

Application Note – Integrating P+F Control’s IOLink Master into TIA Portal v13

Detail: PDI data from IOLink Sensor into S7-1500

Prerequisites:

PNIO model of IOLM

All necessary cables and power supplies and sensors

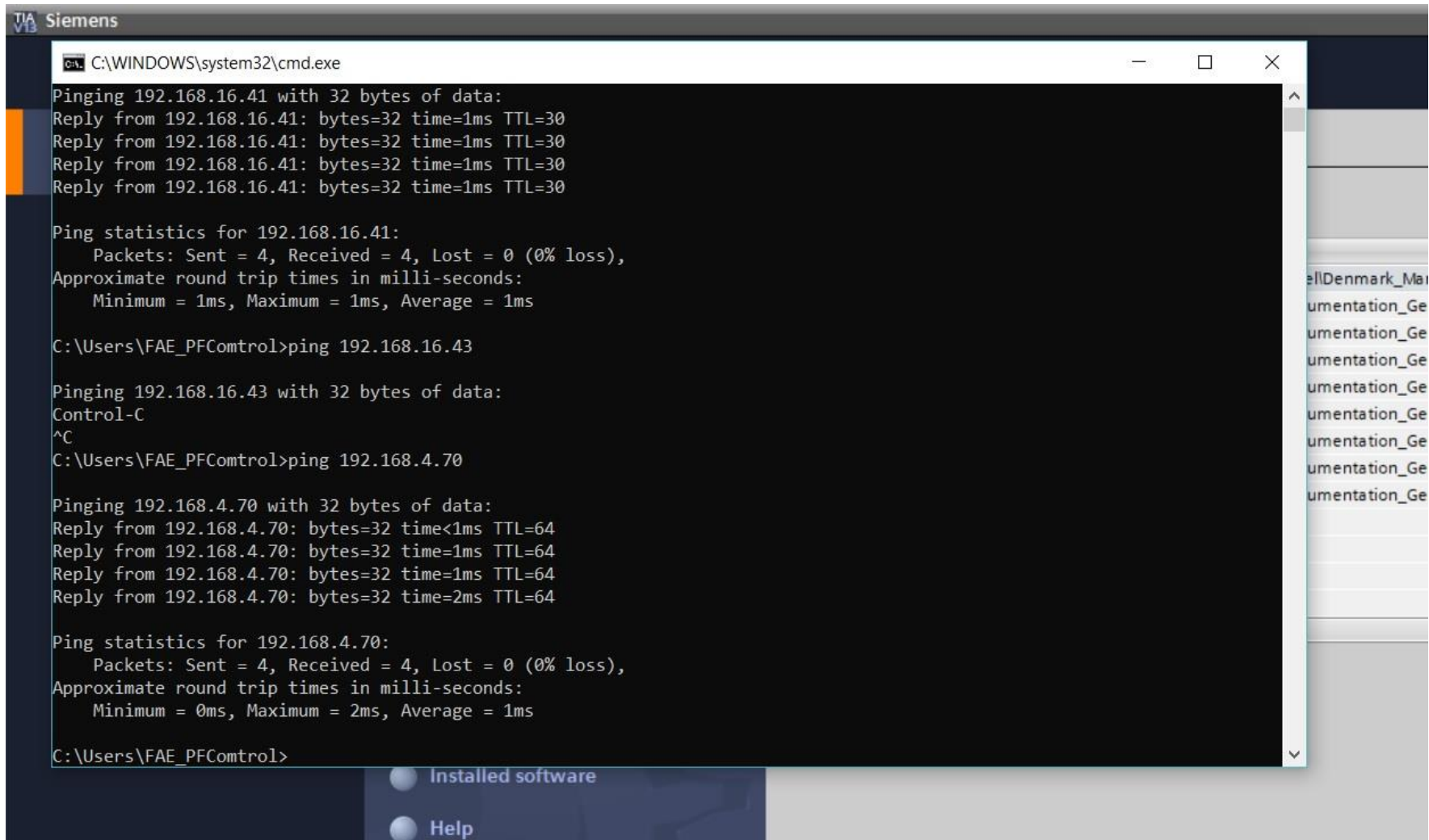
Powered up with appropriate IP address

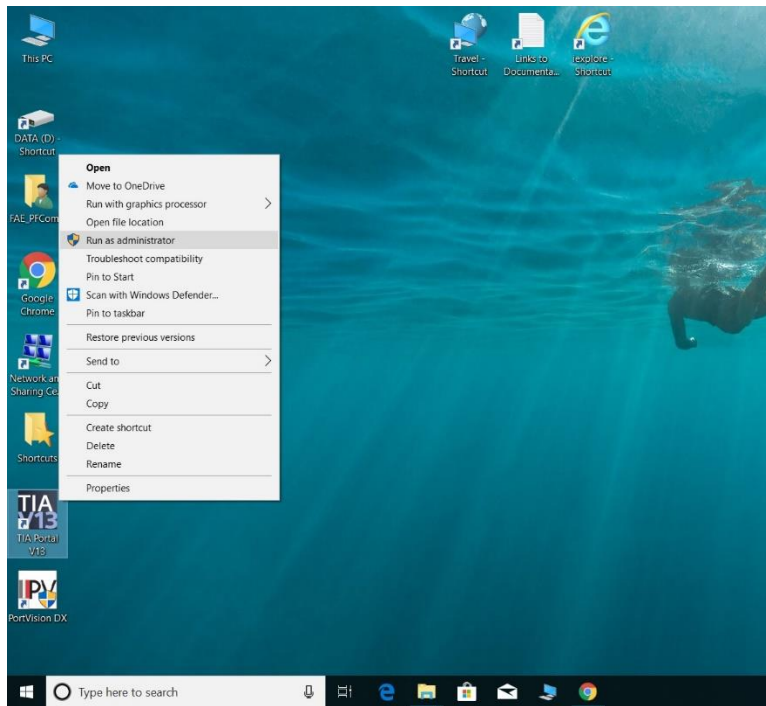
No network/security/rules interference between PLC/NIC/TIA Portal

Date of Note (implies era of relevance): 5/16/19

Author’s Note: There may be more than one way to accomplish the end goal of this exercise. Other ways may have advantages. However, it has been observed that with the featured equipment this approach was effective.

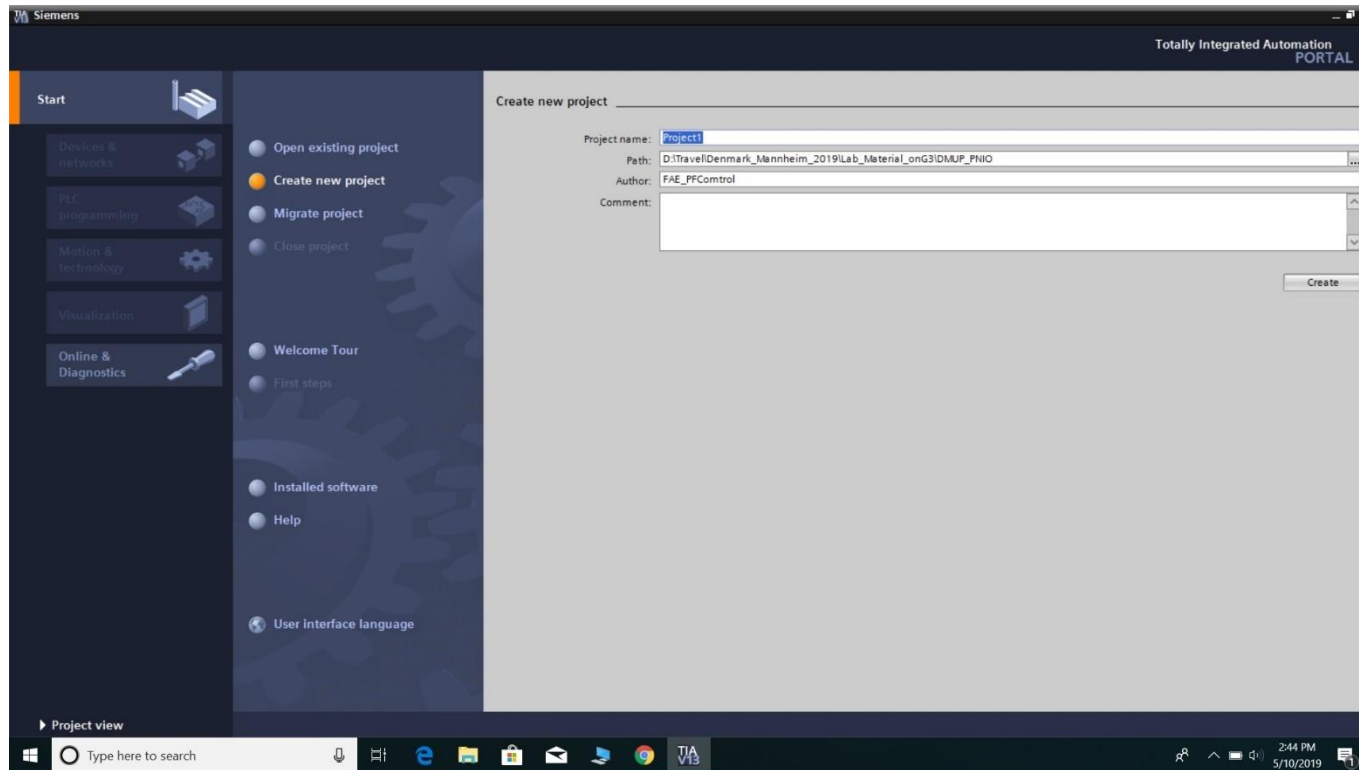
1a) Ensure that you can ping everything involved before beginning





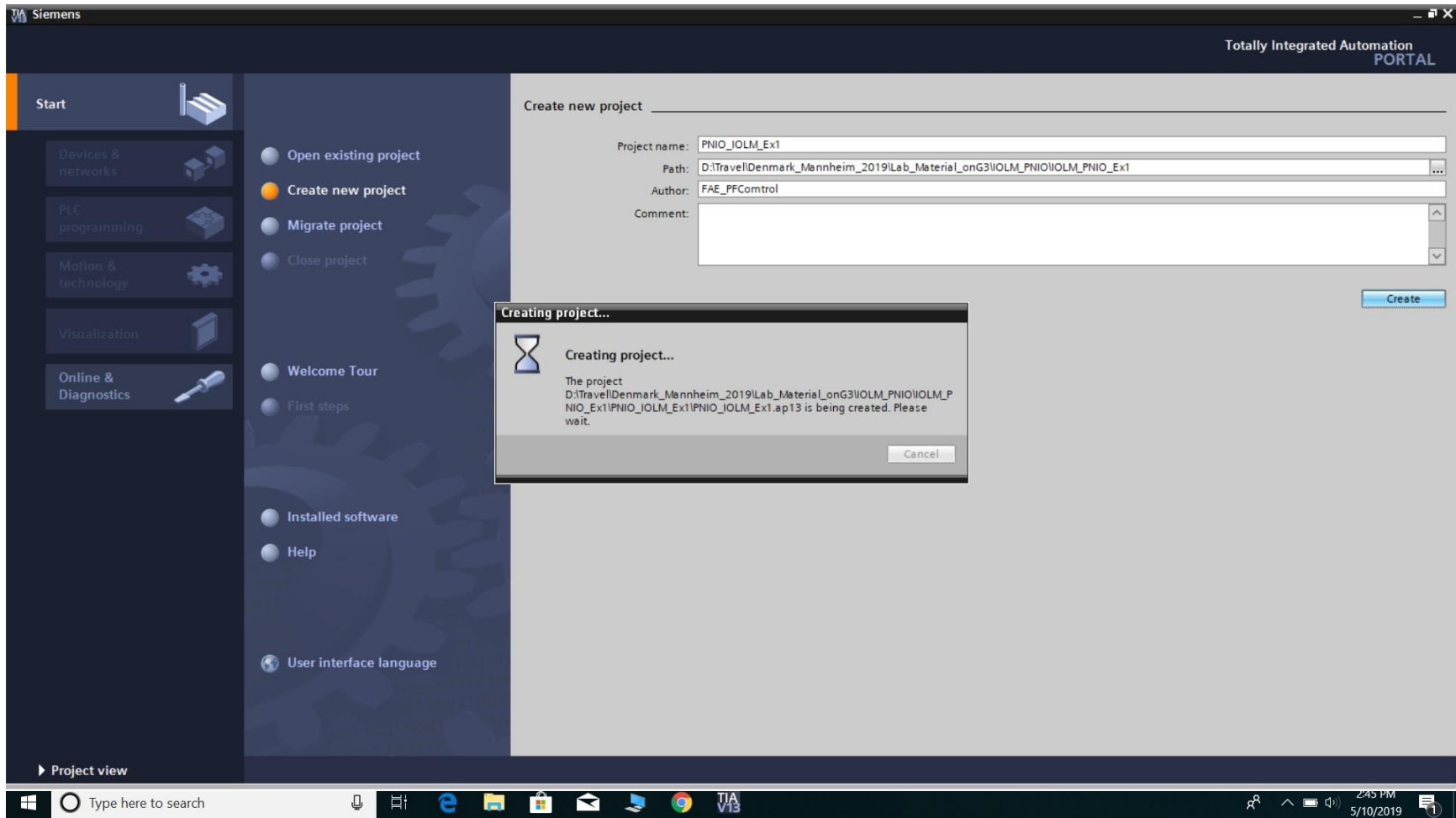
1b) When you run TIA Portal, you may have to run as Administrator. We have observed an inability to use certain vital functions until we chose to do this. (Win 10 Enterprise)

2a) Give the project a name.

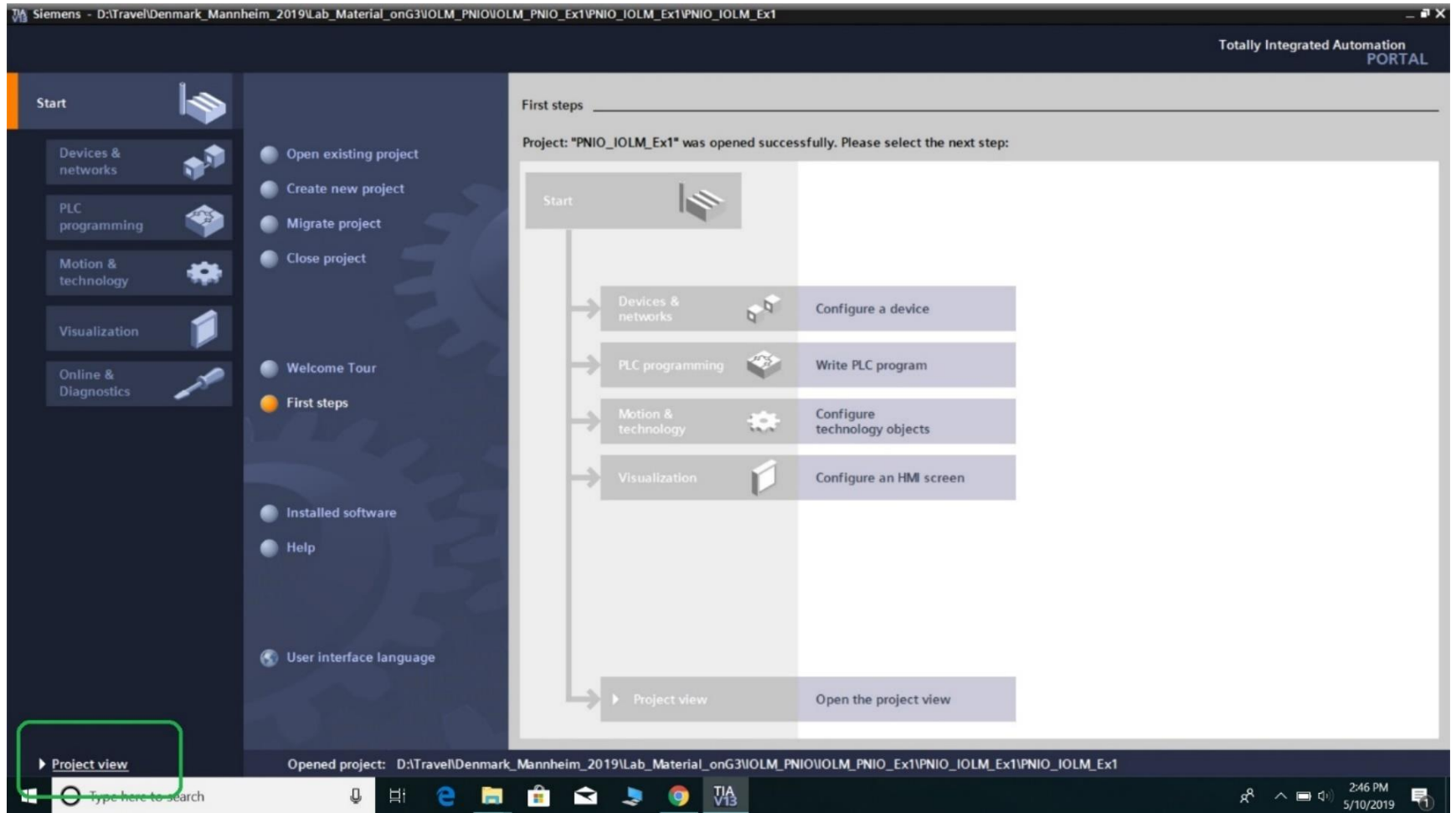


In the next step, the path will be established. It may be beneficial to explore ahead of time and decide where you will want to create this project. Some like to create folder structure to support a plan for several revisions as the project progresses but that is personal choice.

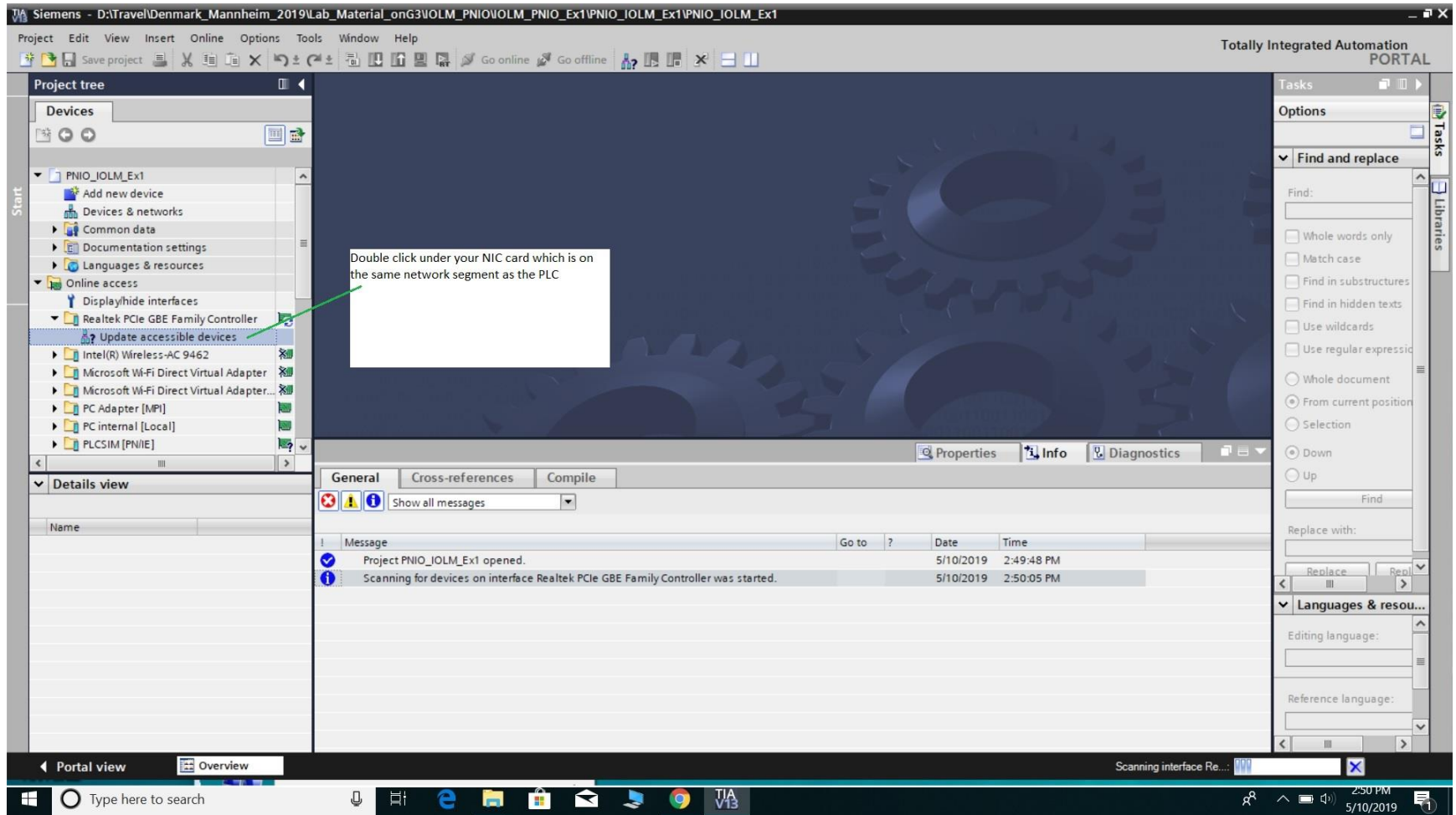
2b) Create the project, with name and path



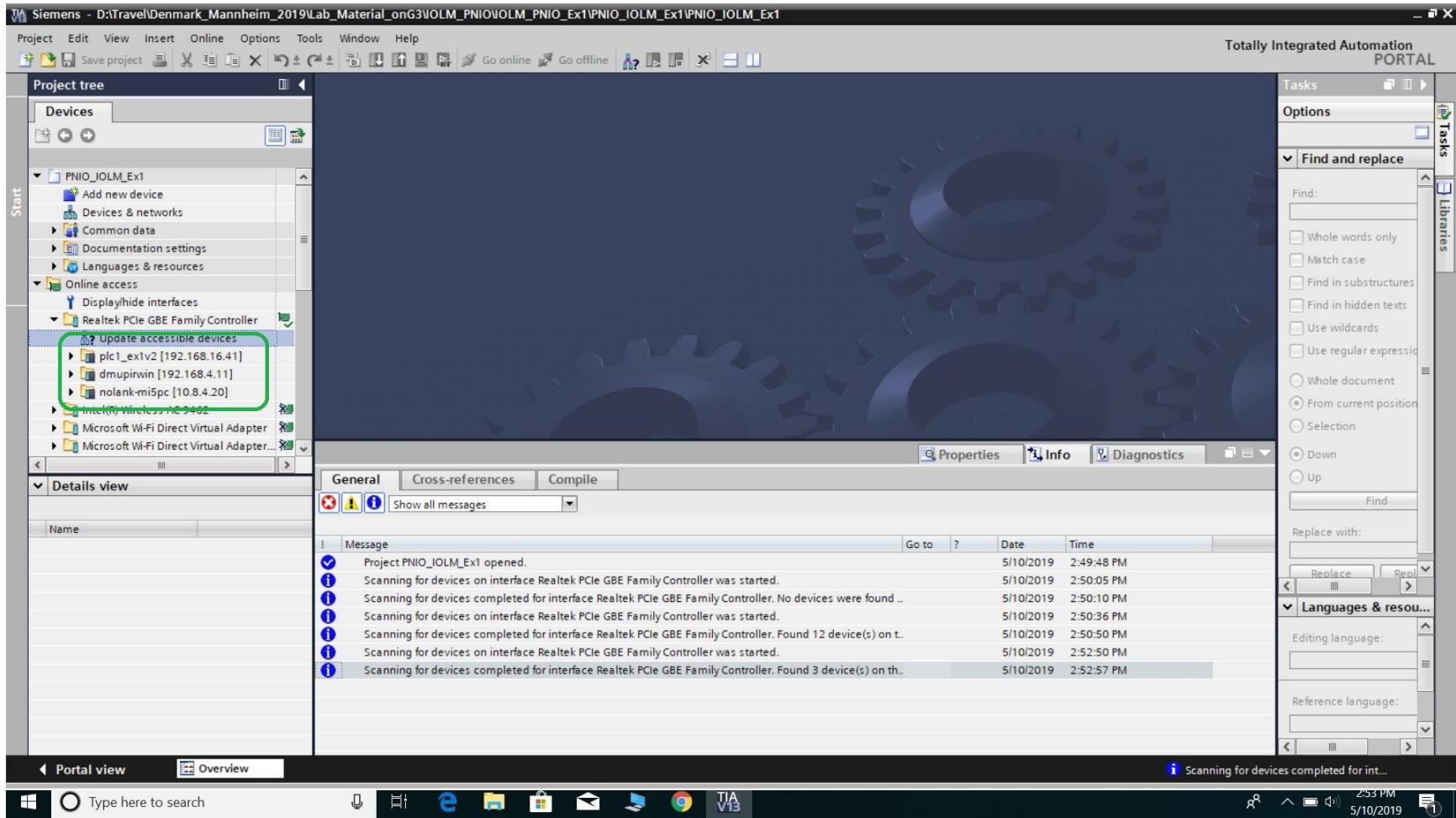
3) Hit "Project View"



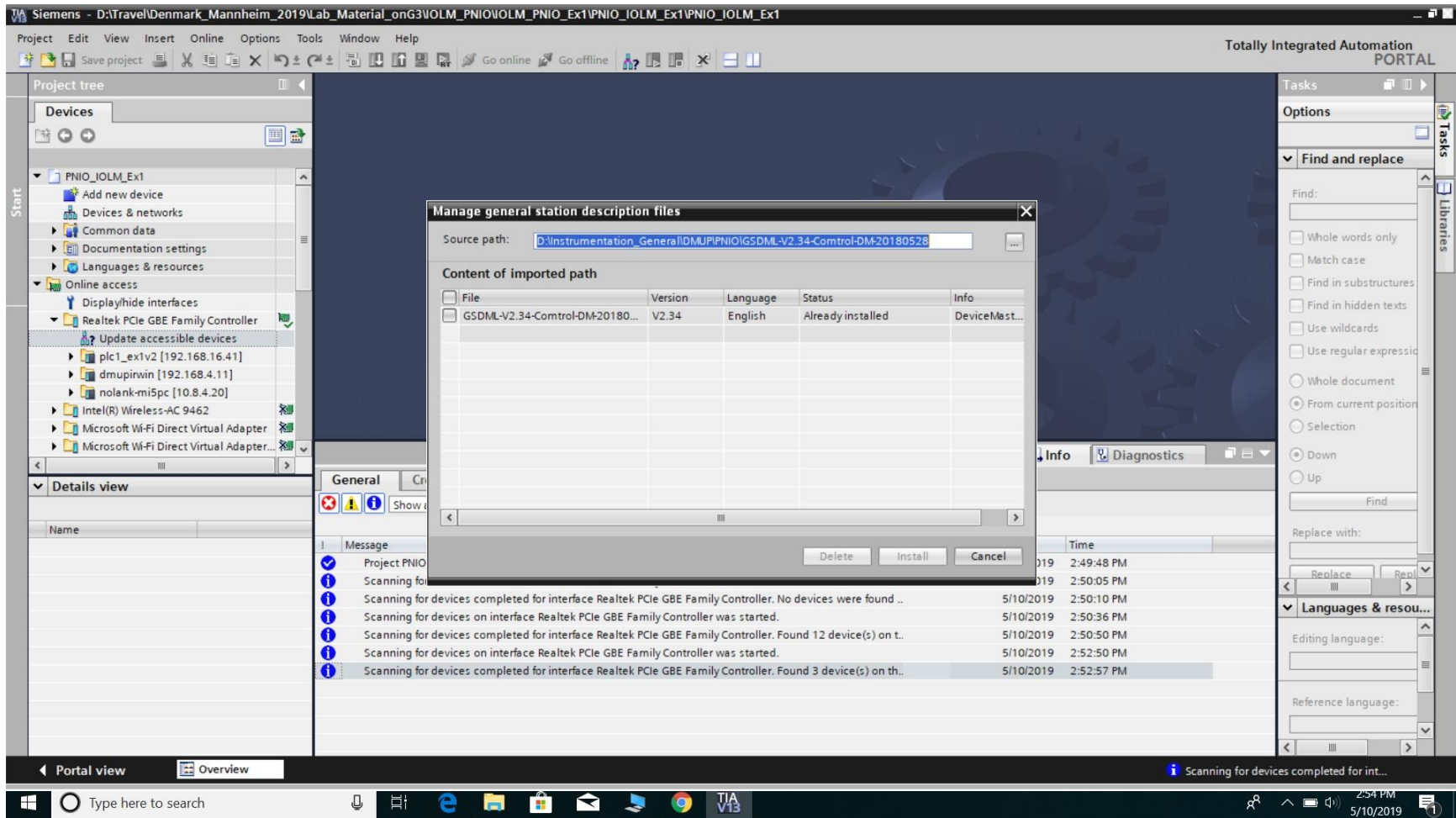
4) Under “online access,” double click “update accessible devices.”



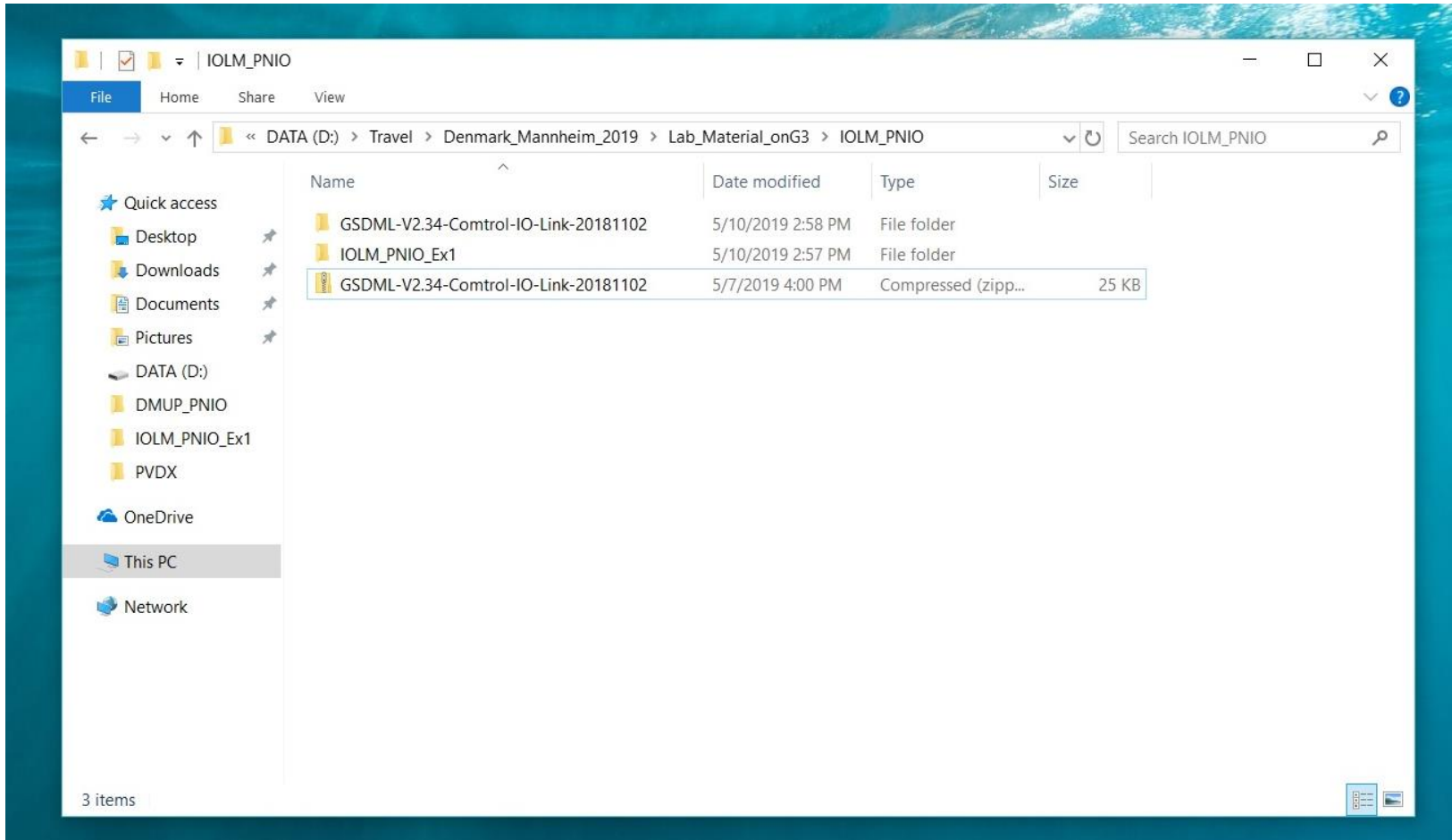
5) Check what devices were found. You should be able to see your PLC's IP address here



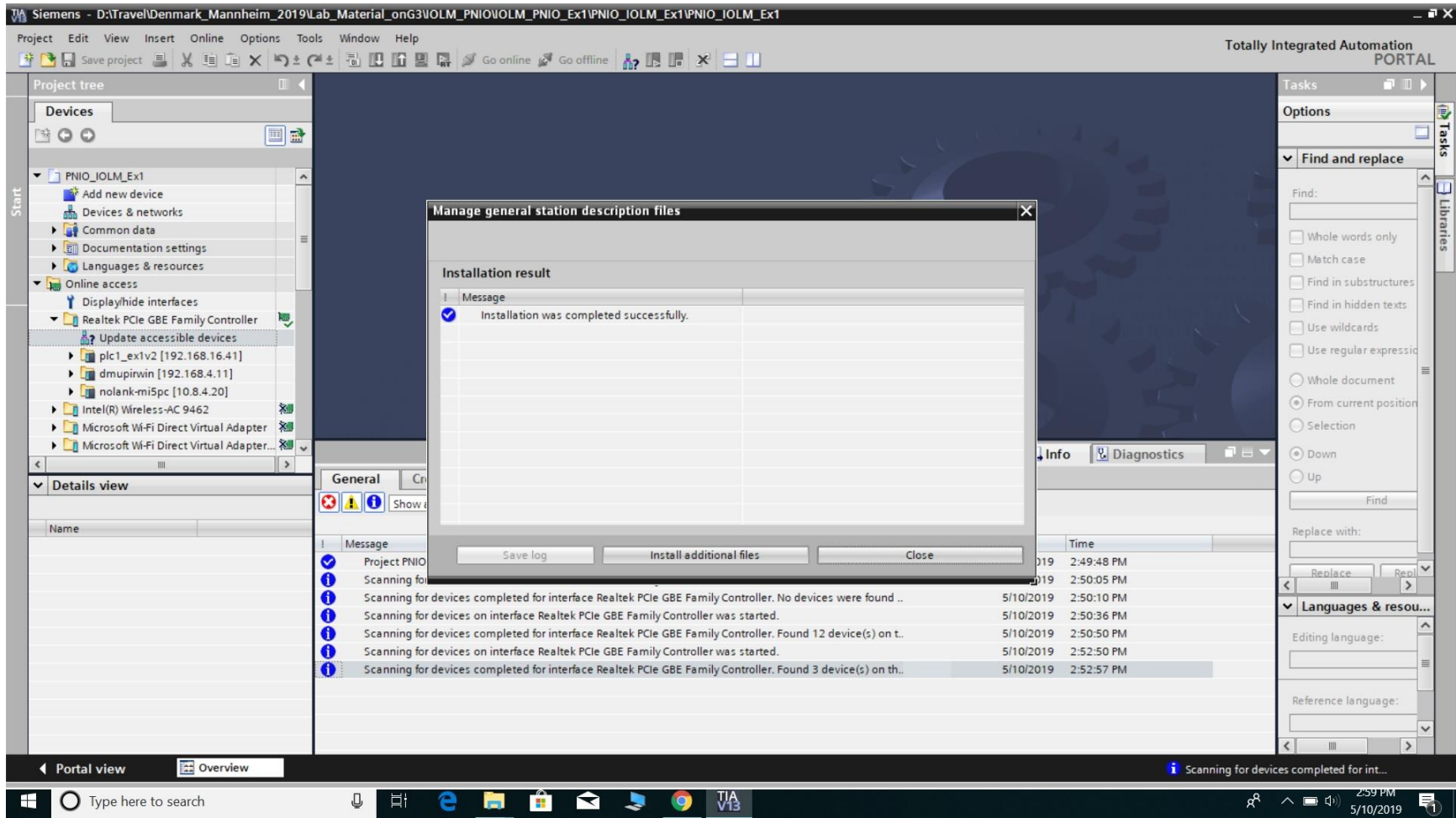
6) You must add the GSDML file for the PNIO IO-Link Master to your project. Choose “manage GSDML files” from the options menu.



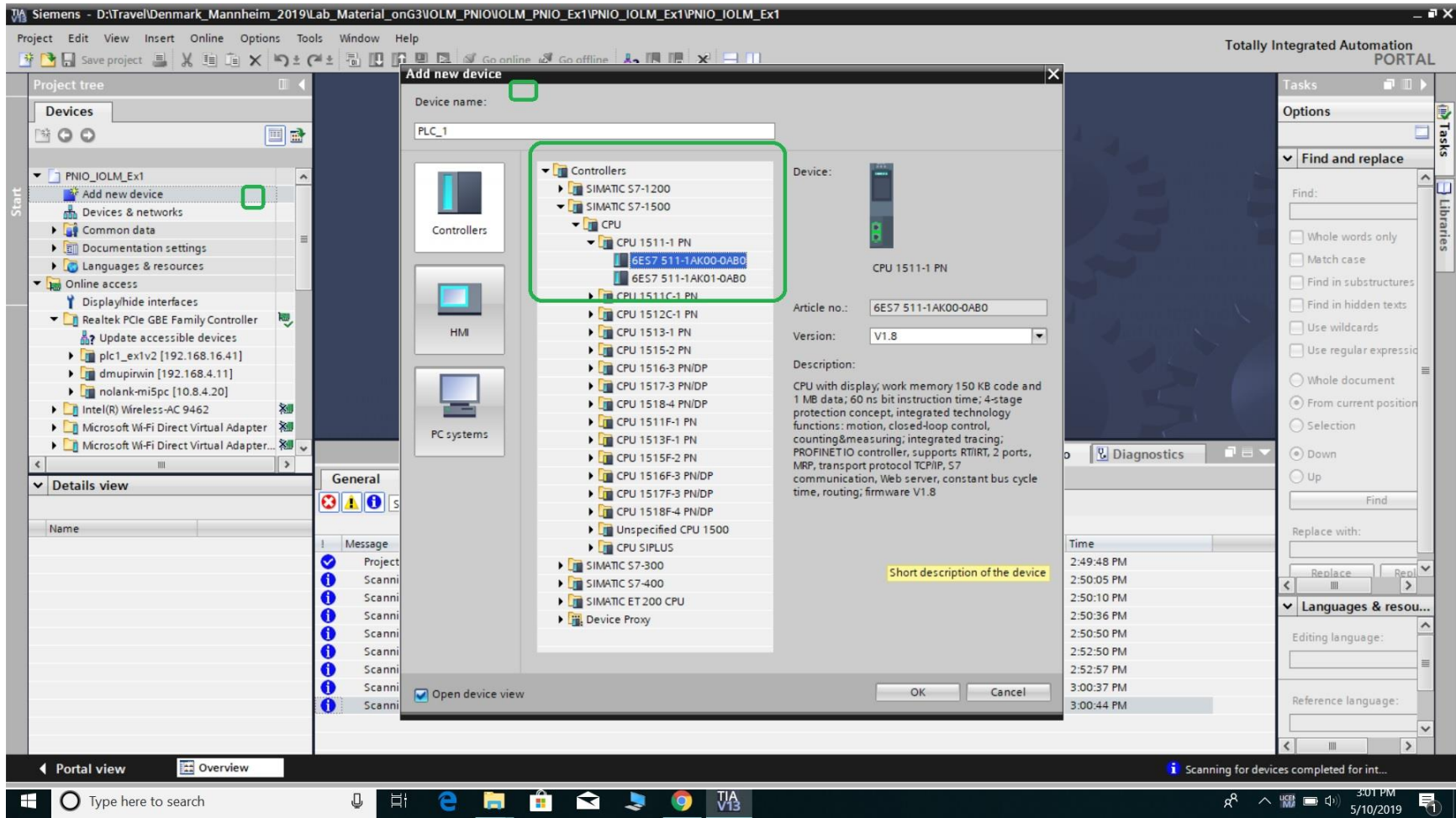
7) Be sure the GSDML file is in not still in a zip when you try to browse for it. Downloads from P+F Control web site will often be in .zip format. Unzip to your directory of choice, and then browse for it from TIA Portal's GSD management option.



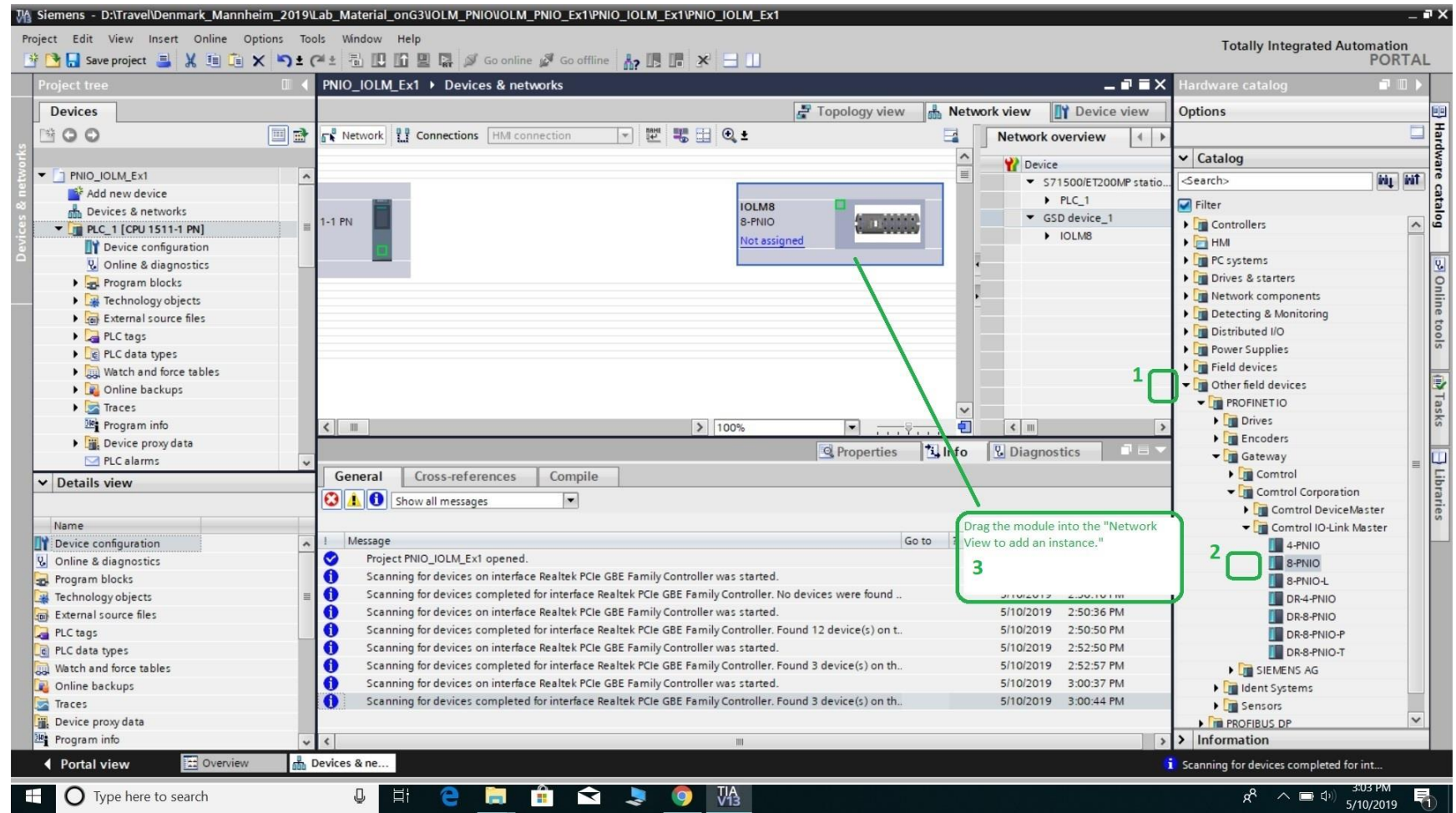
8) Once the GSD file for IOLM is successfully installed, it is a good idea to verify that you can discover your PNIO IOL Master. Under “online access,” double click “update accessible devices.”



- 9) If this is a new project and you don't already have your PLC included in the project, it is time to add your PLC. Choose "Add New Device" and then choose your PLC type. You may have to refer to the physical label (or the onboard screen if present) in order to confirm the exact model.



10) Once PLC is added, navigate to the IO-Link Master via the hardware catalog on the right side of the screen. Since the GSDML file has been added to the project, the IOLM should appear here. Note that there are many versions in the Profinet IO family of the IOLM. Be sure to choose the right one.



11) In the IOLM embedded page, you can change the Network settings if you have not already done so. If you change the network settings, reboot. Note that our official documentation discusses other approaches to integration that are available; For example you can assign the IP address from TIA Portal rather than in the IOLM embedded page. For many purposes, it may be more consistently convenient to maintain awareness of the IOLM in all contexts by only configuring the IP address via the embedded page, and by using only static IPs. This is the approach that will be discussed in this note. Note that the “Host Name” is NOT the Profinet name which TIA Portal will use.

The screenshot displays the 'Network Settings' page in a web browser. The browser tabs show '192.168.16.43 IO-Link Master: pa' and '192.168.4.70 IO-Link Master: Net'. The address bar shows '192.168.4.70/Network/Settings'. The page header includes the 'CONTROL' logo and navigation tabs: Home, Diagnostics, Configuration, Advanced, Attached Devices, and Help. A secondary navigation bar contains: IO-LINK, PROFINET IO, MODBUS/TCP, OPC UA, NETWORK (selected), MISC, LOAD/SAVE, and CLEAR SETTINGS. The main content area is titled 'Network Settings' and contains the following configuration fields:

Current Netmask	255.255.0.0
Current Gateway	
Current DNS	
Configuration	
Host Name	Nemst
IP Type	static
Static IP Address (xxx.xxx.xxx.xxx)	192.168.4.70
Static Subnet Mask (xxx.xxx.xxx.xxx)	255.255.0.0
Static Gateway Address (xxx.xxx.xxx.xxx)	0.0.0.0
DNS 1 (xxx.xxx.xxx.xxx)	
DNS 2 (xxx.xxx.xxx.xxx)	
IP Address Conflict Detection	enable
NTP Server IP/Hostname	

A note at the bottom right of the configuration area reads: 'Reboot after assigning a network name. Note: IP can be assigned in here or you can let the PLC do it. We'll use static IPs assigned in the webpage.'

The footer of the page shows 'Welcome Admin' on the left and '© Copyright Control Corp.' on the right. The Windows taskbar at the bottom indicates the time is 3:06 PM on 5/10/2019.

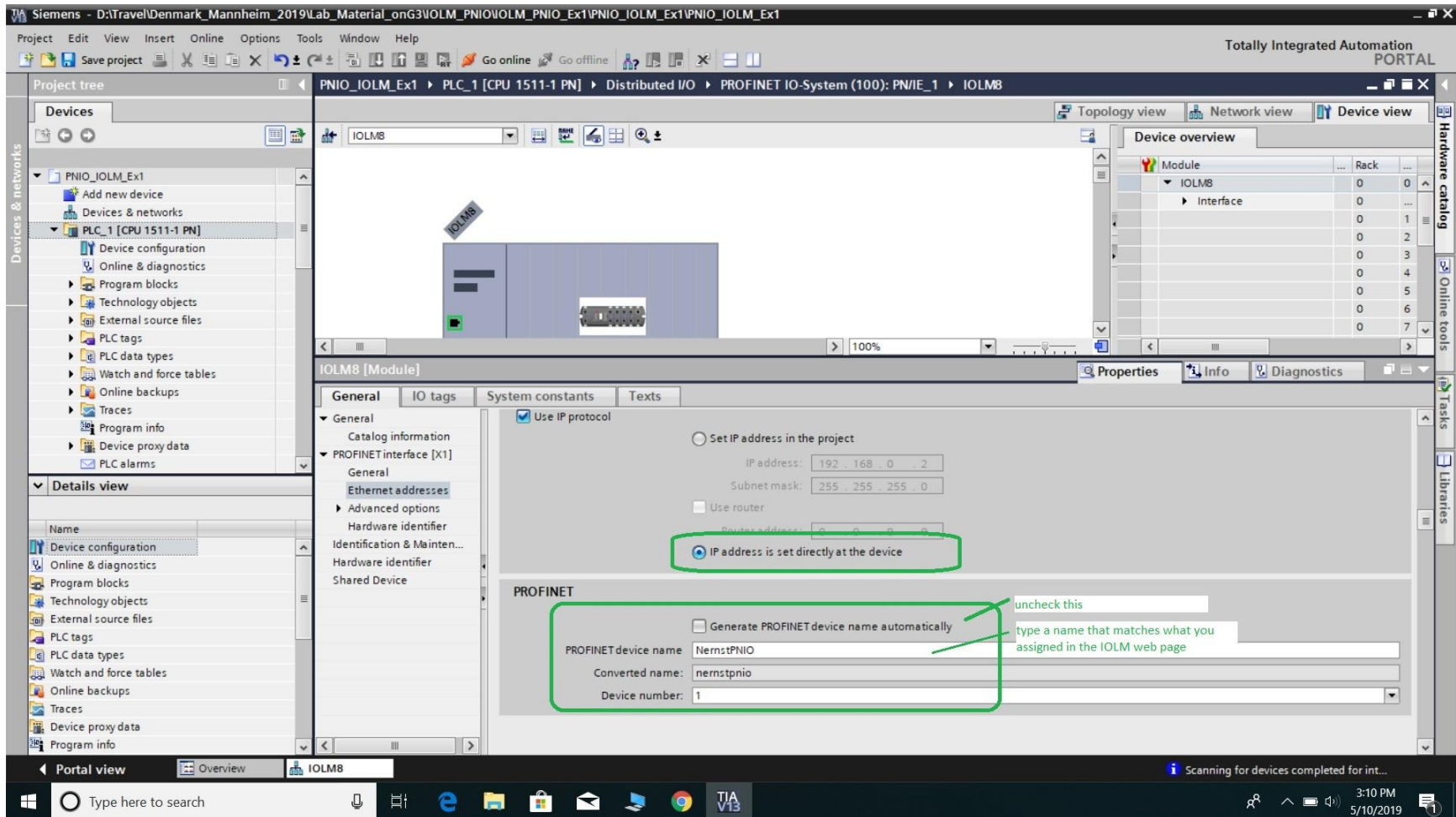
11b) In the embedded web page, configure the Profinet name of the IOLM. This will be an important identity in all PNIO clients that may communicate with this PNIO IO-link Master.

The screenshot displays a web browser window with three tabs. The active tab is titled '192.168.16.44 IO-Link Master: PR'. The address bar shows the URL '192.168.16.44/ProfinetIO/Settings'. The browser's navigation bar includes a 'COMTROL' logo and a menu with 'Home', 'Diagnostics', 'Configuration', 'Advanced', 'Attached Devices', and 'Help'. The 'Configuration' menu is expanded, showing options: 'IO-LINK', 'PROFINET IO', 'MODBUS/TCP', 'OPC UA', 'NETWORK', 'MISC', 'LOAD/SAVE', and 'CLEAR SETTINGS'. The 'PROFINET IO' option is selected. The main content area is titled 'PROFINET IO Settings' and contains a table with the following data:

PROFINET IO CONFIGURATION		EDIT
PROFINET IO Device Name	nernstpnio	
IOL_CALL Function Block Timeout (1 - 20)	20	

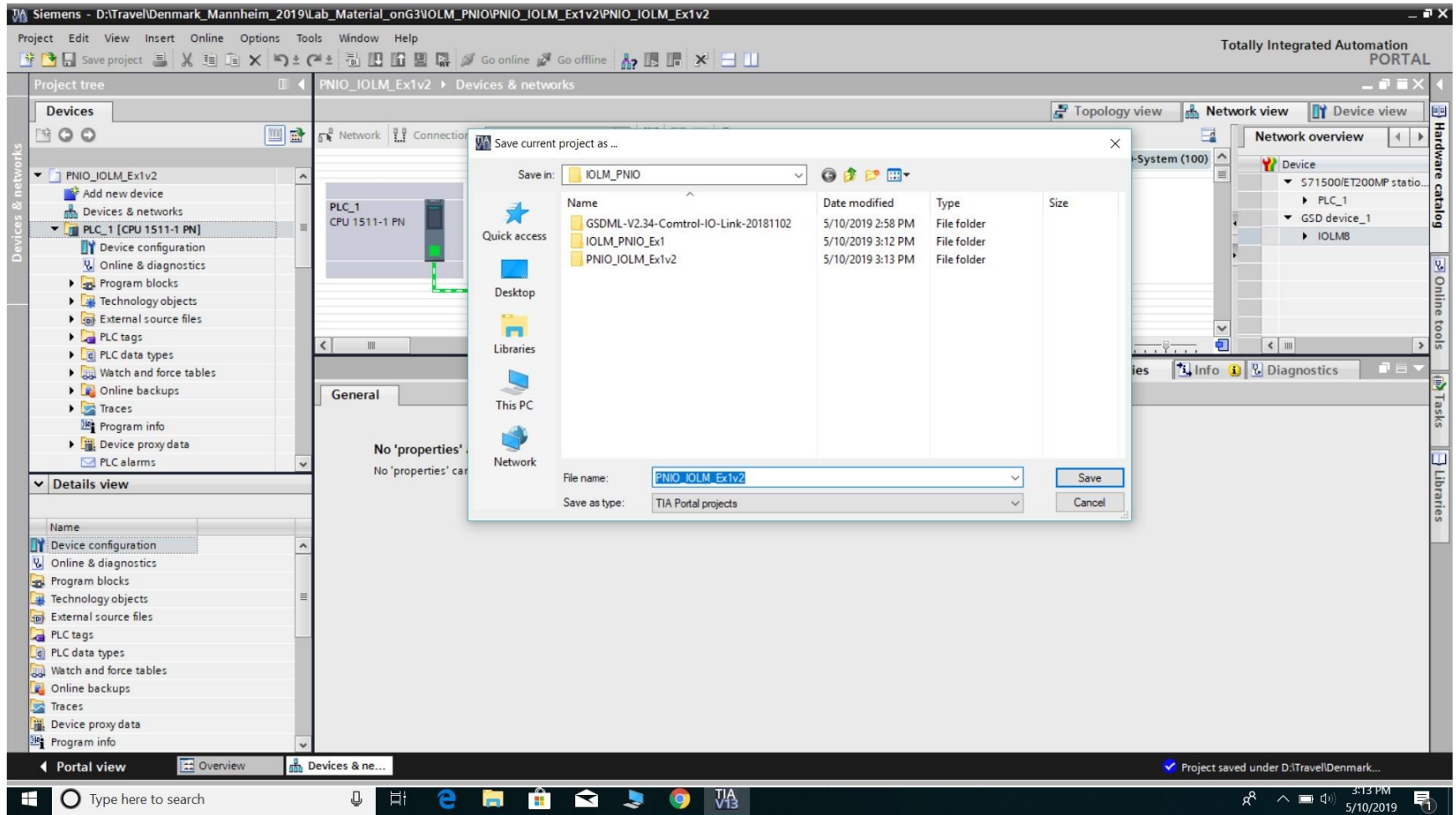
The Windows taskbar at the bottom shows the system tray with the date '5/10/2019' and time '5:13 PM'. The taskbar also displays the 'Welcome Admin' message and the '© Copyright Control Corp.' notice.

- 12) Right click the IOLM and choose properties, then go to “Ethernet addresses.” For the method we used in this note, you should choose “IP address is set directly at the device.” (You set the IP in step 11 if not sooner.) Under the PROFINET section, be sure the box is not checked for “Generate PROFINET device name automatically.” Remember that for the method in this note, the Profinet device name is assigned in the embedded web page as seen in step 11.

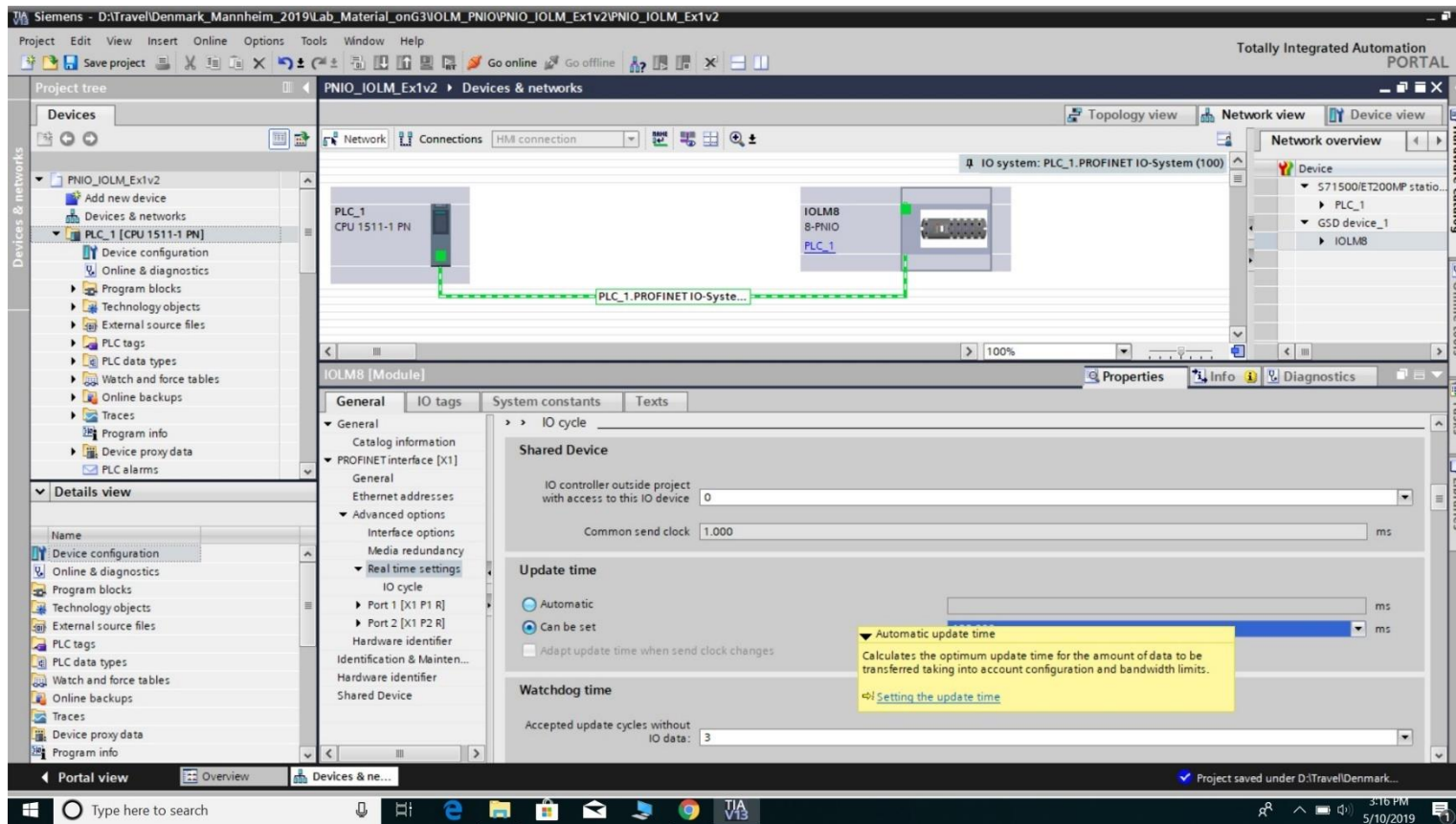


Do not worry if your name is converted to lower case letters. This does not matter.

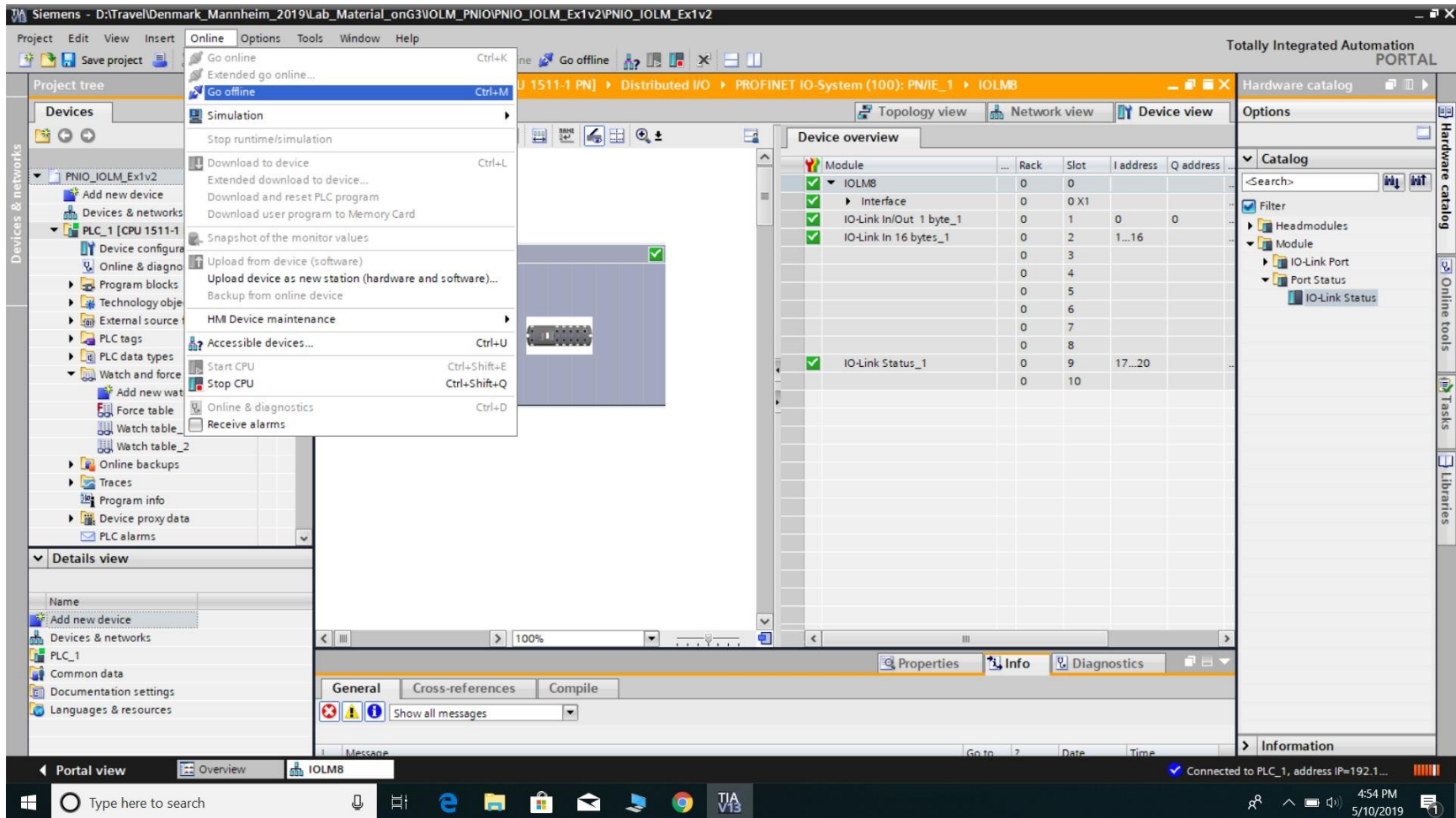
13) This is a good time to save your project. If you created some folder structure in step 2a, navigate to that folder structure. Revision control and storage methods are subjects of personal preference and not within the scope of this Note.



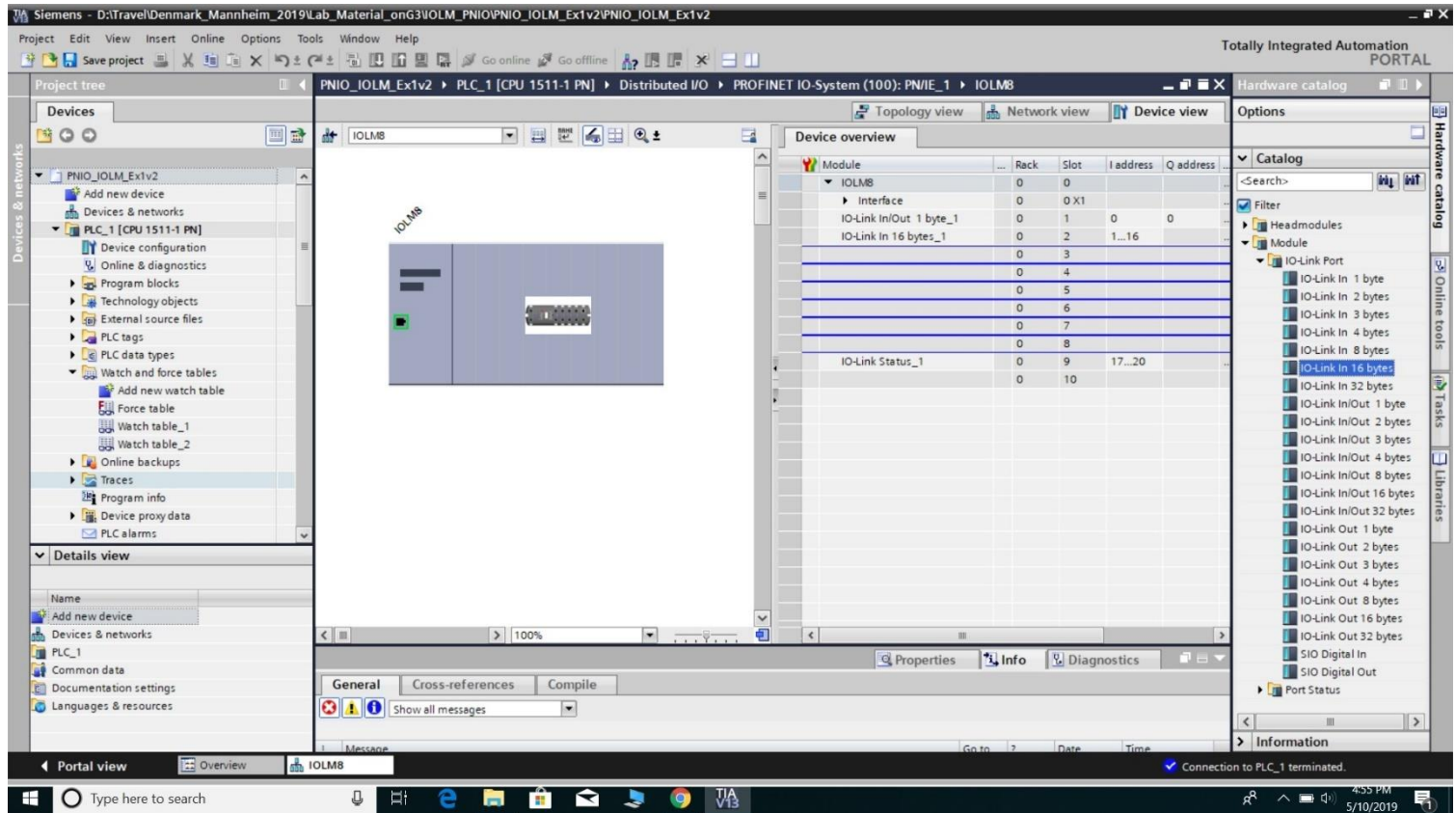
14) Check the Real time settings “update time” if desired. For this note, **it is not necessary to change it** but it may be beneficial to know about this setting and where to change it. In the “Network view,” right click the IOLM and select Properties, then “Real Time Settings.” Note the update time should be considered with regard to the amount of data to be transferred, the overall configuration, and bandwidth limits. It is not necessary or always a good idea to strive for maximum speed in this setting. As an example, if you are connecting only process engineering sensors and the natural timing of your process is such that readings (data) will evolve slowly over the course of many minutes, it is wasteful to ask for updates at 40 Hz. In large projects, it is wise to consider that many devices may need bandwidth on the network and processing time in the PLC and it is always a good idea to be conservative in allowing the most demanding or crucial transactions to use more resources. Having said all this, timing optimization can be subject to much debate depending on the project, and is beyond the scope of this note.



15a) Go offline if you are not presently offline.



15b) To see PDI from an IO-Link device, first right click the module and choose “device configuration.” On the right side, navigate into the “IO Link Port” and choose the form of data block that you would like to add. You will need to consider what you are connecting to the port. Do you need an input or an output? How much data? It does not hurt to be generous. For example, you can choose “IO-Link in 16 bytes” even if the IO-Link sensor actually only uses 2 bytes. The embedded web page of the IOLM can help here. Go into Diags/IO-Link and check – with the device plugged into the port- what it says for PDI valid, PDO valid, PDI size, and PDO size. For this place in the Note, just choose a generous option so you will see that it does not matter. (It is simpler for learning, and for quickly setting up the system, to just go with a large size. For large projects or experienced integrators, each data block might be optimized to only use a data block just large enough to hold the data. However, this generates errors if devices are moved around and is not recommended for early experimentation or where changes in port use may be frequent.)



17) For as many data elements as you need, drag the appropriate size data block over to the module. In this note, we will only do 1 or 2 ports.

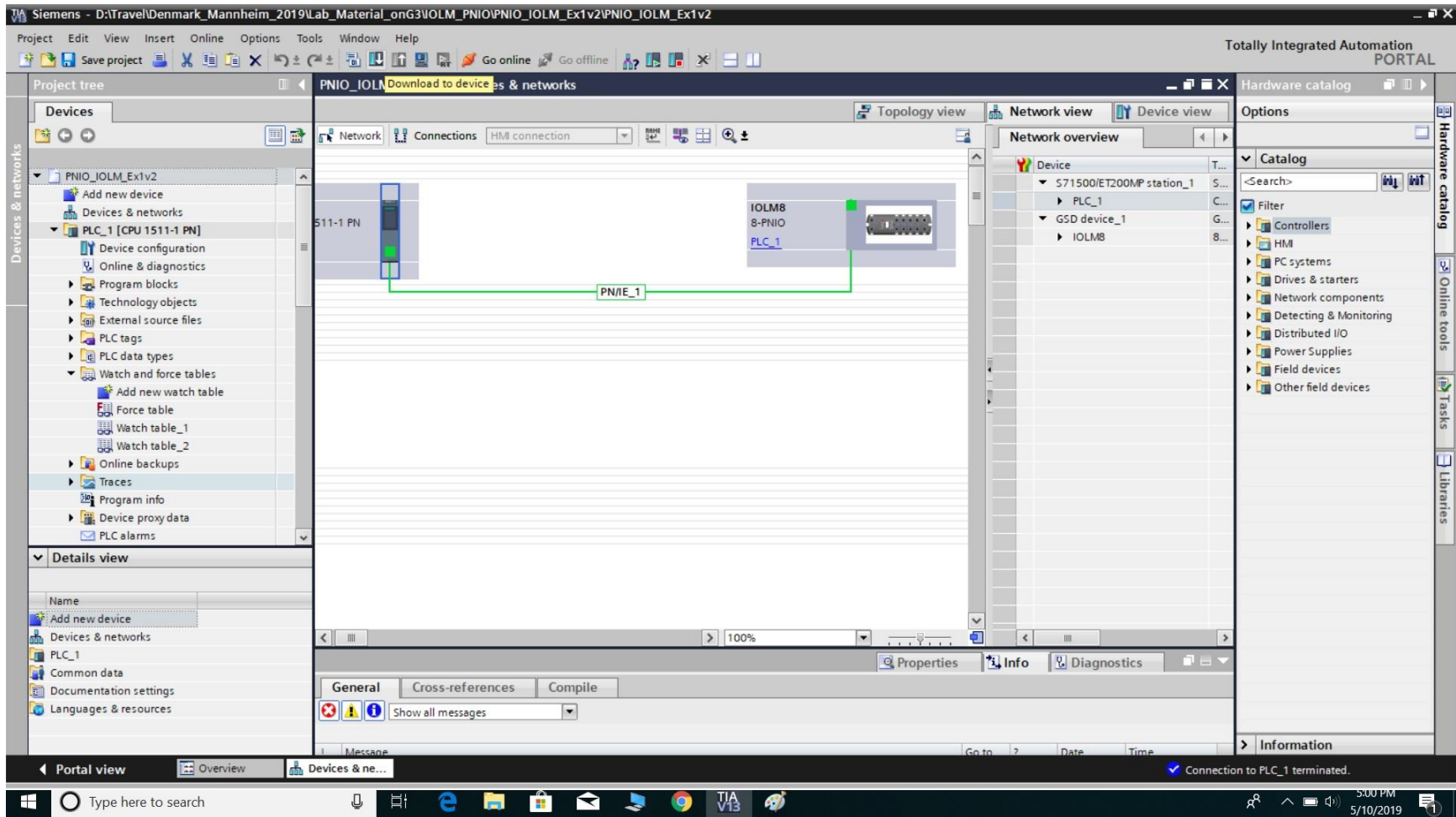
The screenshot displays the Siemens TIA Portal interface for configuring a PROFINET IO-System. The main window shows the 'Device overview' for the 'IOLM8' module. The hardware catalog on the right lists various IO-Link port configurations. Annotations provide the following instructions:

1. Right click the IOLM and choose Configure to bring up Device Overview
2. For as many data elements as you like, drag the appropriate size data block over to the module. Slot 1 is IO-Link port 1, Slot 2 is Port 2 and so on.
3. On port 2 we have a VDM-28. PFControl IOLM embedded page says the PDI is 2 bytes, but it does not hurt to use a generous sized data block. This point is illustrated by using a 16byte block..

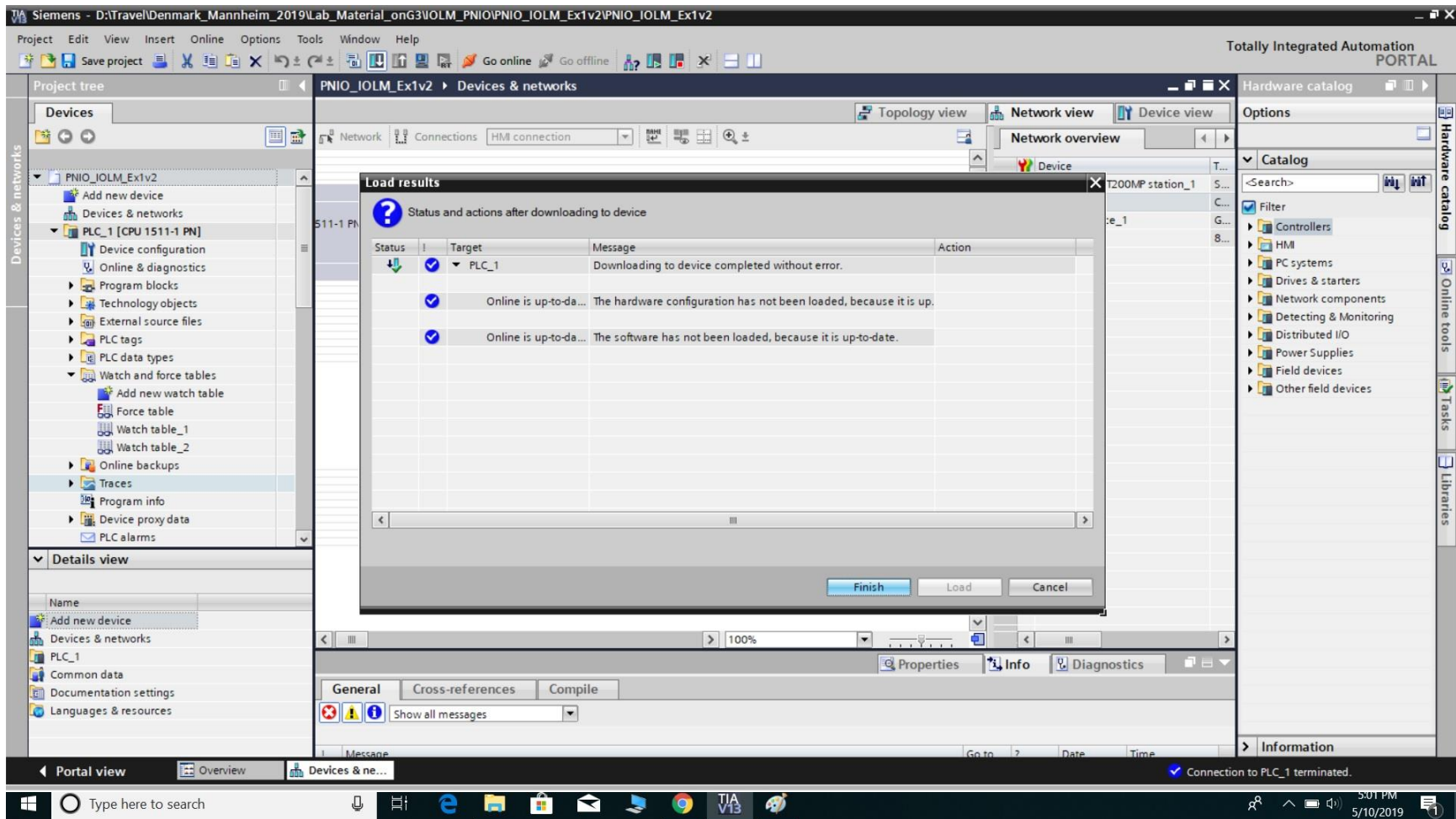
On port 1, 1byte in/1 byte out object was used (just the actual size in use.)

Module	Rack	Slot	I address	Q address
IOLM8	0	0		
Interface	0	0 X1		
IO-Link In/Out 1 byte_1	0	1	0	0
IO-Link In 16 bytes_1	0	2	1...16	
	0	3		
	0	4		
	0	5		
	0	6		
	0	7		
	0	8		
IO-Link Status_1	0	9	17...20	
	0	10		

18) Many changes have been made. Go into Network View, click PLC to select it, then hit Download



19) Hit "Load" and then "Finish" and then go back online.

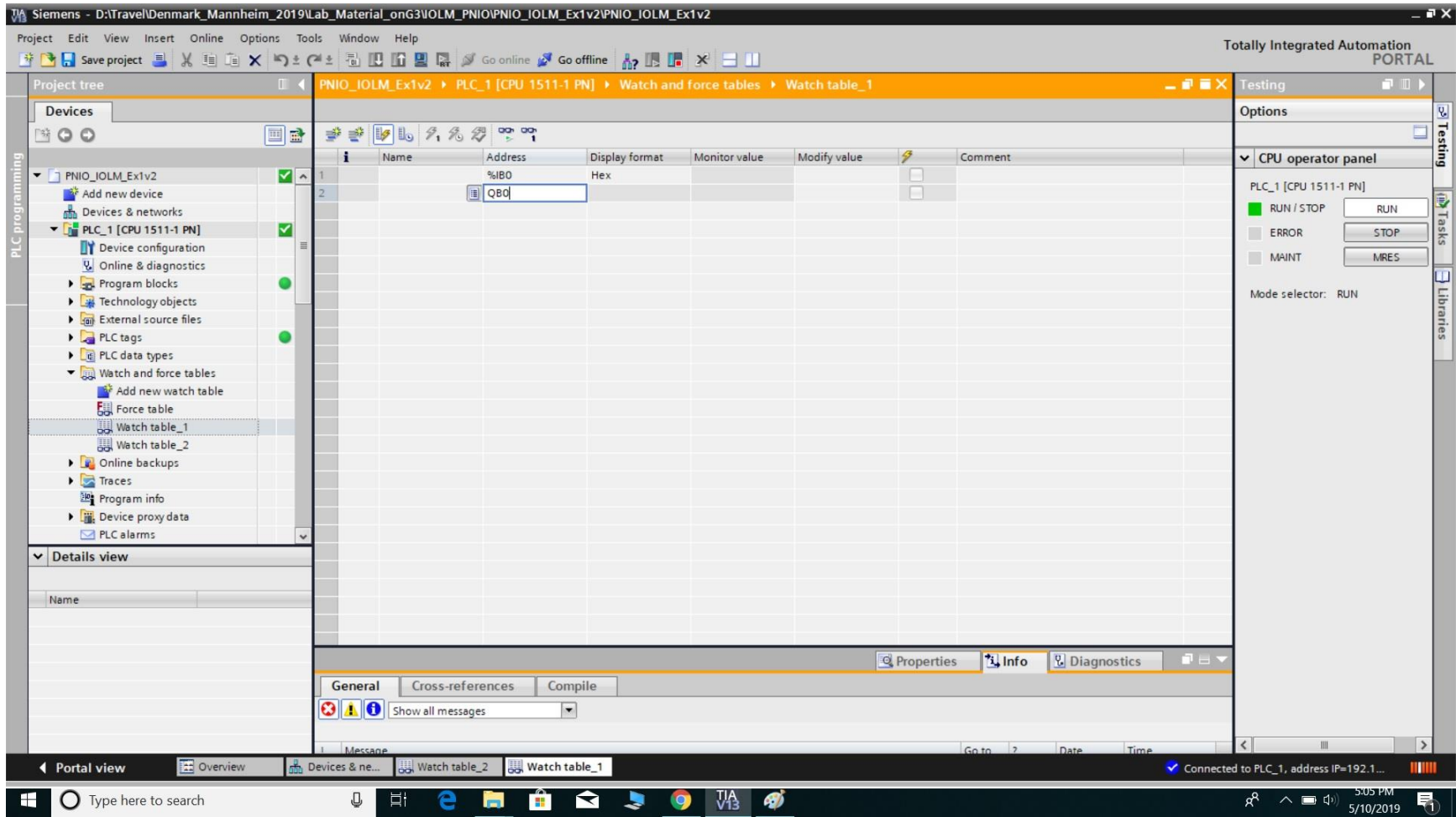


20) As we are not using an HMI, it will be good to add a “watch table” to see the data changing live. On the left side, hit “Add New Watch Table.”

The screenshot displays the Siemens TIA Portal interface. On the left, the 'Project tree' shows the 'Watch and force tables' folder expanded, with 'Add new watch table' highlighted. A green callout box with the text 'Hit ADD NEW WATCH TABLED' points to this option. The main workspace shows a table for configuring watch tables. The table has the following columns: Name, Address, Display format, Monitor value, Modify value, and Comment. The 'Address' column contains a dropdown menu with '<Add new>' selected. The status bar at the bottom indicates 'Connected to PLC_1, address IP=192.1...'. The Windows taskbar at the very bottom shows the system clock as 5:02 PM on 5/10/2019.

Name	Address	Display format	Monitor value	Modify value	Comment
	<Add new>				

21) Unless you have created tags and tied them to addresses, just use the addresses directly into a watch table. Designate an input with “I” and an output with “Q.” If you want to see a byte or word, use B or W. Other symbols exist for longer/other data types. So, as an example, the lowest byte on the lowest input slot could be “IB0.” TIA Portal will add the % sign for you.



22) Add some more addresses

Siemens - D:\Travel\Denmark_Mannheim_2019\Lab_Material_onG3\IOLM_PNIO\PNIO_IOLM_Ex1v2\PNIO_IOLM_Ex1v2

Project Edit View Insert Online Options Tools Window Help

Totally Integrated Automation PORTAL

Project tree: PNIO_IOLM_Ex1v2 > PLC_1 [CPU 1511-1 PN] > Watch and force tables > Watch table_1

	Name	Address	Display format	Monitor value	Modify value	Comment
1		%IB0	Hex		<input type="checkbox"/>	
2		QB0			<input type="checkbox"/>	

I is input B is byte 0 is zero hit enter and it will do everything else

QB0 (thats Q B zero) hit ENTER

Options

CPU operator panel

PLC_1 [CPU 1511-1 PN]

RUN / STOP

ERROR

MAINT

Mode selector: RUN

General Cross-references Compile

Show all messages

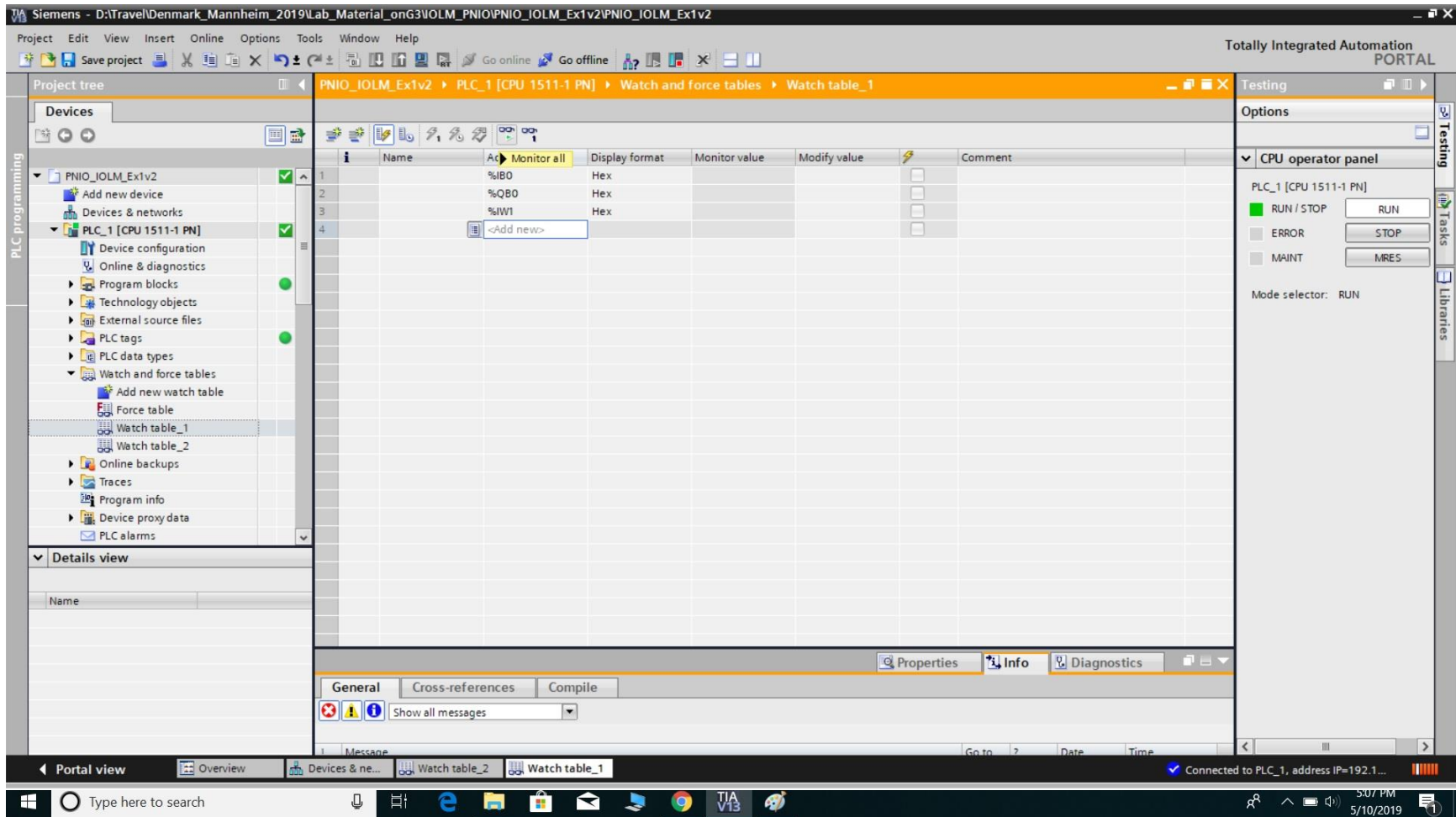
Portal view Overview Devices & ne... Watch table_2 Watch table_1

Connected to PLC_1, address IP=192.1...

Type here to search

5:05 PM 5/10/2019

23) Hit the “eyeglasses icon with the play symbol” to MONITOR ALL



24) You should now be able to see readings changing if you manipulate your sensor. That's it! You have successfully integrated IOLink PDI data into a PNIO PLC with TIA Portal!

The screenshot displays the Siemens TIA Portal interface. The main window shows a watch table for 'Watch table_1' with the following data:

Index	Name	Address	Display format	Monitor value	Modify value	Comment
1		%B0	Hex	16#01	<input type="checkbox"/>	Port 1 photoprox PDI (a bit)
2		%QB0	Hex	16#00	<input type="checkbox"/>	
3		%IW1	Hex	16#0012	<input type="checkbox"/>	Port 2 laser distance (16 bits)
4		<Add new>				

A white callout box with the text "You can now see readings changing" is positioned over the watch table. The right-hand side of the interface shows the 'CPU operator panel' for 'PLC_1 [CPU 1511-1 PN]' with 'RUN / STOP' and 'ERROR / STOP' buttons, and a 'Mode selector: RUN' indicator. The bottom status bar indicates 'Connected to PLC_1, address IP=192.1...'. The Windows taskbar at the bottom shows the time as 5:08 PM on 5/10/2019.

25) Status fields for all 8 ports are available in the location seen here

The screenshot displays the Siemens TIA Portal software interface. The main window shows a watch table for PLC_1 [CPU 1511-1 PN] with the following data:

Line	Name	Address	Display format	Monitor value	Modify value	Comment
1		%IB0	Hex	16#00	<input type="checkbox"/>	
2		%QB0	Hex	16#00	<input type="checkbox"/>	
3		%IW1	Hex	16#0015	<input type="checkbox"/>	
4		%IB17	Bin	2#0000_0011	<input type="checkbox"/>	
5		%B18	Bin	2#0000_0000	<input type="checkbox"/>	
6		%B19	Bin	2#0000_0001	<input type="checkbox"/>	
7		%B20	Bin	2#0000_0000	<input type="checkbox"/>	
8		<Add new>			<input type="checkbox"/>	

A callout box with an arrow pointing to the checkboxes in the 'Modify value' column contains the text: "Status of ports 1-8. Experiment by plugging/unplugging devices into each of the 8 ports."

The interface also shows a project tree on the left, a CPU operator panel on the right with buttons for RUN, STOP, ERROR, MAINT, and MRES, and a status bar at the bottom indicating "Connected to PLC_1, address IP=192.1...".