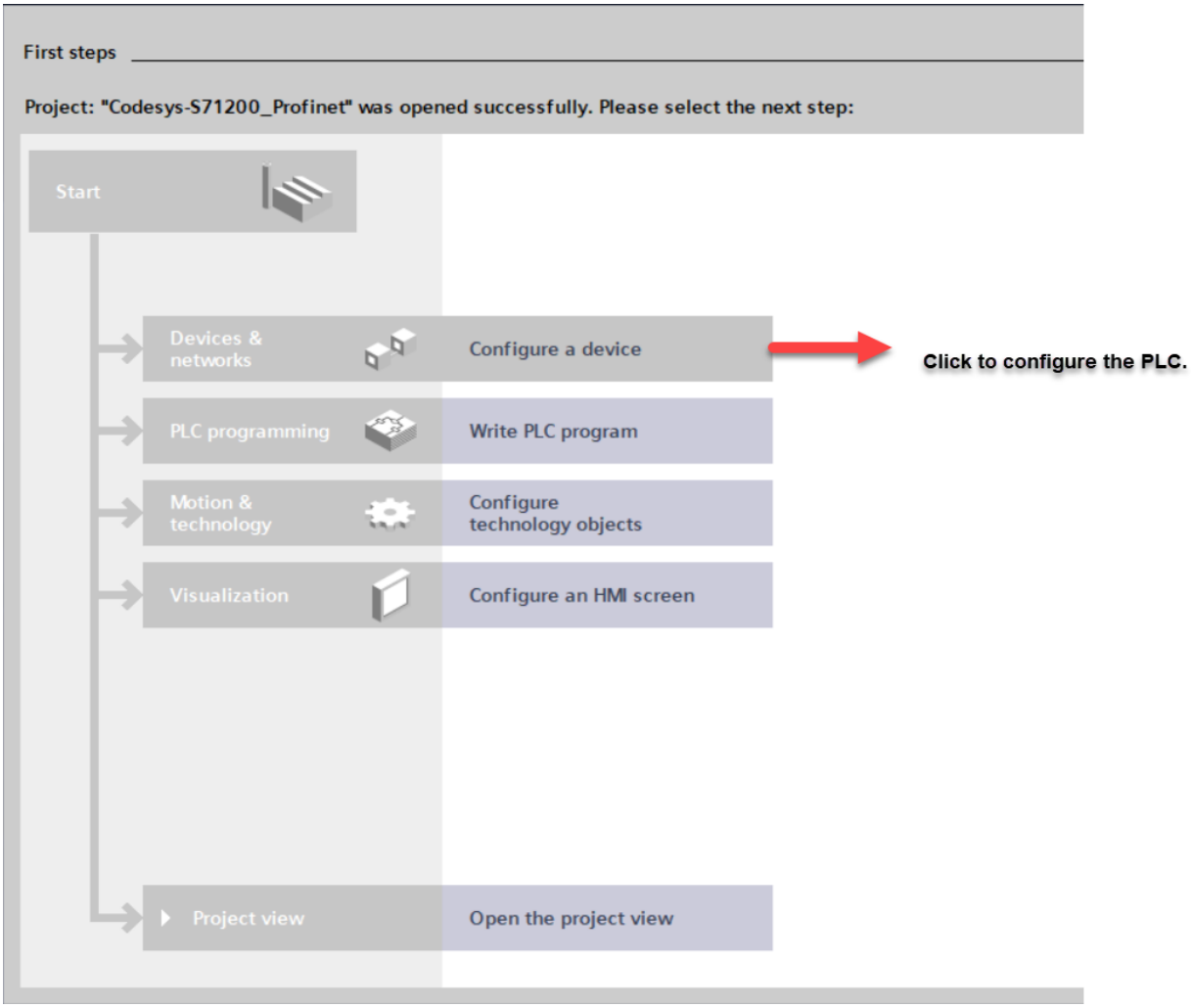
This chapter explains how to setup S7-1200 in TIA portal. It includes the device configuration and communication settings of the S7-1200 PLC.

4.1 Creating a new project in TIA Portal

1. Open TIA Portal 15 from your PC.
2. Create a new project by assigning a name to the project and by selecting the appropriate place where the project has to be saved in your PC.

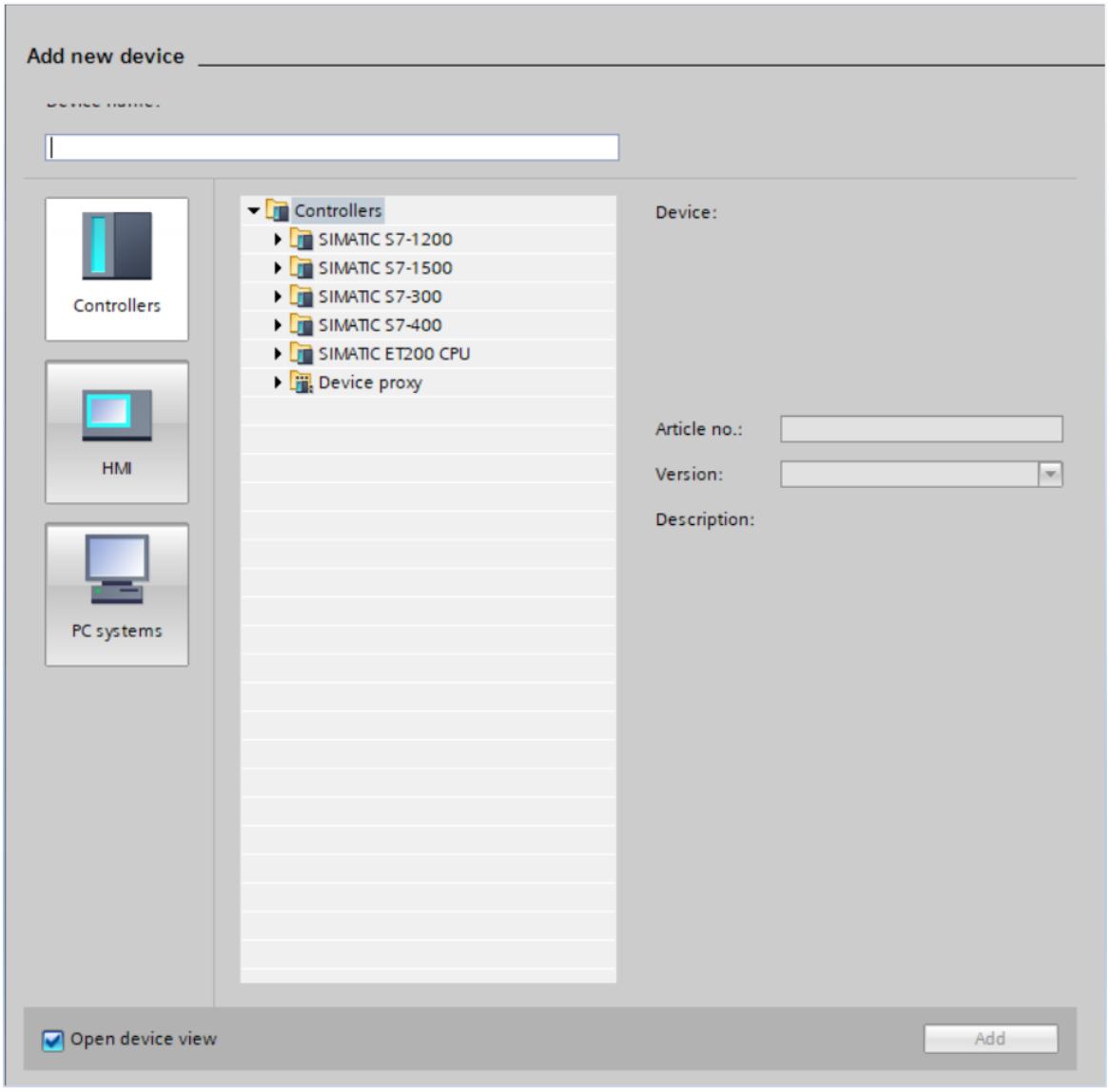


3. After assigning the name, Click on **Create** to create the project. Once you click create the following view will be displayed.

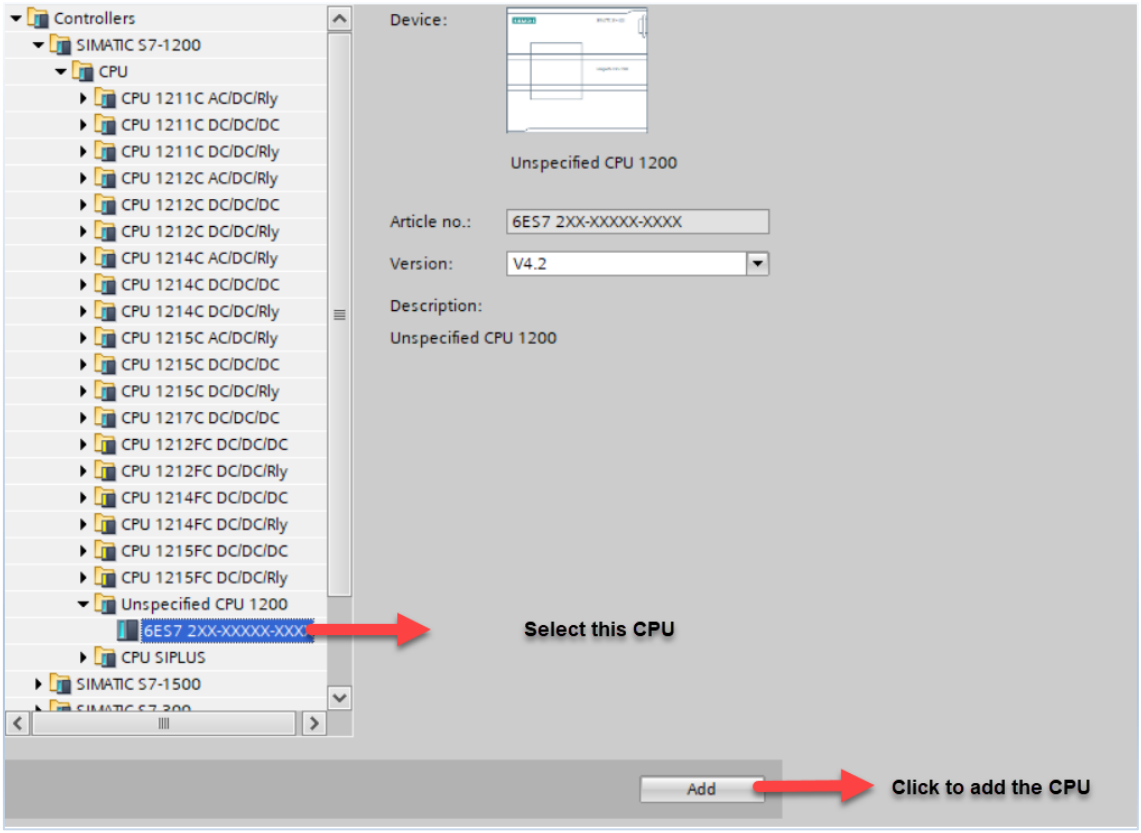


4. Click on **Configure a device** to do the PLC configuration as shown in the above image.The configuration screen allows you to choose the PLC CPU needed from the available list of CPU's.

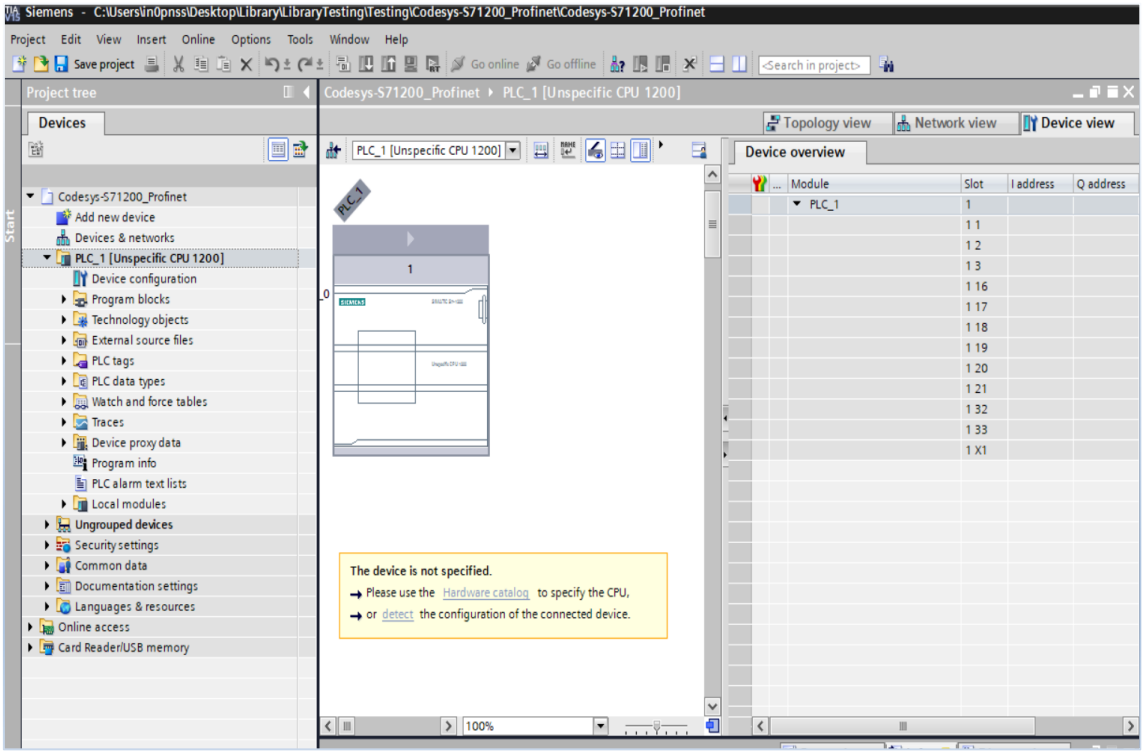
The list of avialable CPU's will be displayed as shown below.



5. If the PLC and you PC are connected in the same network , then it will be easy to do the PLC configuration if we can retrieve the actual hardware configurations present at the PLC. So for this purpose select **Unspecified CPU 1200** from the list of available CPU's as shown below.

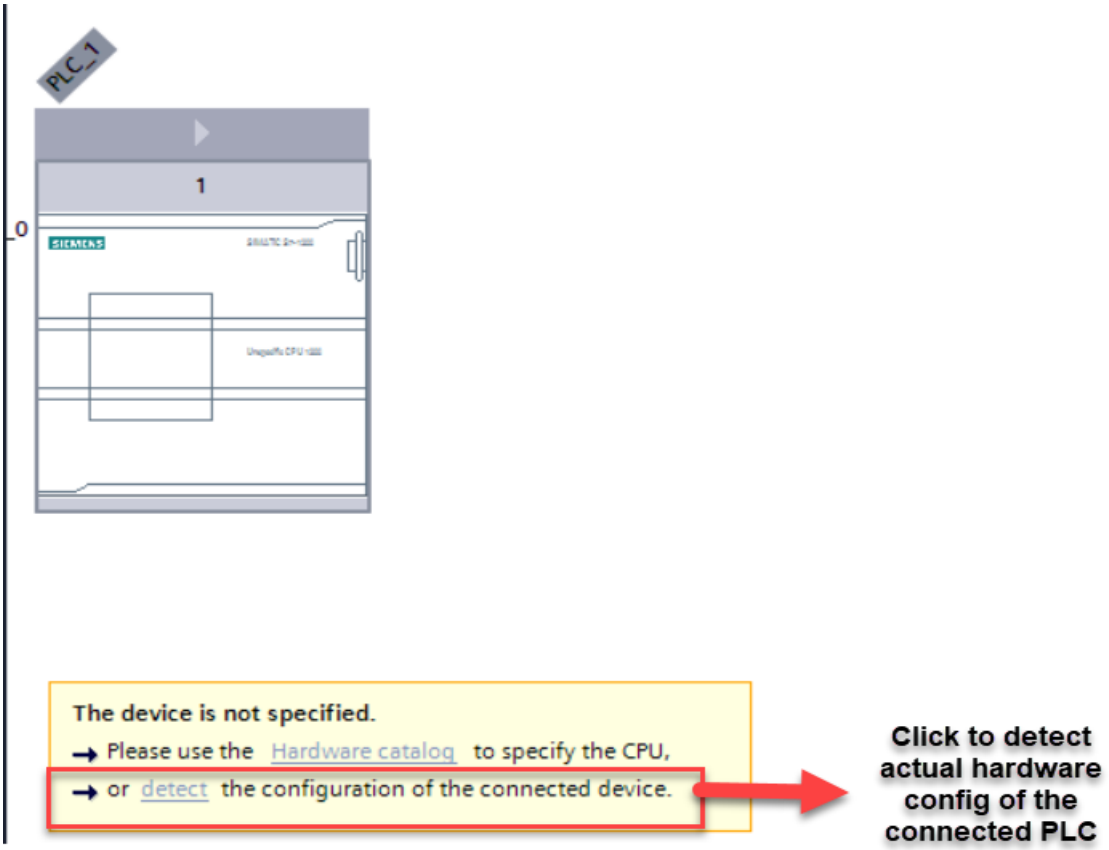


6. Once the CPU is selected click on **Add** as shown in above image. Once the CPU has been added to the project, the following display the project will have.

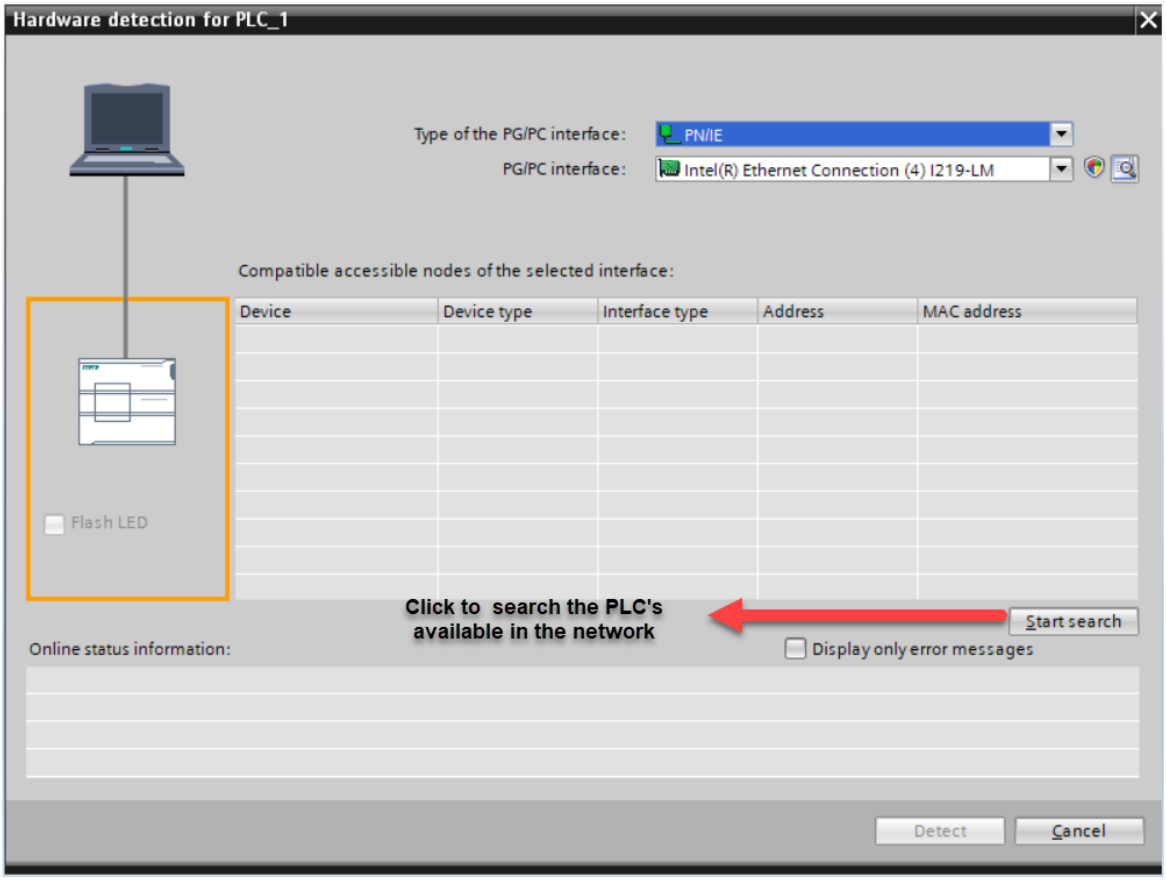


4.2 Detecting the actual hardware configuration of the PLC connected to the network

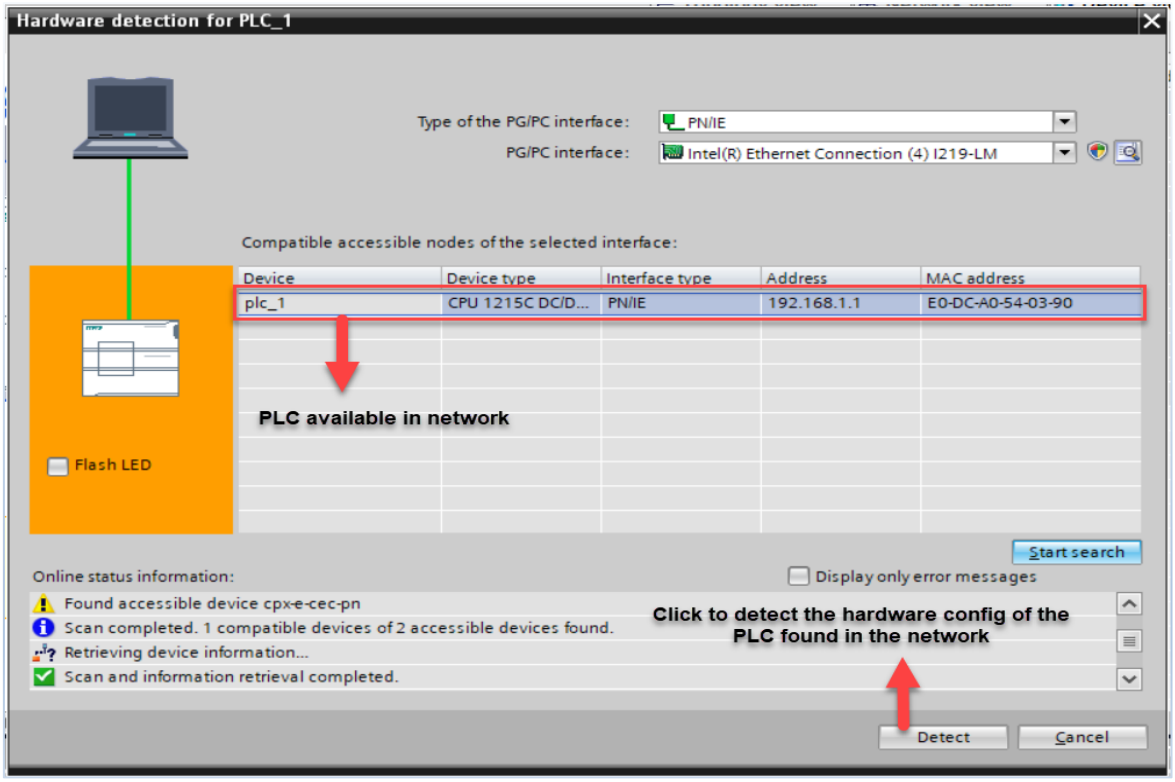
1. Click on **Detect the configuration of the connected PLC** option to retrieve the PLC Configuration.



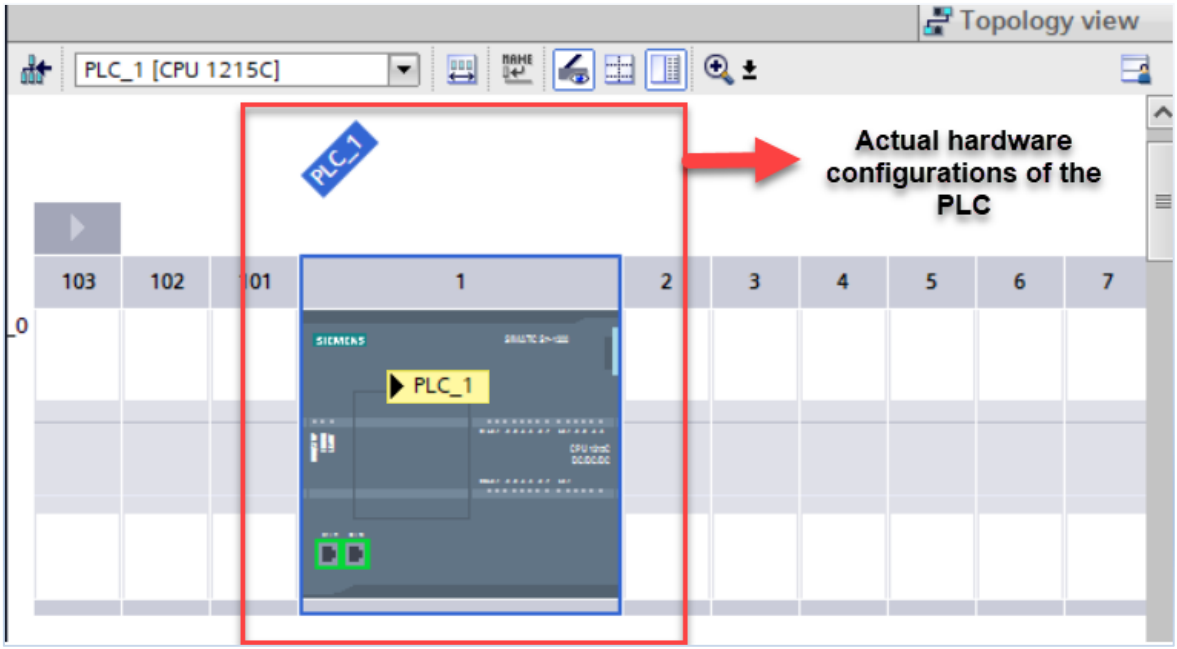
2. Once you give **Detect the configuration option** , the following display is visualized.



3. Click the **Search Button** as shown in above image to search the PLC's available in the network.
4. Once the search is completed the available PLC's will be displayed as shown below.



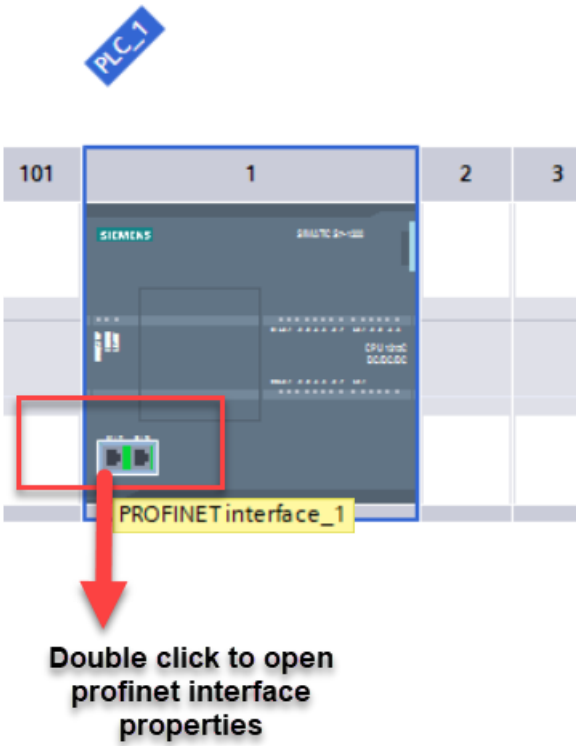
5. Once the search is completed, click **Detect** to retrieve the actual hardware configurations of in the PLC found in the network .
6. Once the Hardware configurations have been retrieved the PLC configuration will be displayed as shown below.



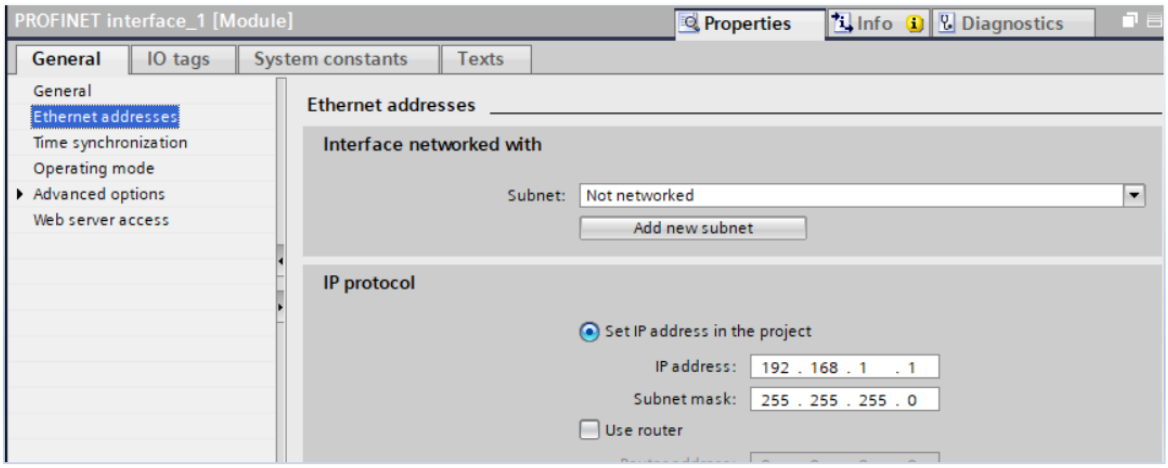
4.3 Configuration of the IP parameters of the Profinet interface of the PLC

Once the hardware configurations of the PLC has been done the next important task is to configure the IP parameters of the profinet interface.

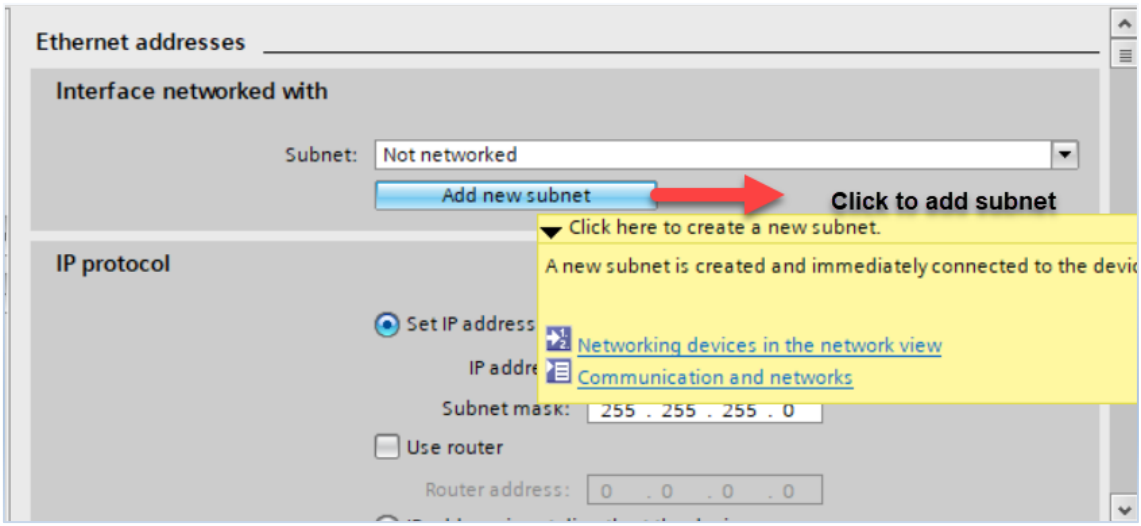
1. Double click on Profinet interface_1 to open the properties of the Profinet interface.



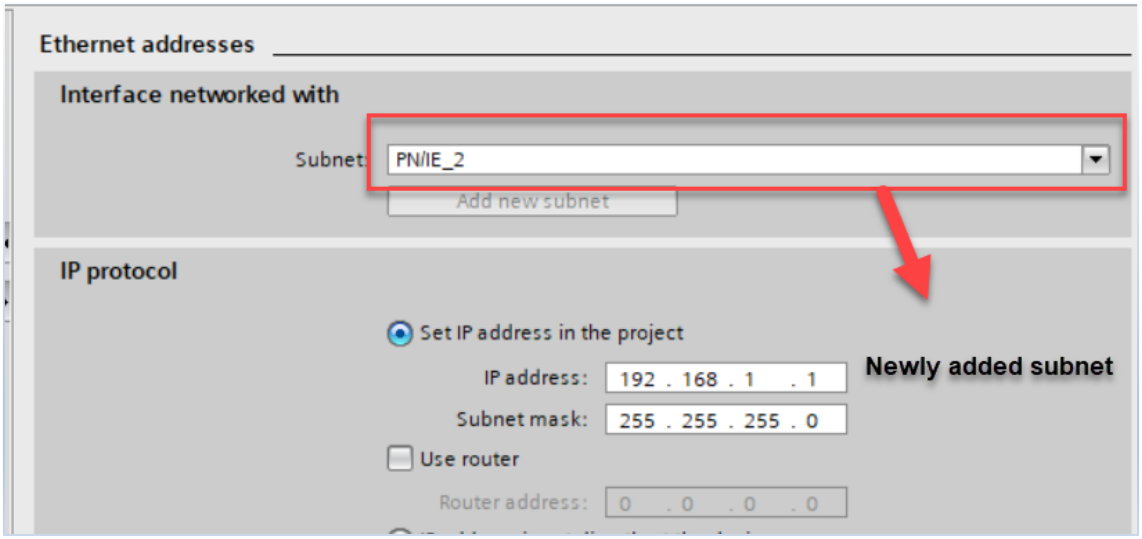
2. Profinet interface properties tab looks as shown below.



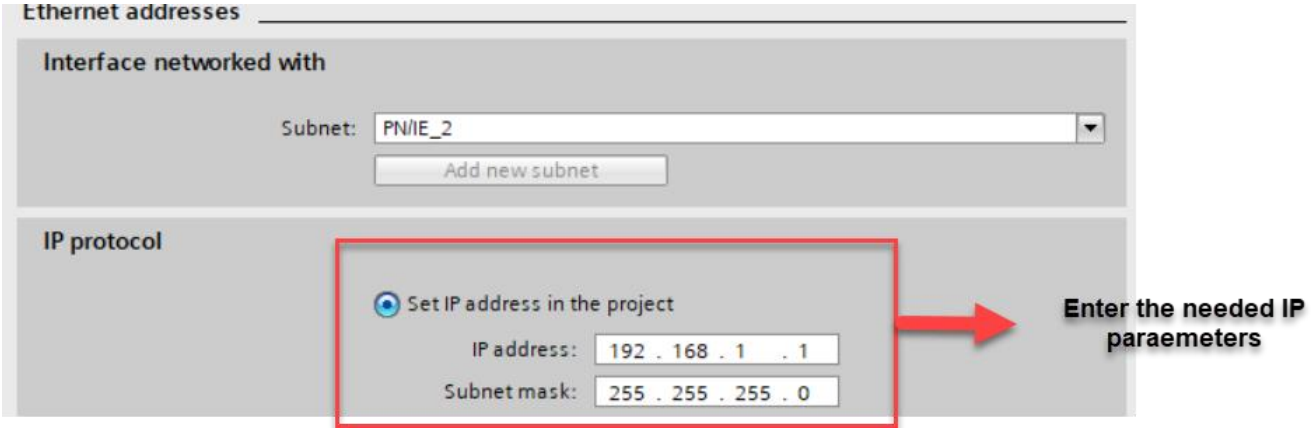
3. In the **Ethernet Addresses** properties click on **Add new subnet** to create a new subnet as shown below.



Once the subnet is added the view looks as shown below.



4. Enter the needed IP address and subnet mask in the **IP protocol** part of the ethernet addresses.



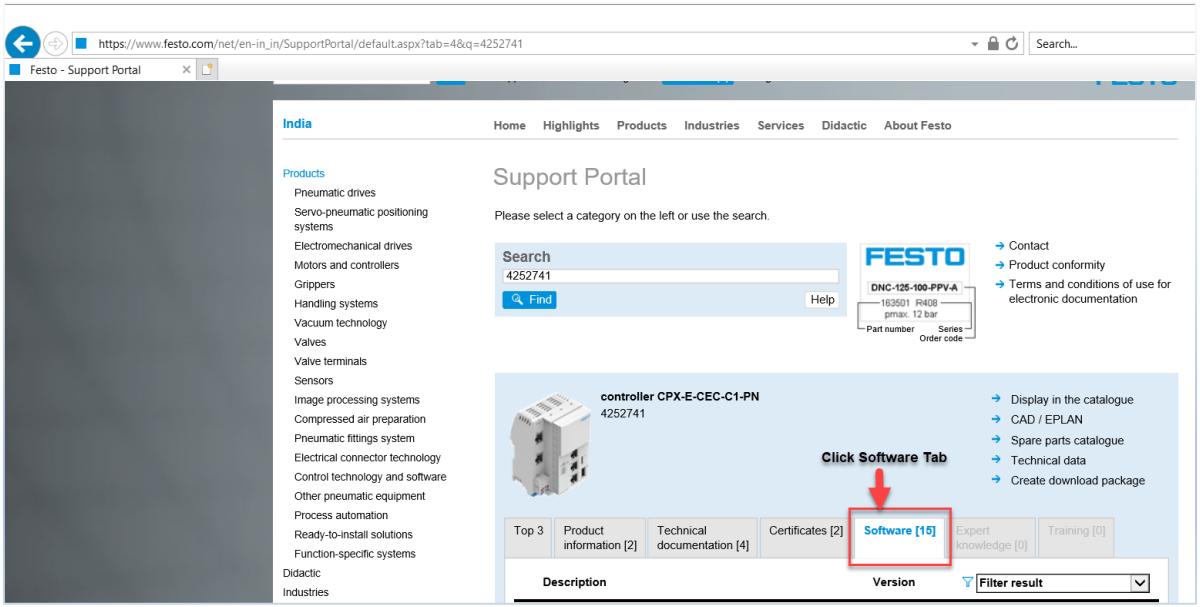
5 Adding GSDML File of Festo CPX-E-CEC Controller to TIA Portal

This chapter explains the procedure to add the GSDML file of CPX-E-CEC controller to the TIA Portal project.

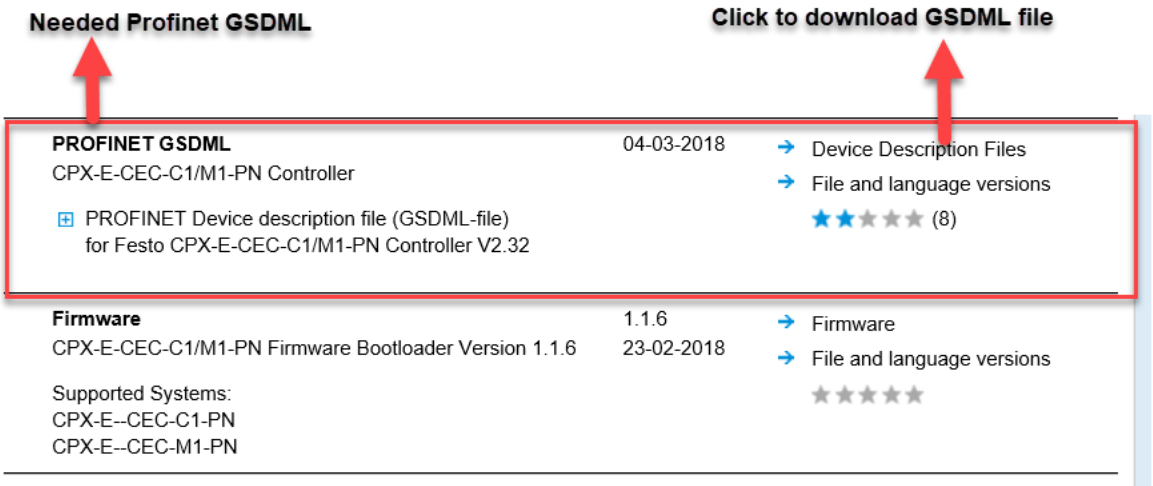
5.1 Downloading the GSDML File from the Festo Support Portal

1. Download the GSDML File for CPX-E-CEC from the Festo Support Portal.
   You can download the GSDML file from the below link.
   https://www.festo.com/net/en-in_in/SupportPortal/default.aspx?tab=4&q=4252741

2. In the web page, click **Software** tab.



3. Under Software category scroll down until you find the Profinet GSDML File for CPX-E-CEC controller.



4. Save the GSDML file in an appropriate folder in your PC.
5. The GSDML file will be downloaded as a zipped file as shown in the below image.

6. Unzip the file to view the contents of the file. The unzipped files will look as shown below.

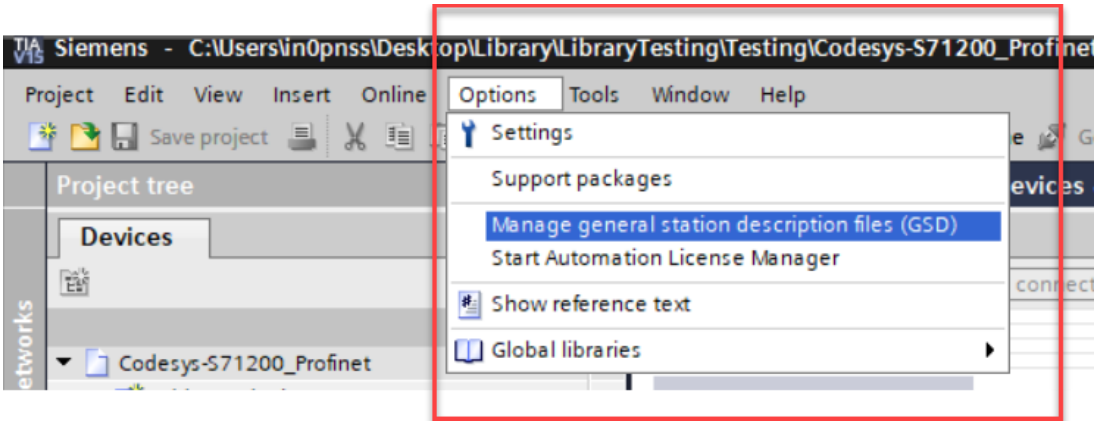
NOTE

- When the GSDML file has to be added to TIA Portal, the downloaded GSDML file from support portal should be unzipped.

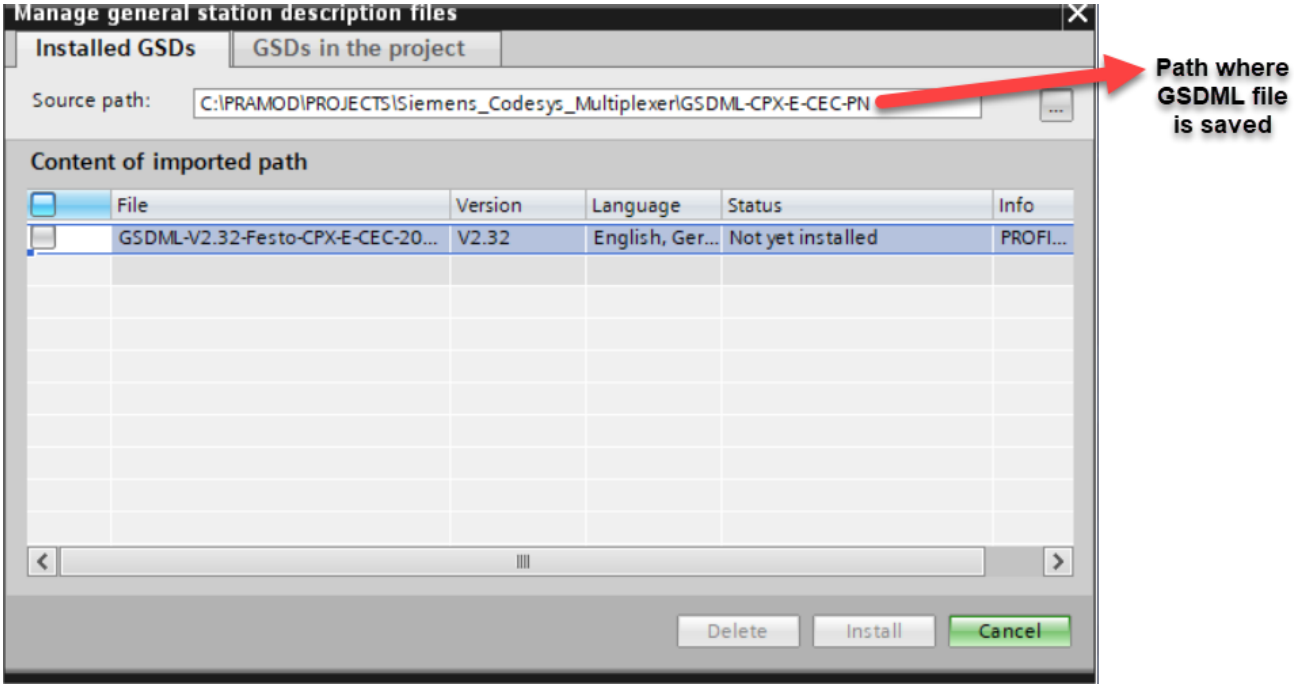
5.2 Adding the GSDML File to TIA Portal

The downloaded GSDML file of CPX-E controller must be added to the TIA portal.

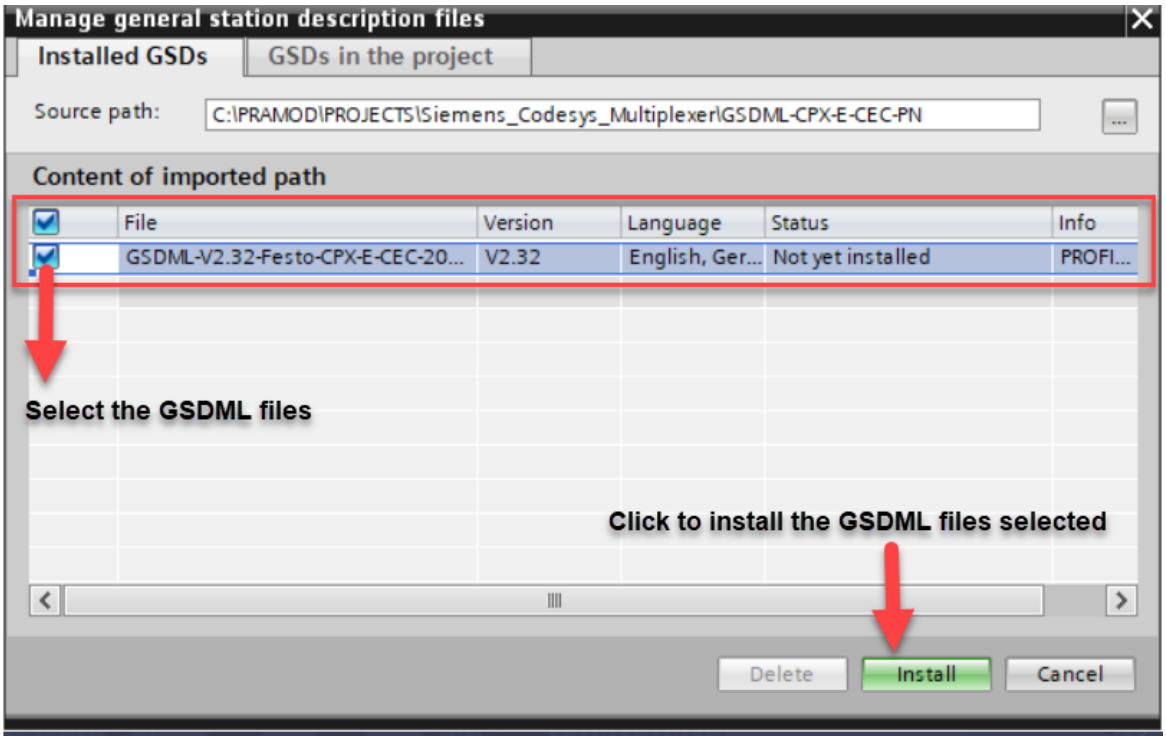
1. Click on **Options ›› Manage General Station Description Files (GSD).**



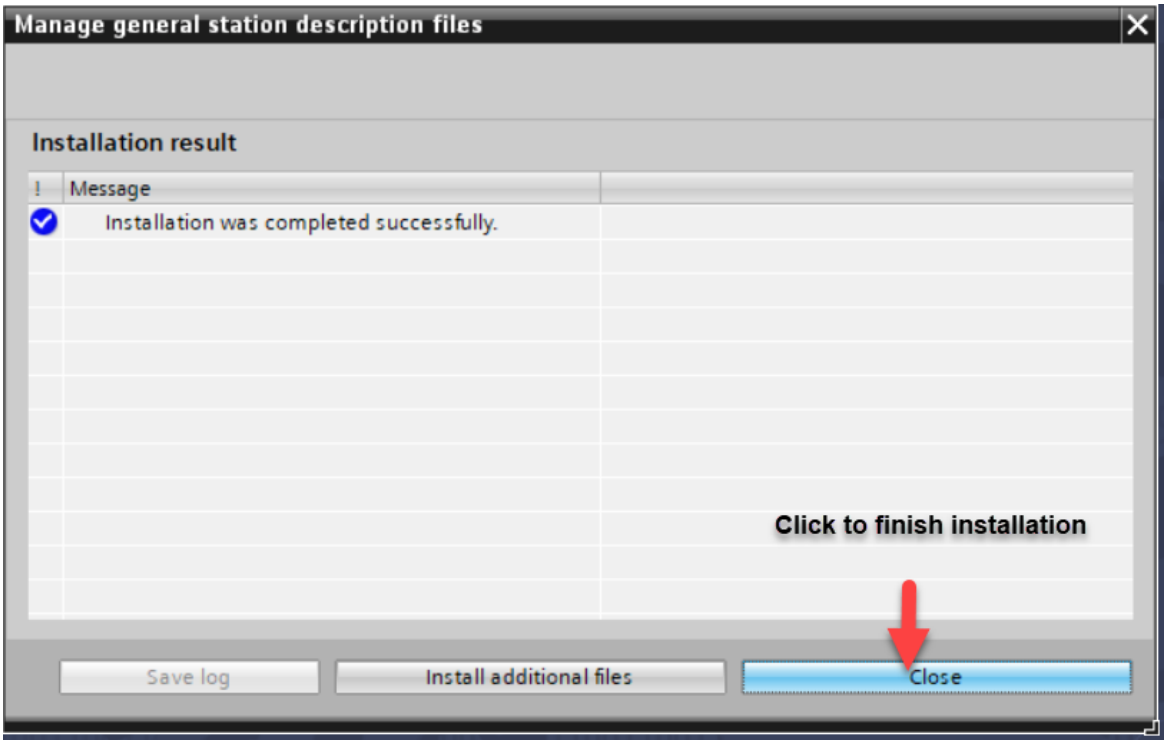
2. Select the path in your PC where the Profinet GSDML file of CPX-E controller has been saved.



3. Select the GSDML files and Click on **Install.**



4. Once the installation is over, the following display can be visualised.



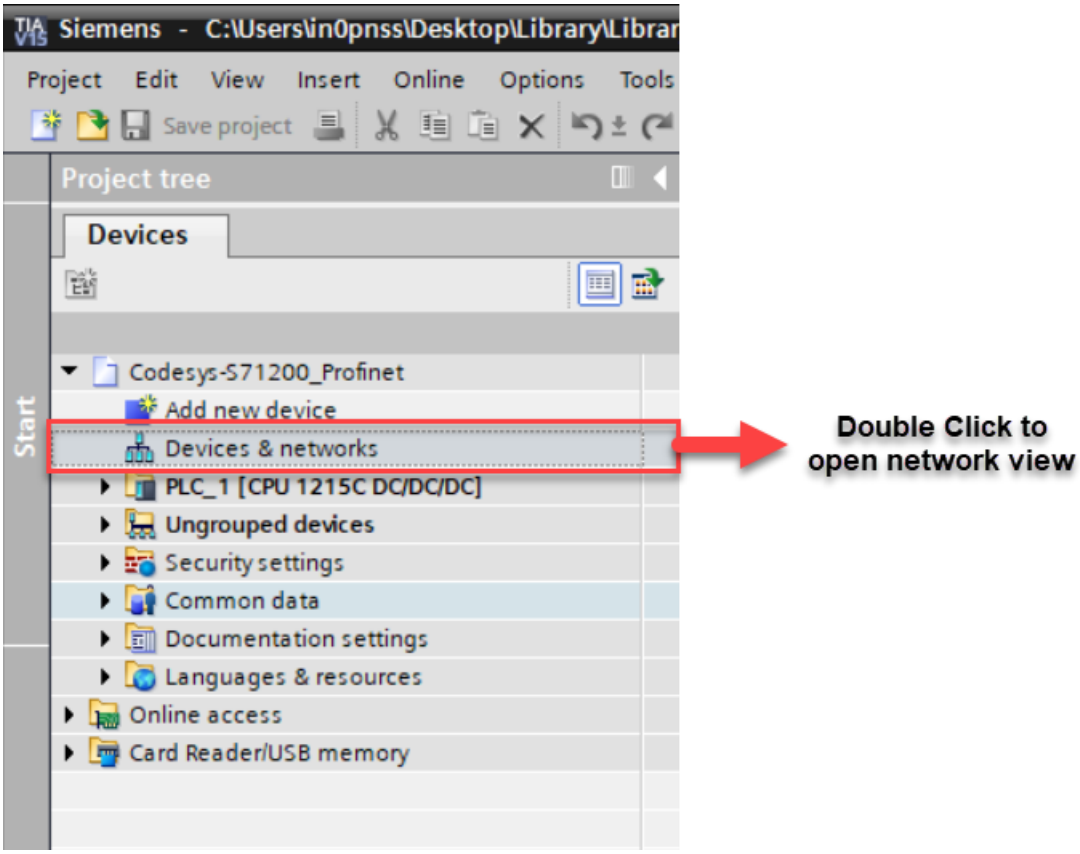
5. Click on **Close** to finish the installation.

6 Configuration of Festo CPX-E-CEC Controller in TIA Portal

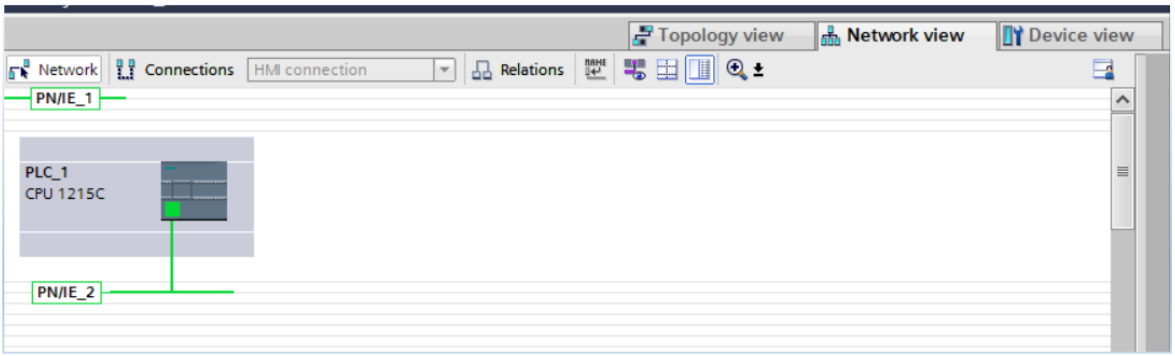
Once the GSDML file of CPX-E-CEC controller is added, the next step is to do the configuration of it in TIA Portal.

6.1 Adding the installed CPX-E-CEC-C1-PN to network view.

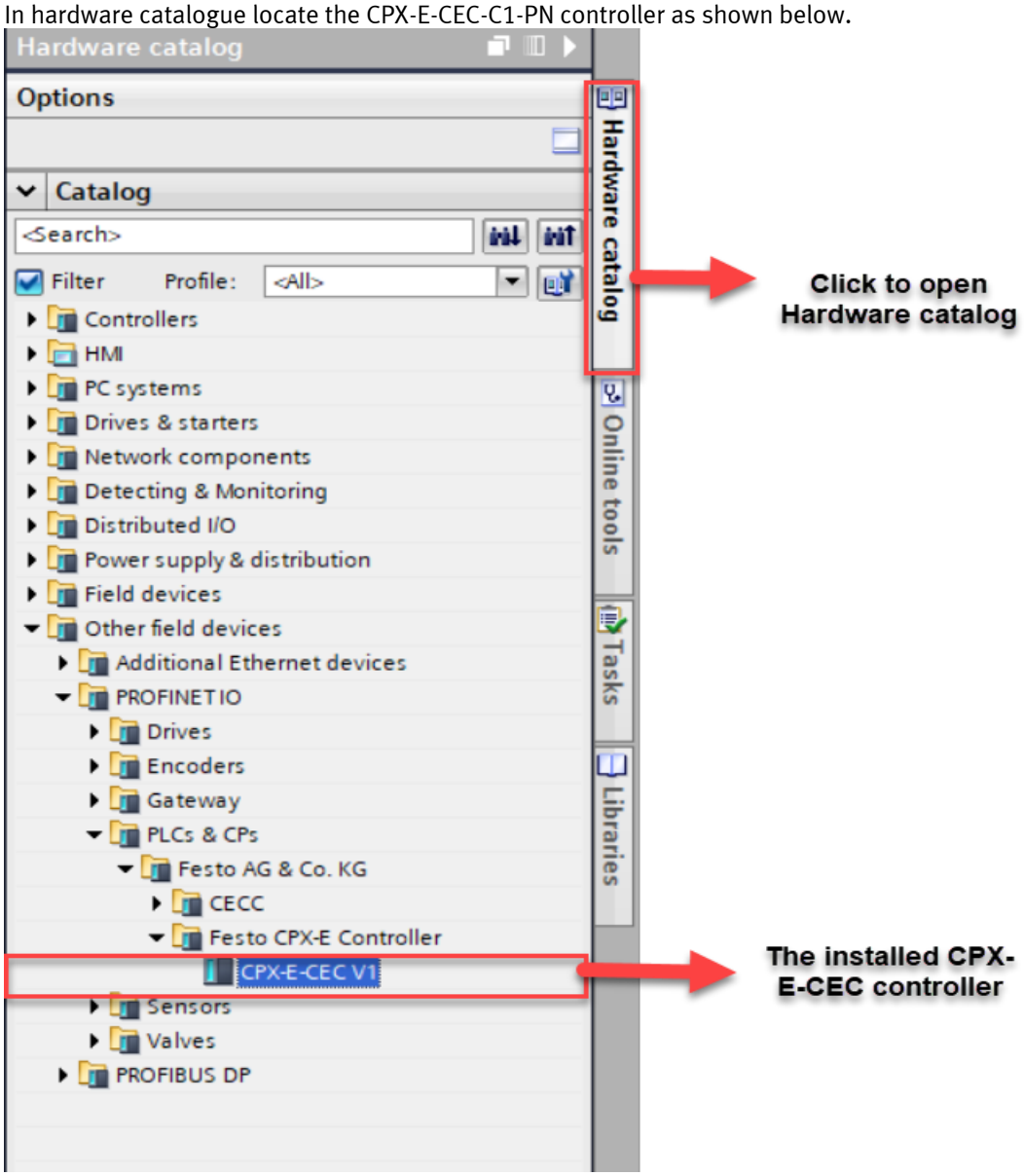
1. Double Click on **Devices and Networks**.



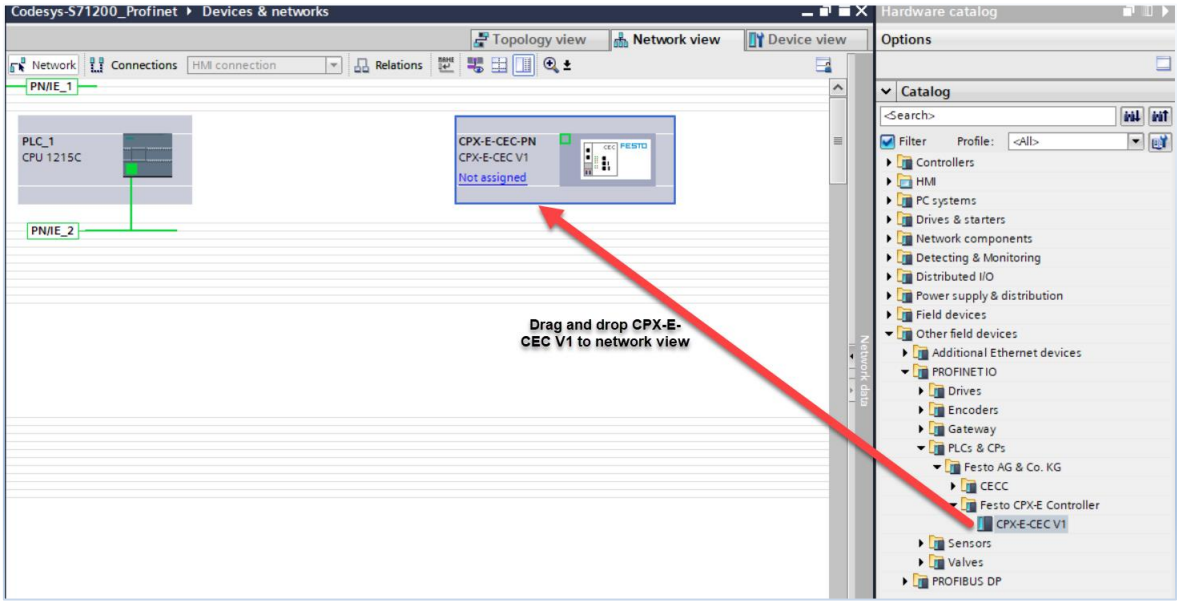
2. The Network view will be as shown below.



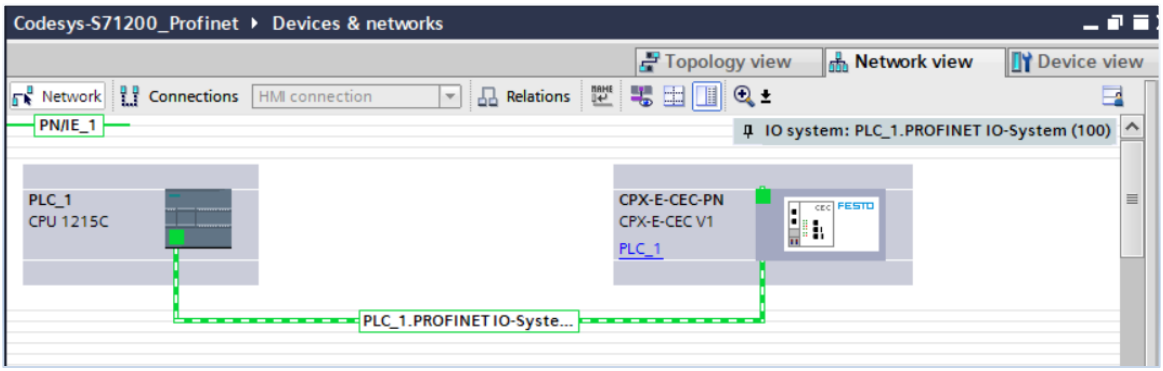
3. In hardware catalogue locate the CPX-E-CEC-C1-PN controller as shown below.



4. Drag and drop the **CPX-E-CEC V1** to the network view.

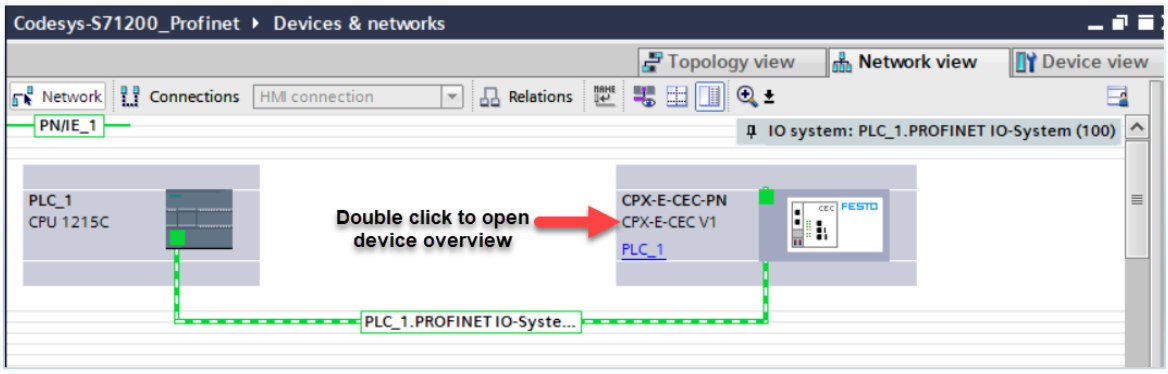


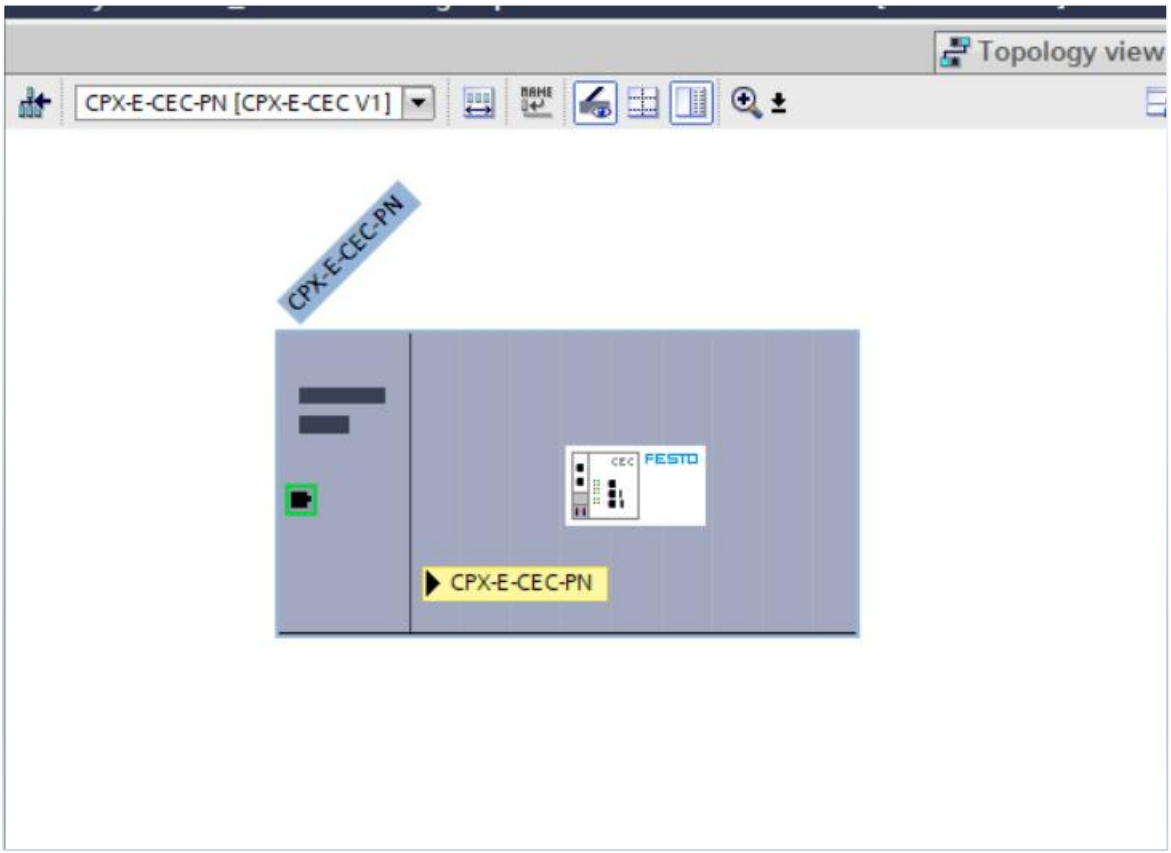
5. Connect the S7-1200 PLC to CPX-E-CEC-C1-PN .



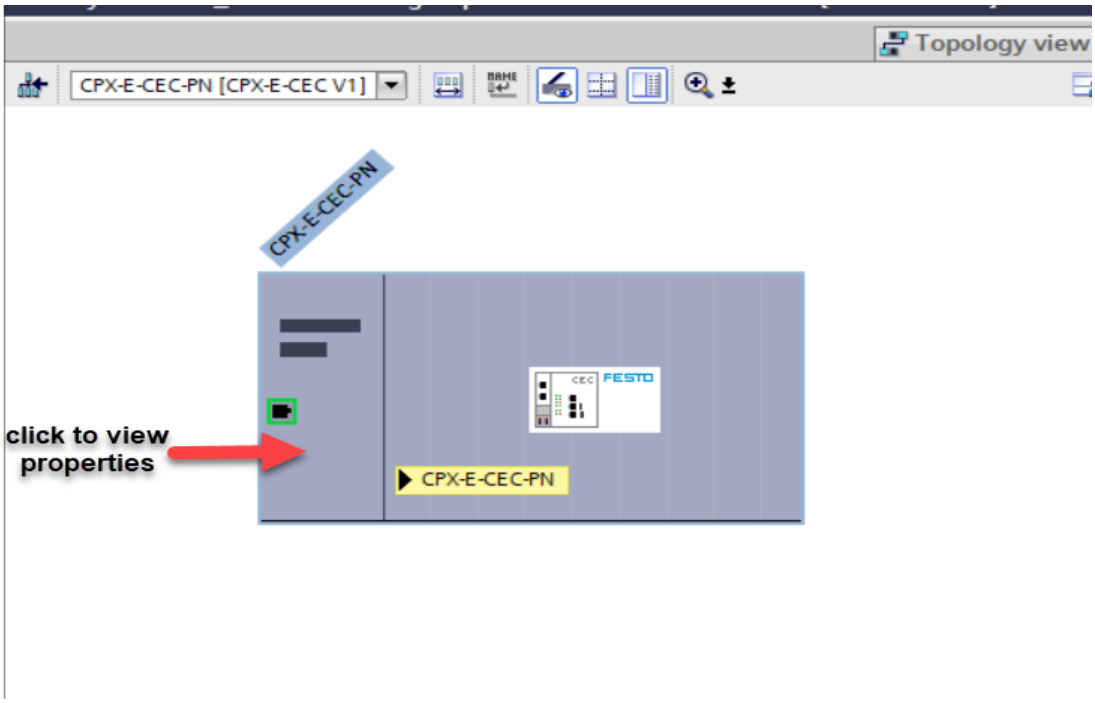
6.2 Network Configuration of Profinet Interface XF1 of CPX-E-CEC-C1-PN controller in TIA Portal

1. Double click **CPX-E-CEC-PN** module .

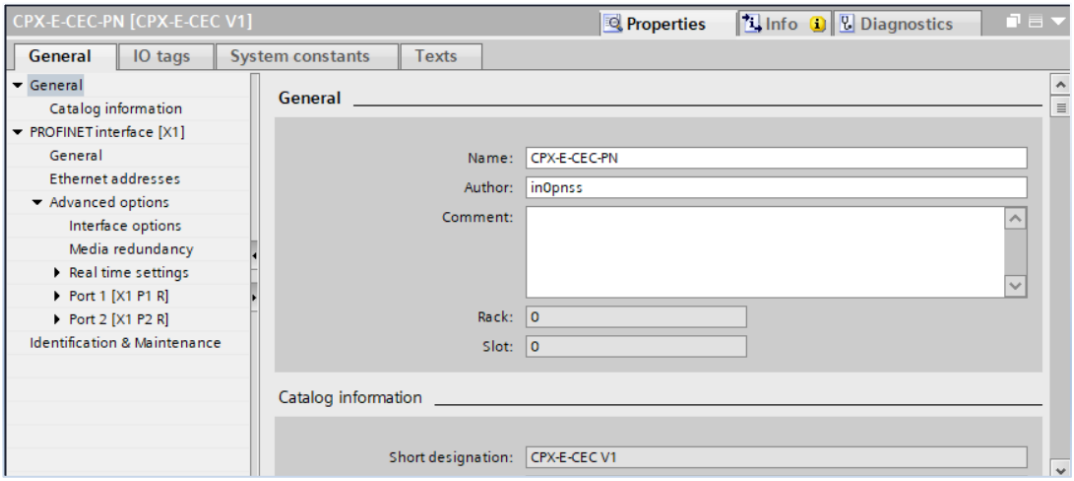




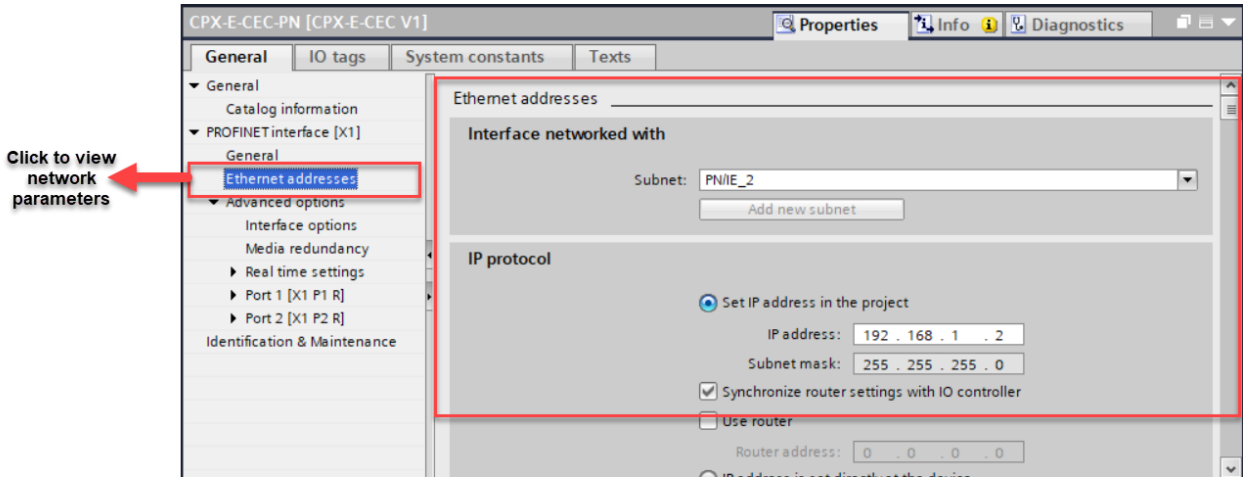
2. **Click on CPX-E-CEC-PN module** to view the properties of the controller.



3. The properties will be viewed as shown below.



4. The network parameters are under **Ethernet Addresses.**



NOTE

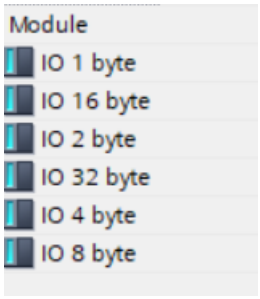
- The above IP parameters are of the Profinet interface **XF1** of the **CPX-E-CEC-C1-PN** Controller.

NOTE

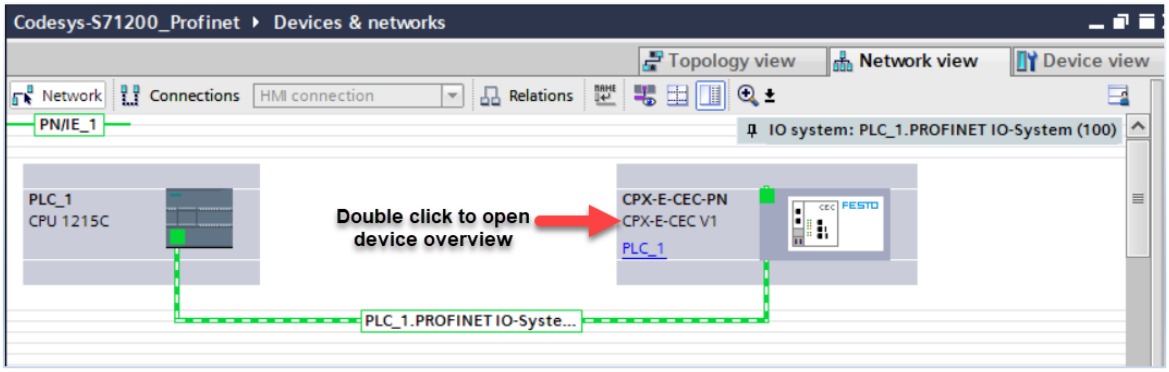
- The IP address of the Profinet interface **XF1 , ETH1 Port** of CPX-E-CEC-C1-PN and S7-1200 PLC should be in the same range.

6.3 Adding Profinet IO modules to the Profinet Interface of CPX-E-CEC-C1-PN.

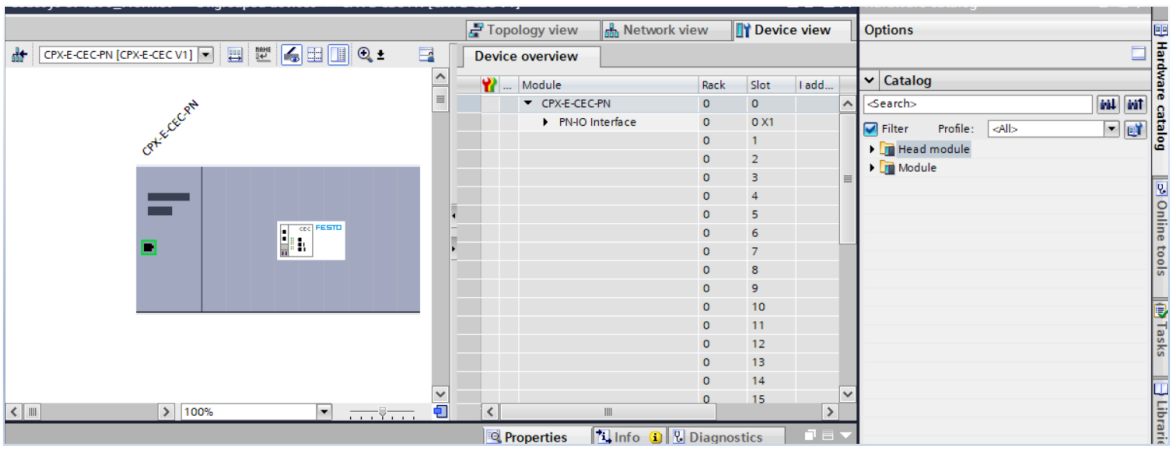
The following Profinet IO modules are available.



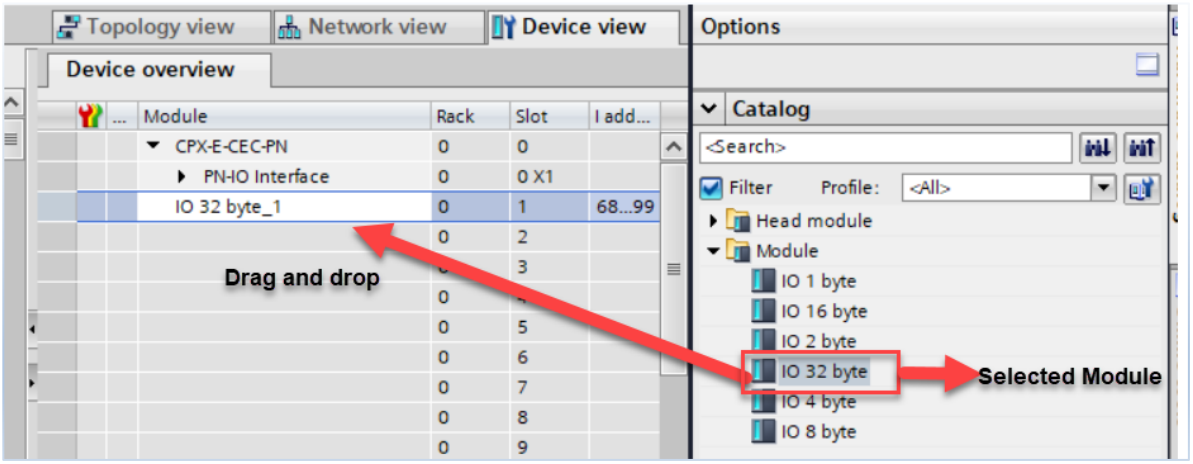
1. Go to **Device and Networks**.



2. Double click on CPX-E-CEC-PN as shown above to get below view.



3. From the catalog select the needed Profinet IO module .



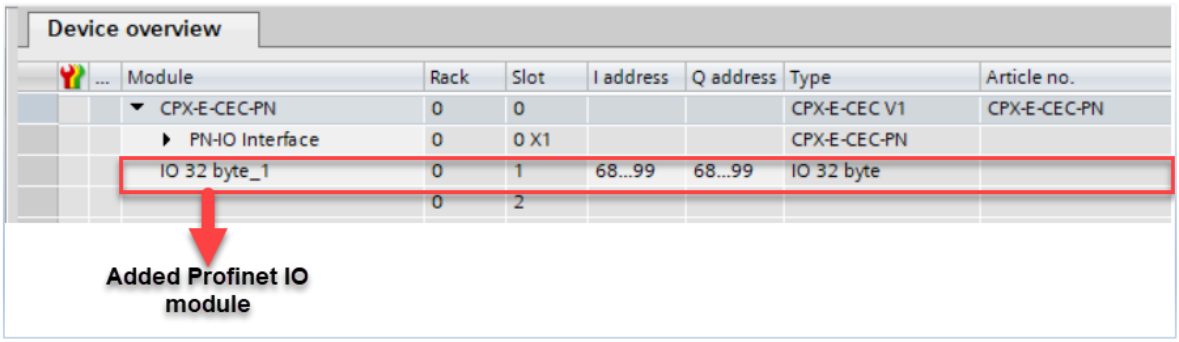
NOTE

- **The Profinet IO module configured in Codesys Project and the one configured in TIA Portal side must be same. If not errors will be found in TIA Portal.**

NOTE

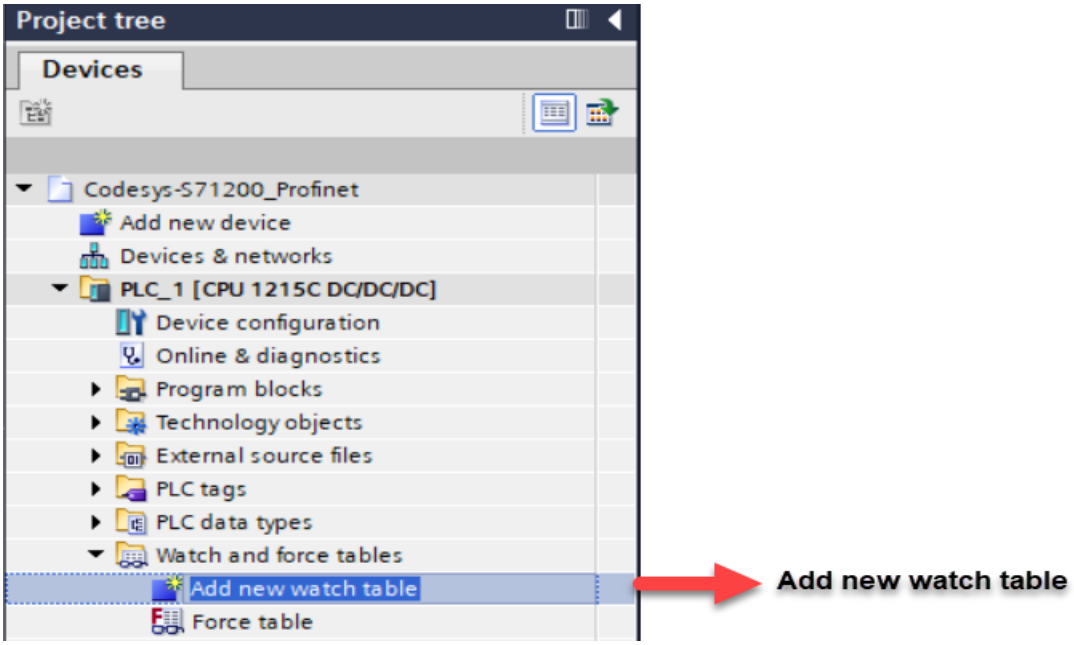
- **In our example weh ad chosen 32 byte Profinet IO in codesys side. So we are choosing the same in TIA Portal also.**

4. The Input and Output addresses of the profinet module are **IB 68-99 AND QB 68-99**.

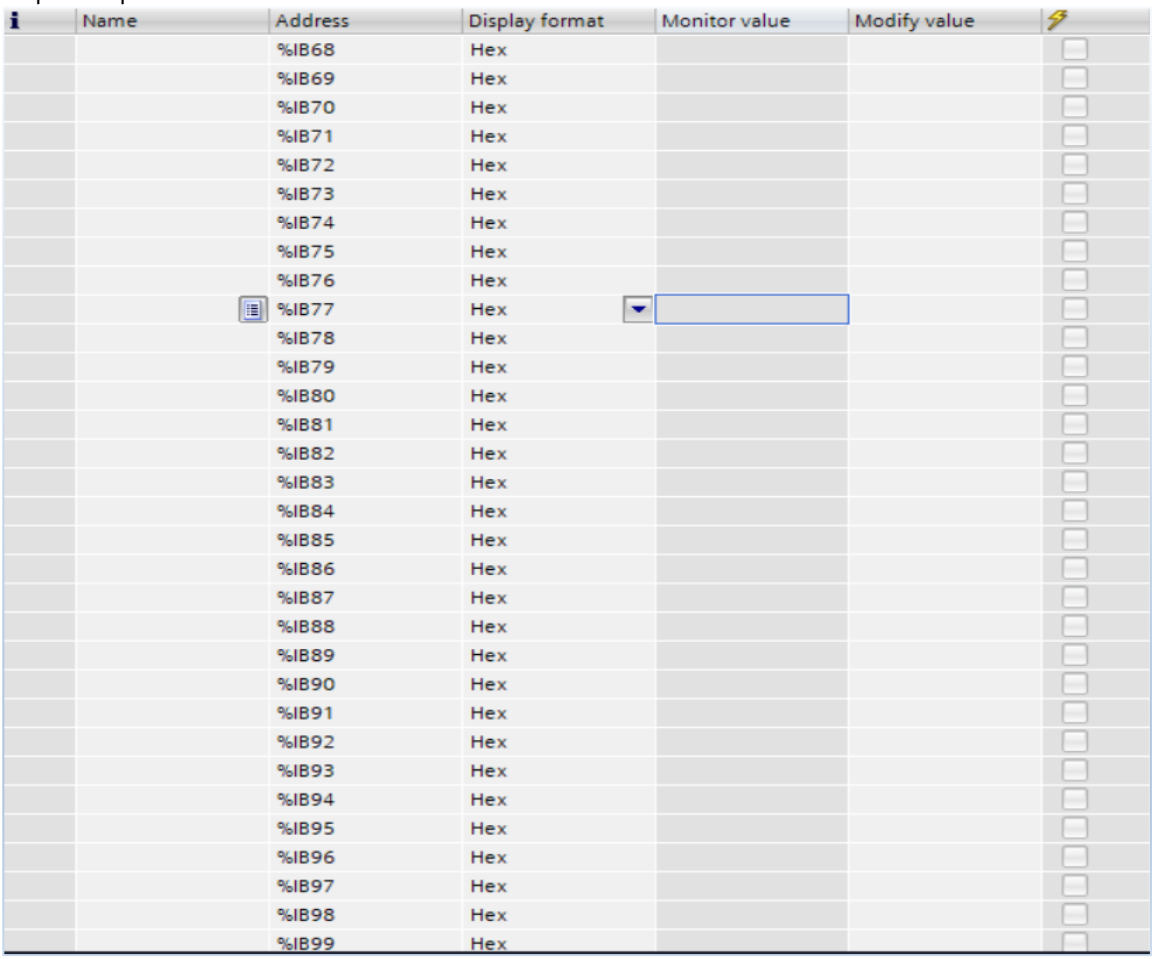


7 Mapping the Input and Output Addresses of Profinet Module in a watch table for testing

1. Create a new watch table.



2. Map the Input addresses of the Profinet Module to the watch table.



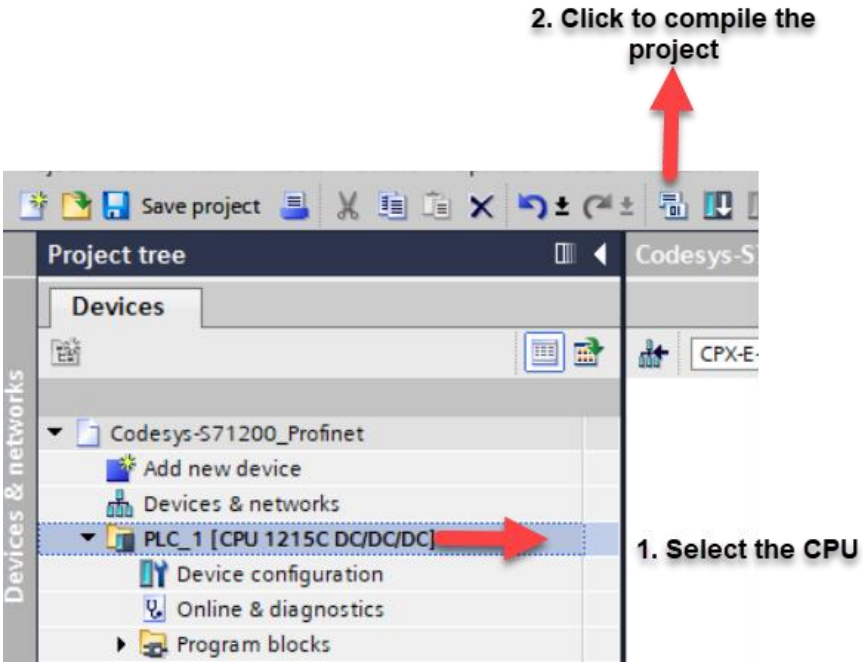
i	Name	Address	Display format	Monitor value	Modify value	
		%IB68	Hex			
		%IB69	Hex			
		%IB70	Hex			
		%IB71	Hex			
		%IB72	Hex			
		%IB73	Hex			
		%IB74	Hex			
		%IB75	Hex			
		%IB76	Hex			
		%IB77	Hex			
		%IB78	Hex			
		%IB79	Hex			
		%IB80	Hex			
		%IB81	Hex			
		%IB82	Hex			
		%IB83	Hex			
		%IB84	Hex			
		%IB85	Hex			
		%IB86	Hex			
		%IB87	Hex			
		%IB88	Hex			
		%IB89	Hex			
		%IB90	Hex			
		%IB91	Hex			
		%IB92	Hex			
		%IB93	Hex			
		%IB94	Hex			
		%IB95	Hex			
		%IB96	Hex			
		%IB97	Hex			
		%IB98	Hex			
		%IB99	Hex			

3. Map the Output addresses of the Profinet Module to the watch table.

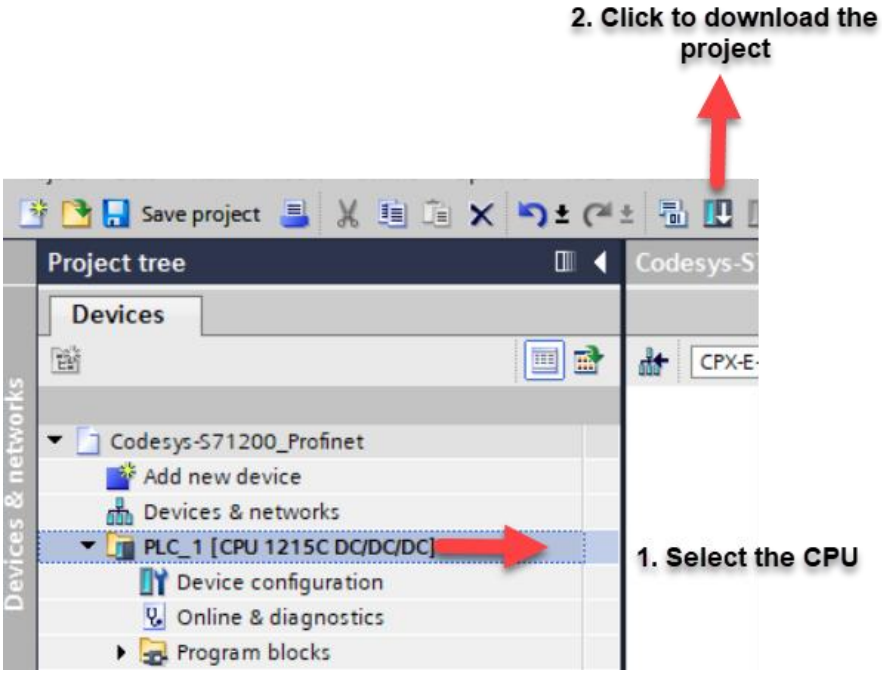
Name	Address	Display format	Monitor value	Modify value
	%QB68	Hex		
	%QB69	Hex		
	%QB70	Hex		
	%QB71	Hex		
	%QB72	Hex		
	%QB73	Hex		
	%QB74	Hex		
	%QB75	Hex		
	%QB76	Hex		
	%QB77	Hex		
	%QB78	Hex		
	%QB79	Hex		
	%QB80	Hex		
	%QB81	Hex		
	%QB82	Hex		
	%QB83	Hex		
	%QB84	Hex		
	%QB85	Hex		
	%QB86	Hex		
	%QB87	Hex		
	%QB88	Hex		
	%QB89	Hex		
	%QB90	Hex		
	%QB91	Hex		
	%QB92	Hex		
	%QB93	Hex		
	%QB94	Hex		
	%QB95	Hex		
	%QB96	Hex		
	%QB97	Hex		
	%QB98	Hex		
	%QB99	Hex		

8 Downloading the program to S7-1200 PLC

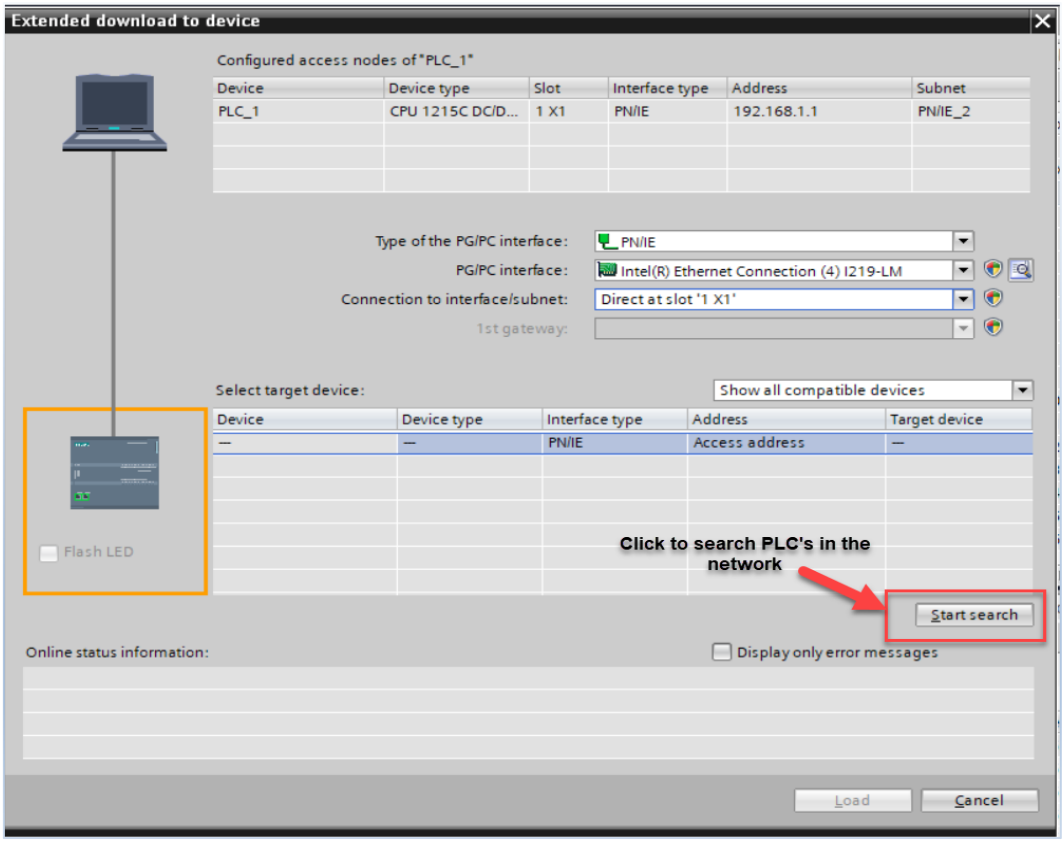
1. Click on the **PLC_1 [CPU 1215C DC/DC/DC]** and then click **Compile** .



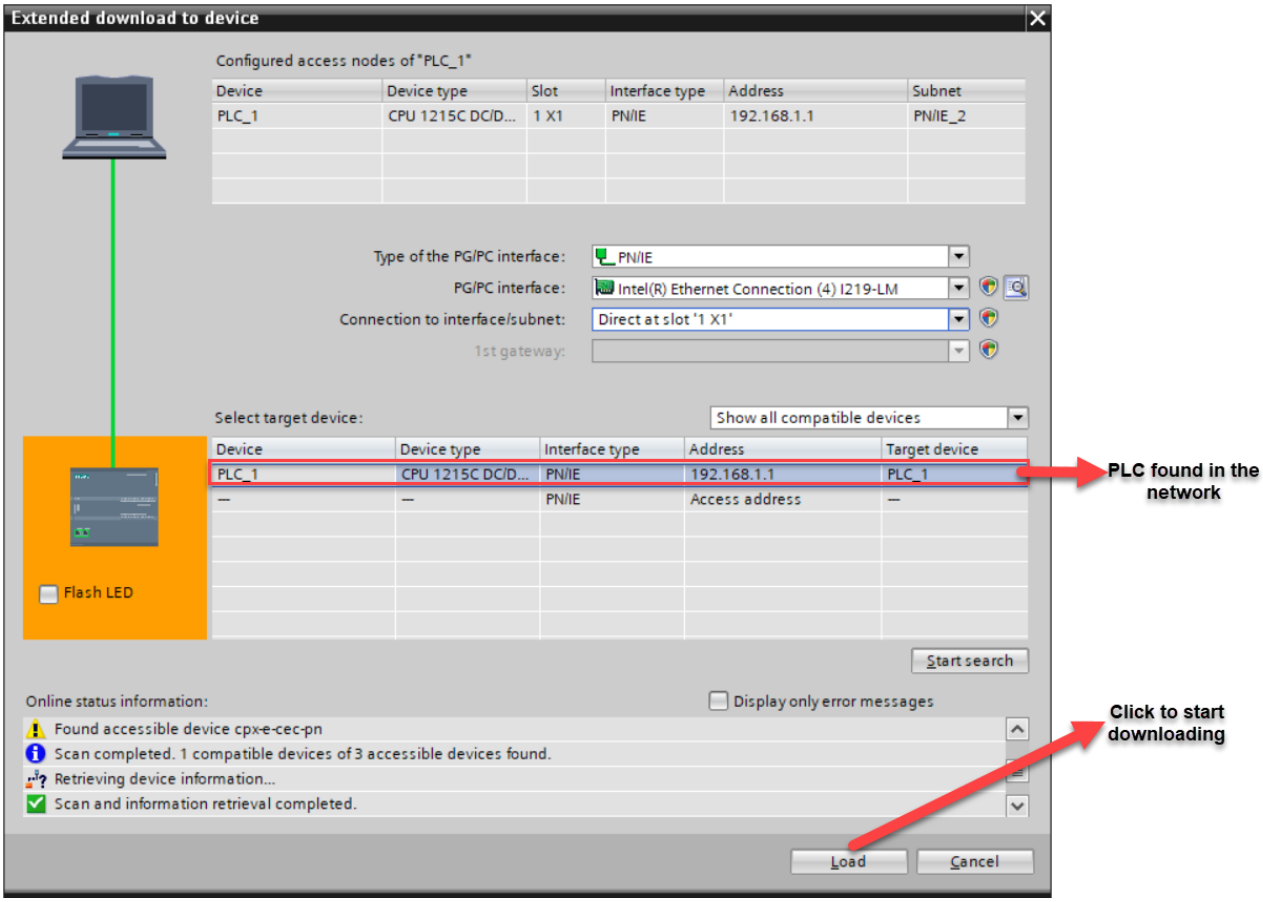
2. Once the compilation is finished with no errors, then the project can be downloaded to the PLC.



3. Do the selections as shown below and click the **Search** button to find the PLC's connected in the network.



4. Do the selections as shown below and click the **Search** button to find the PLC's connected in the network.
5. Once the PLC connected in the network is found, Click **Load** to start downloading the project to PLC.



9 Testing

1. Go **Online** in TIA Portal.
2. Force the following data to the Output addresses of the Profinet Module in the watch table created.

The below table shows the forced values in the watch table created.

"Output1"	%QB68	DEC	4
"Output2"	%QB69	DEC	0
"Output3"	%QB70	DEC	6
"Output4"	%QB71	DEC	7
"Output5"	%QB72	DEC	8
"Output6"	%QB73	DEC	9
"Output7"	%QB74	DEC	10
"Output8"	%QB75	DEC	111
"Output9"	%QB76	DEC	12
"Output10"	%QB77	DEC	13
"Output11"	%QB78	DEC	23
"Output12"	%QB79	DEC	25
"Output13"	%QB80	DEC	45
"Output14"	%QB81	DEC	56
"Output15"	%QB82	DEC	34
"Output16"	%QB83	DEC	34
"Output17"	%QB84	DEC	23
"Output18"	%QB85	DEC	24
"Output19"	%QB86	DEC	23
"Output20"	%QB87	DEC	12
"Output21"	%QB88	DEC	11
"Output22"	%QB89	DEC	13
"Output23"	%QB90	DEC	66
"Output24"	%QB91	DEC	77

3. Go **Online** in Codesys to see the values appearing in the Input addresses of the Profinet Module

Input[0]	~~%IB0~~	BYTE		4
Input[1]	~~%IB1~~	BYTE		0
Input[2]	~~%IB2~~	BYTE		6
Input[3]	~~%IB3~~	BYTE		7
Input[4]	~~%IB4~~	BYTE		8
Input[5]	~~%IB5~~	BYTE		9
Input[6]	~~%IB6~~	BYTE		10
Input[7]	~~%IB7~~	BYTE		111
Input[8]	~~%IB8~~	BYTE		12
Input[9]	~~%IB9~~	BYTE		13
Input[10]	~~%IB10~~	BYTE		23
Input[11]	~~%IB11~~	BYTE		25
Input[12]	~~%IB12~~	BYTE		45
Input[13]	~~%IB13~~	BYTE		56
Input[14]	~~%IB14~~	BYTE		34
Input[15]	~~%IB15~~	BYTE		34
Input[16]	~~%IB16~~	BYTE		23
Input[17]	~~%IB17~~	BYTE		24
Input[18]	~~%IB18~~	BYTE		23
Input[19]	~~%IB19~~	BYTE		12
Input[20]	~~%IB20~~	BYTE		11
Input[21]	~~%IB21~~	BYTE		13
Input[22]	~~%IB22~~	BYTE		66
Input[23]	~~%IB23~~	BYTE		77
Input[24]	~~%IB24~~	BYTE		88

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4. Both the tables have the same values , which shows that the Profinet communication established between S71200 PLC and CPX-E-CEC-C1-PN controller is working fine.