Using an AIMCO Gen IV Controller with Profinet

Introduction

Many AIMCO controllers are available with an optional Profinet interface. A common use is interfacing them to a GE PLC. This document is intended to show the steps required to setup the PLC and controller for a Profinet connection.

Equipment/Software

- ProfiNet capable controller from AIMCO.
  - Generation 4 controller (PN: iEC4EGVP????).
  - Anybus PROFINET IO Module.
- GE PACSystems RX3i PLC controller.
- GE IC695PNC001-AK RX3i ProfiNet Control Module.
- GE Proficy Machine Edition v8.6.
- 5 – Ethernet cables.
- 1 – Ethernet switch.

Hardware Setup

- Connect an Ethernet cable from the GE PLC CPU module to the Ethernet switch.
- Connect an Ethernet cable from the GE ProfiNet control module to the Ethernet switch.
- Connect an Ethernet cable from the Gen 4 controller Ethernet port to the Ethernet switch.
- Connect and Ethernet cable from the PROFINET IO module on the Gen 4 controller to the Ethernet switch.
- Connect an Ethernet cable from the PC to the Ethernet switch.

Initial Setup

Defining the CPE305 Module for the PLC

After the GE Proficy Machine Edition software is initialized, you will choose to create an empty project. Don't be concerned with any highlighted existing projects. Click 'OK' when finished.
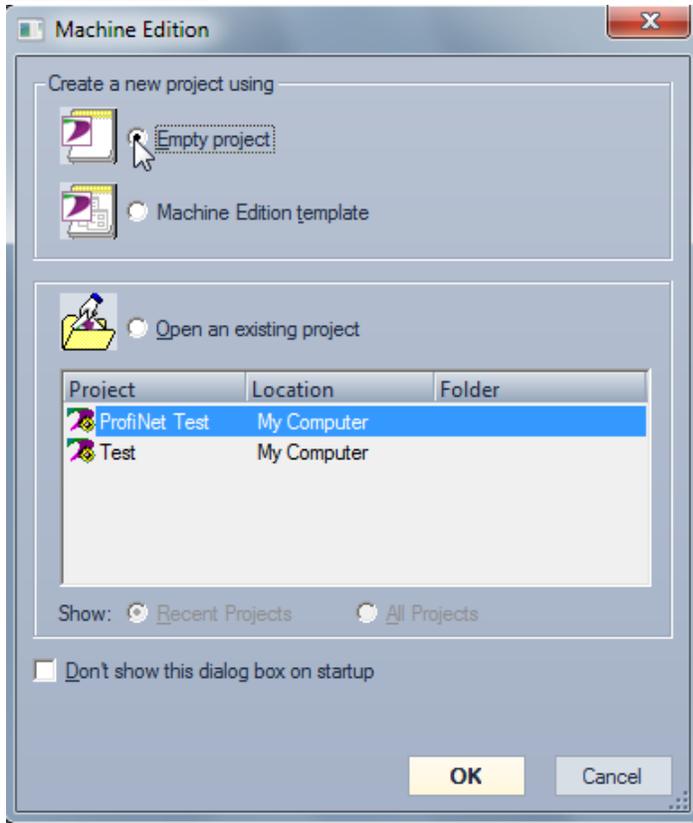

Figure 1 – Proficy Machine Edition Initial Setup

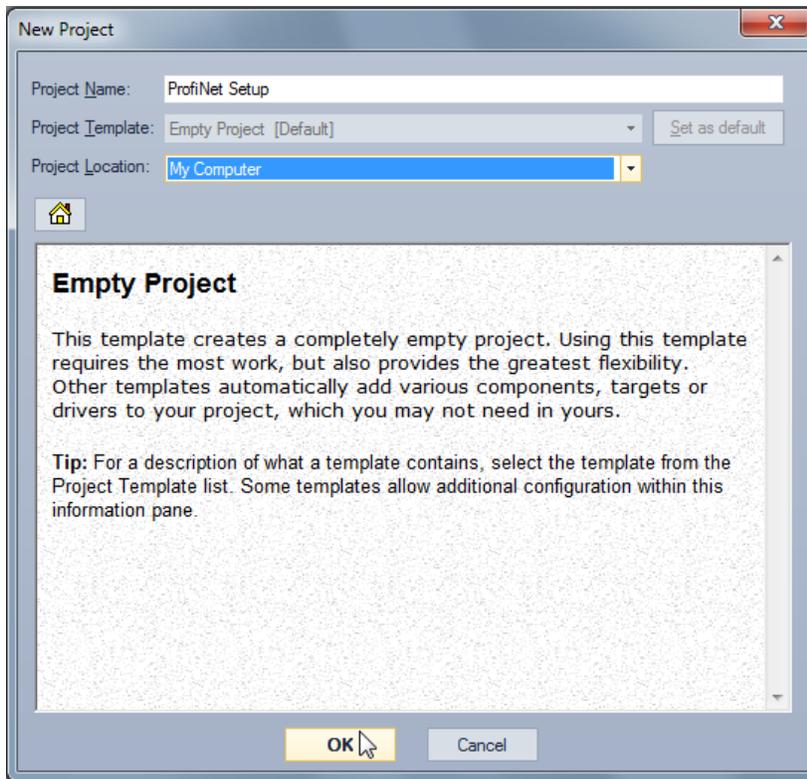Select a project name suitable for use. Click 'OK' when finished.

Figure 2 – Proficy Machine Edition Initial Setup Continued

The final step in the initial setup process is to tell the program what platform this project will operate on. Navigate to 'Project'→'Add Target'→'GE Intelligent Platforms Controller'→'PACSystems RX3i'. See Figure 3 for reference.
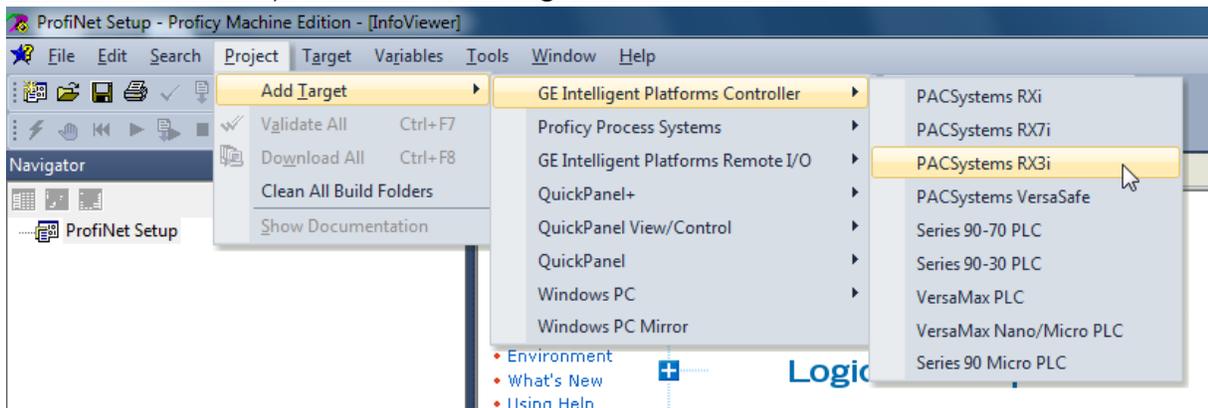

Figure 3 – Proficy Machine Edition Initial Setup Continued

At this point, the user can specify a target name in the 'Navigator' field, but for this example, the default entry will be used.
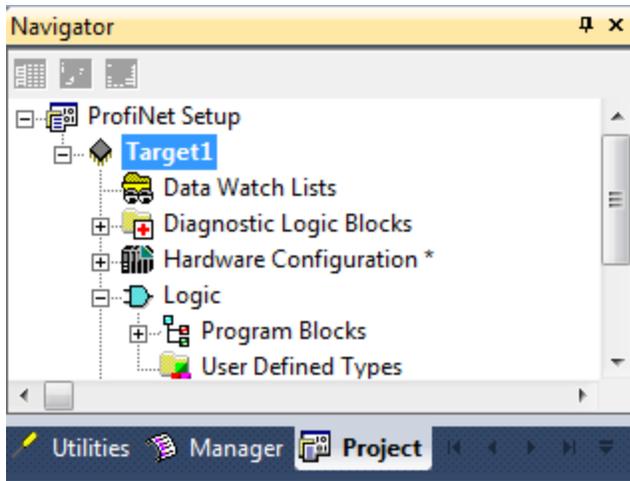
Figure 4 – Proficy Machine Edition Initial Setup Continued

Defining the GE PLC Modules

In the 'Navigator' window with the 'Project' tab selected, expand 'Hardware Configuration'. This is where we set the configuration of the backplane. In this example, the backplane, from left to right, consists of a DC power supply (PSD040), CPU (CPE305), and a ProfiNet (PNC001) control module. The default arrangement is shown below in Figure 5.
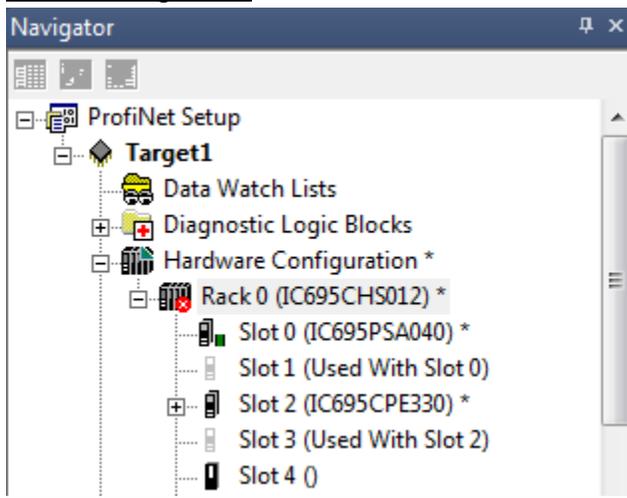

Figure 5 – Default Module Configuration

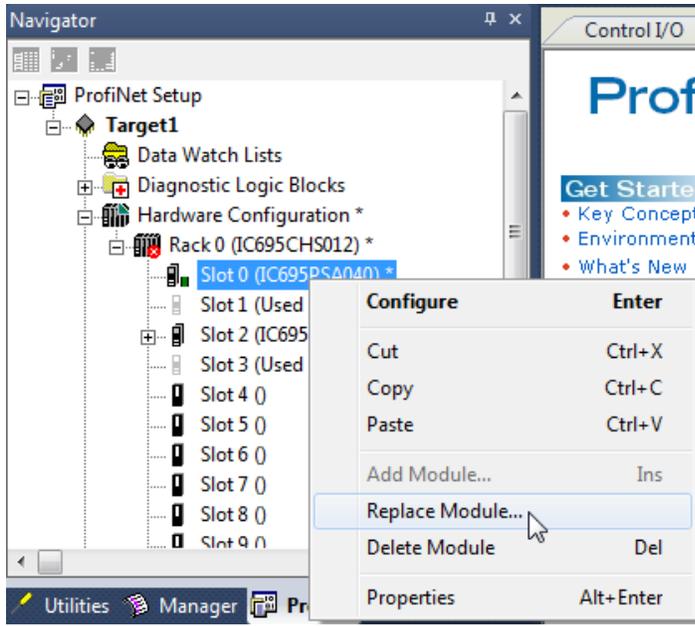Right click on Slot 0 and select 'Replace Module…'

Figure 6 – Power Supply Configuration

When the Catalog dialog box appears, select 'IC695PSD040 – 24VDC 40W Power Supply' and click 'OK' when finished.
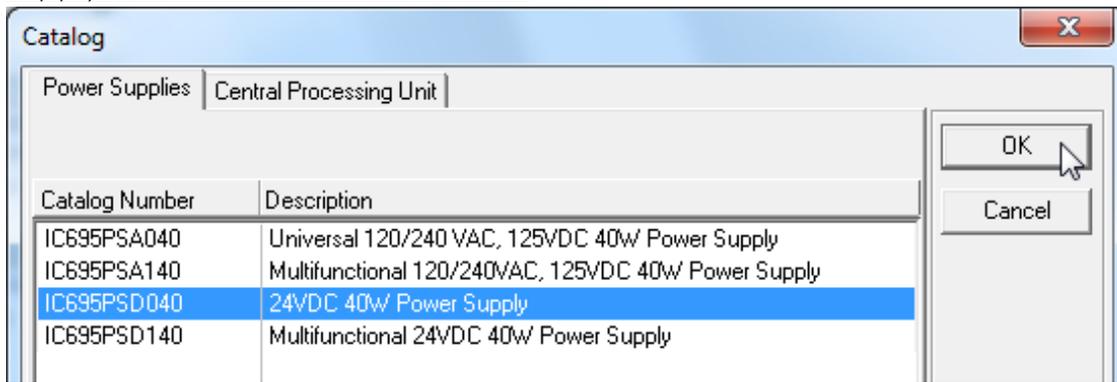

Figure 7 – Power Supply Configuration Continued

Slot 1 is now free and the CPE module can be placed accordingly (simply drag and drop into slot 1). Right click on slot 1 and select 'Replace Module…'.
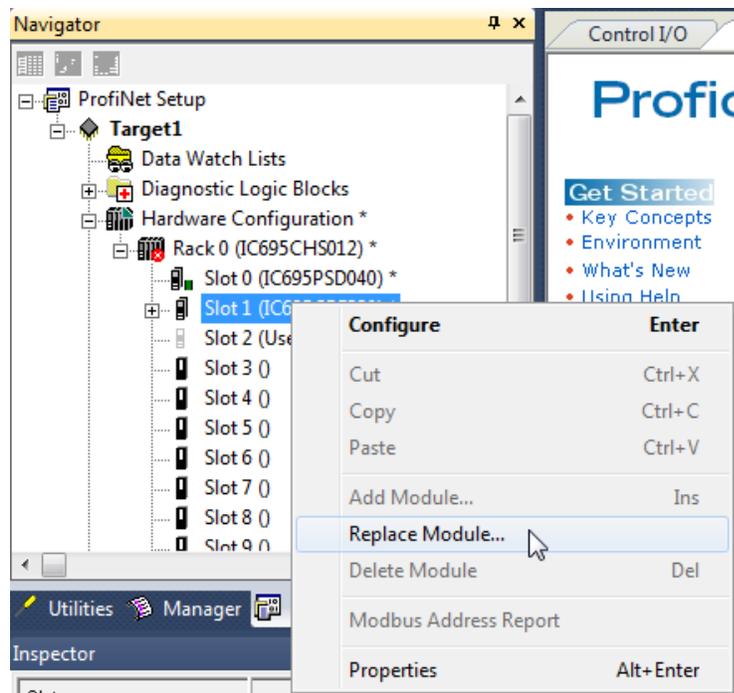
Figure 8 – CPE Configuration

When the Catalog box appears, select 'IC695CPE305 – PACSystems Single Slot CPU 5 MB w/ Ethernet' and click 'OK' when finished.
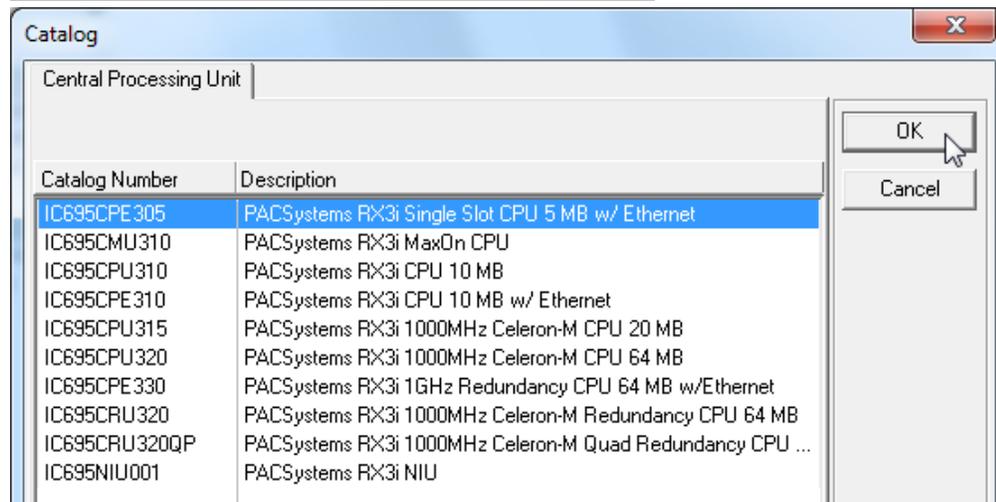

Figure 9 – CPE Configuration Continued

Click 'Yes' to keep the current settings for common parameters. The last step in configuration is to add the ProfiNet control module. Right click on Slot 2 and select 'Add Module…'.
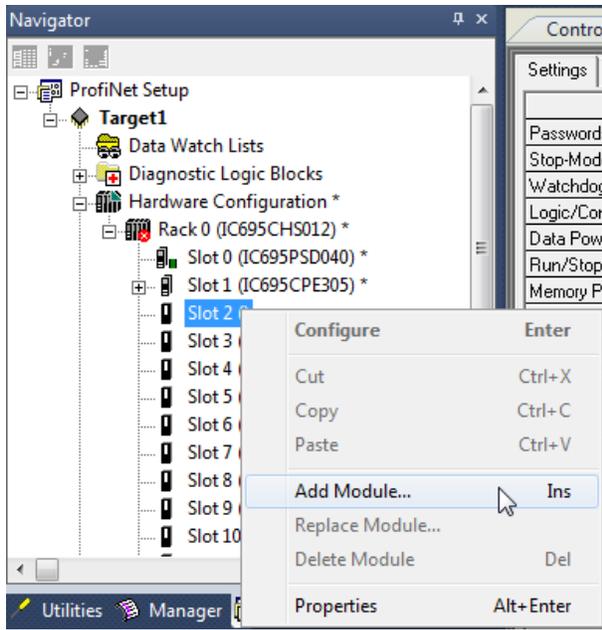
Figure 10 – ProfiNet Configuration

When the Catalog box appears, click on the 'Bus Controller' tab and select 'IC695PNC001 – RX3i PROFINET Controller (2 SFP)'. Click 'OK' when finished.
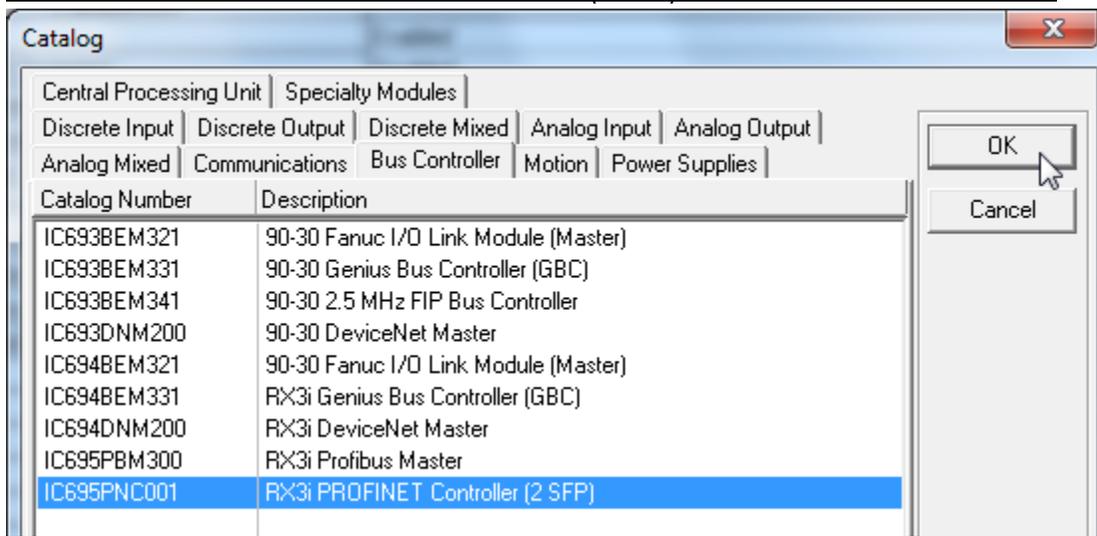

Figure 11 – ProfiNet Configuration Continued

Setting up the Connection

Now that the backplane slots are configured properly, the communication between the ProfiNet and CPE module must be configured.

Configuring the CPE Connection

The CPE module needs to be configured such that it can communicate with the PC. In this example, we will use the Ethernet connection to do so. Expand Slot 1 and right click on 'Configure'.
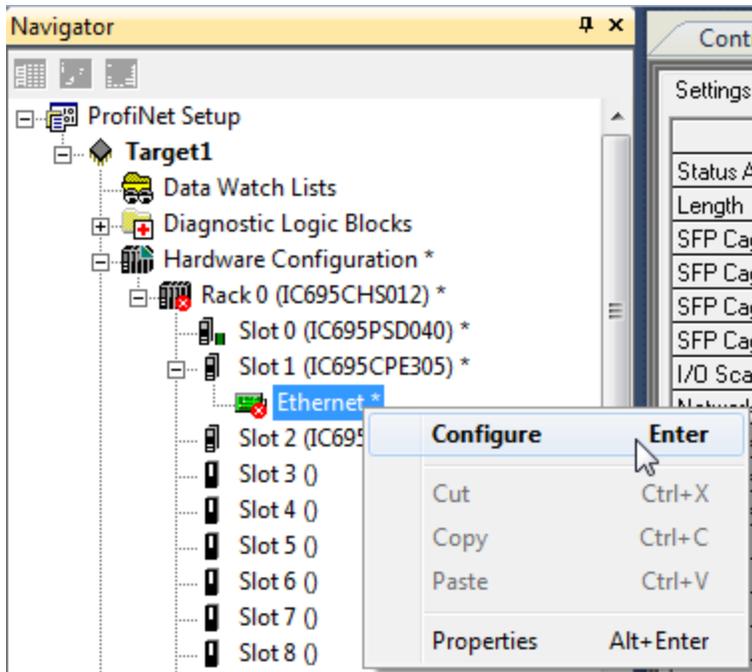
Figure 12 – CPE Communication

The PLC in this example has IP address 10.10.13.201 (if this is a new device, check for the default IP address value). Set the IP address to this value with subnet 255.255.255.0.

Figure 13 – CPE Communication Continued

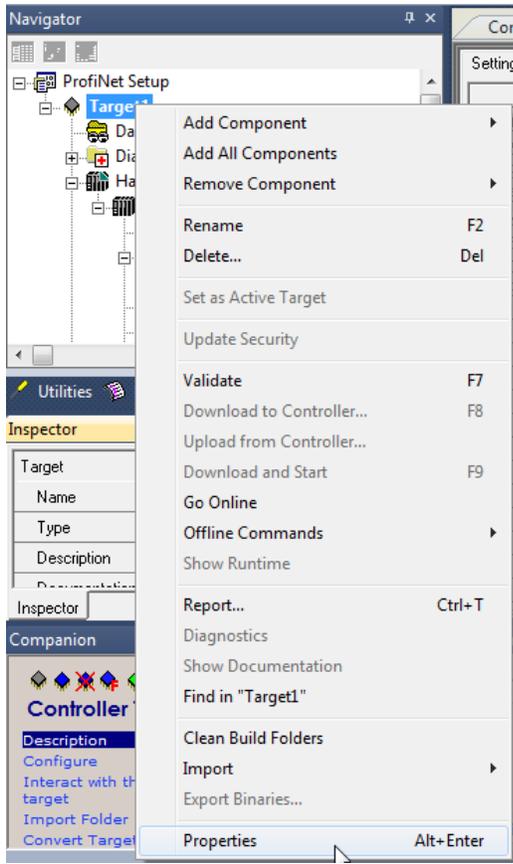Lastly, right click on 'Target1' and select 'Properties'.

Figure 14 – CPE Communication Continued

The properties of any device are shown in the 'Inspector' window. From this menu, scroll down to the bottom and enter IP address 10.10.13.201. Hit enter when finished.

Inspector	⌷ ✕
Name	Target1
Type	GE IP Controller
Description	
Documentation Address	
Family	PACSystems RX3i
Controller Target Name	ProfiNetSetup1
Update Rate (ms)	250
Sweep Time (ms)	Offline
Controller Status	Offline
Scheduling Mode	Normal
Force Compact PVT	True
Enable Shared Variables	False
Process System Enabled	False
DLB Heartbeat (ms)	1000
Enhanced Security	False
Compression Level	Normal
Physical Port	ETHERNET
IP Address	10.10.13.201
⊞Additional Configuration	

Inspector

Figure 15 – CPE Communication Continued

Configuring the ProfiNet Connection

The PLC controller needs to have a Device name set by an external configuration tool. We will use 'PROFINET DCP' scan tool which ships with the GE Machine Edition software. Select the 'Utilities' tab at the bottom of the 'Navigator' window.
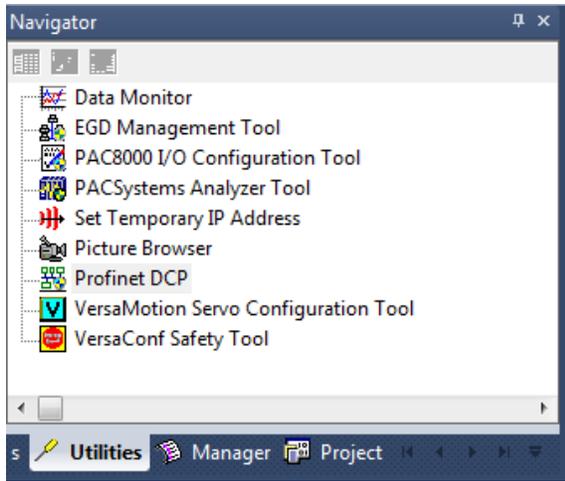
Figure 16 – ProfiNet Communication

Double click 'Profinet DCP' to bring up the discovery tool. From the drop down menu, select 'Local Area Connection' and press the 'Refresh Device List' button. This should list all the Profinet devices on the network.
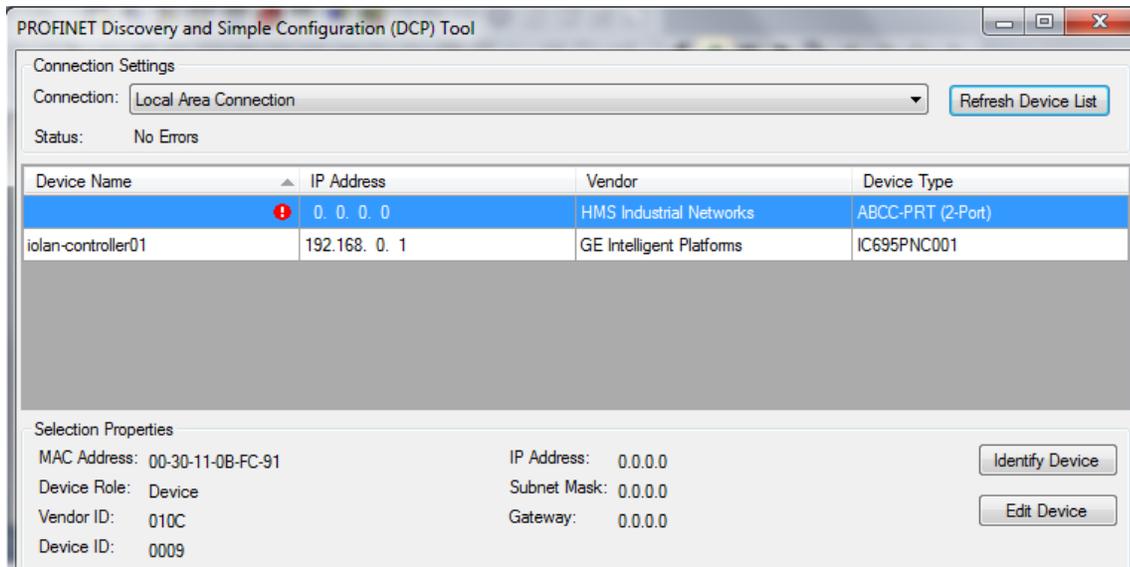

Figure 17 – ProfiNet Communication Continued

The GE PNC001 scanner card has a Device Name of 'iolan-controller01' and is at IP address 192.168.0.1. If the Gen 4 controller has never been configured and will not have a Device Name or IP address yet. The Gen 4 controller will always show up as an HMS Industrial Networks ABCC-PRT (2-Port). Select the controller and press the 'Edit Device' button.
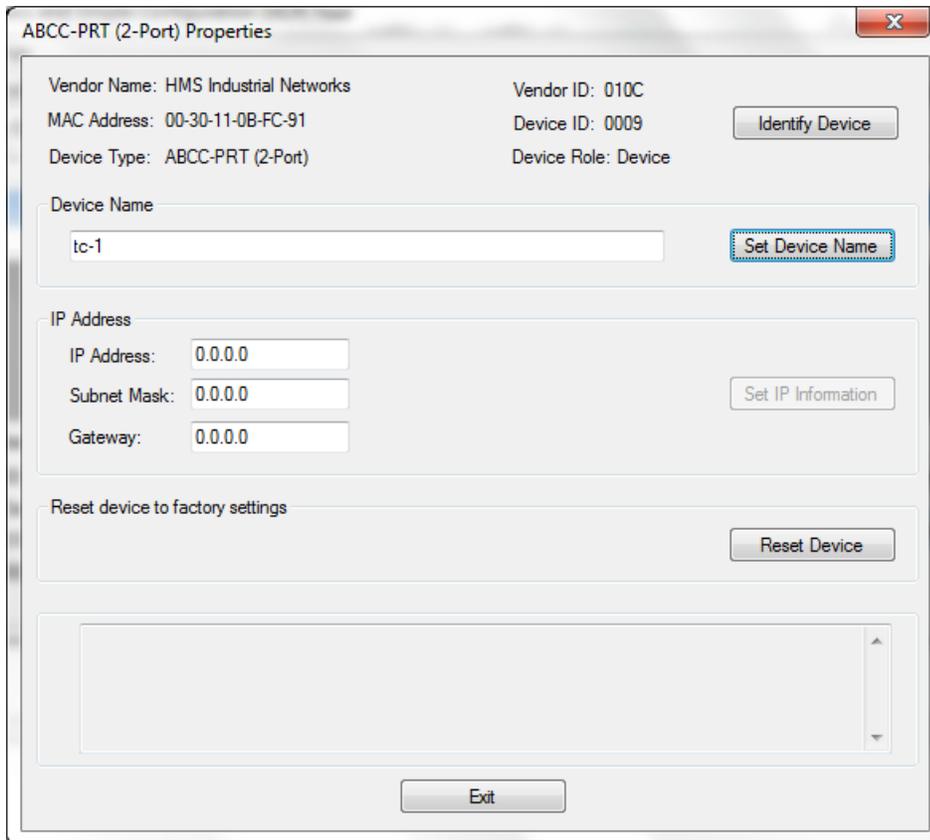
Figure 18 – ProfiNet Communication Continued

For simplicity, set the device name to 'tc-1' and hit 'Set Device Name', then 'Exit'. The Gen 4 controller now has a device name but not an IP address.
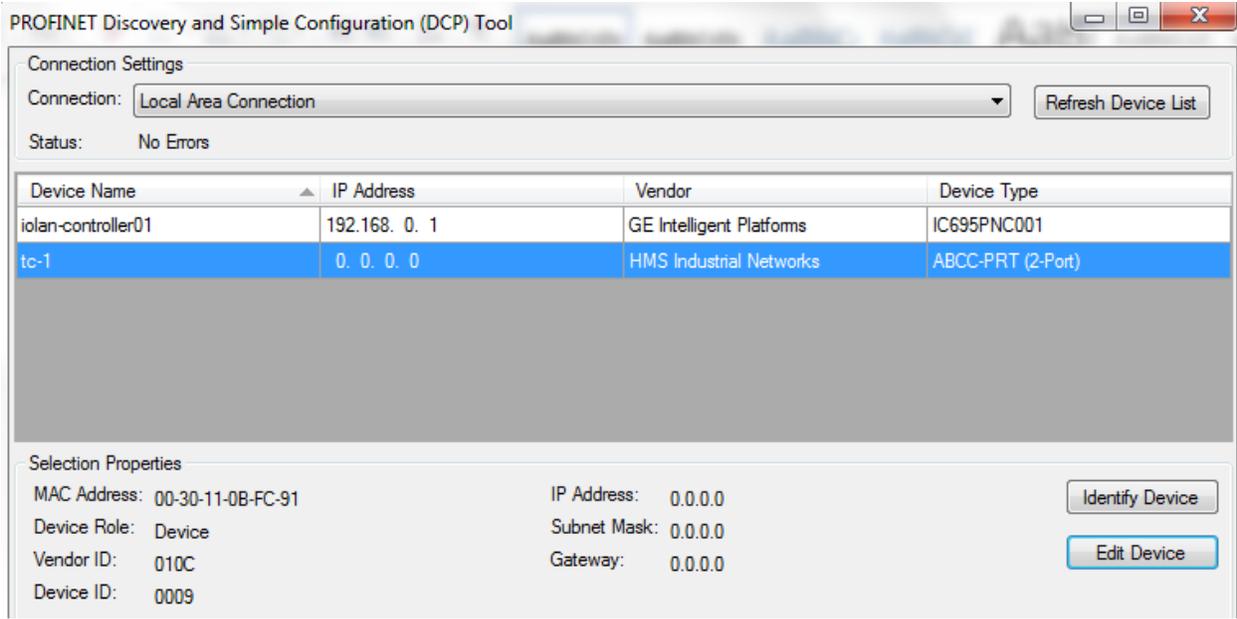
Figure 19 – ProfiNet Communication Continued

Close the Profinet DCP utility.

Now that we have given the UEC a device name (tc-1) we can add it to our project. Navigate to the PNC001 card in the hardware configuration, right click on it and select 'Launch Discovery Tool'. Click 'Refresh Device List' and the controller (tc-1) should show up as 'Not assigned'.
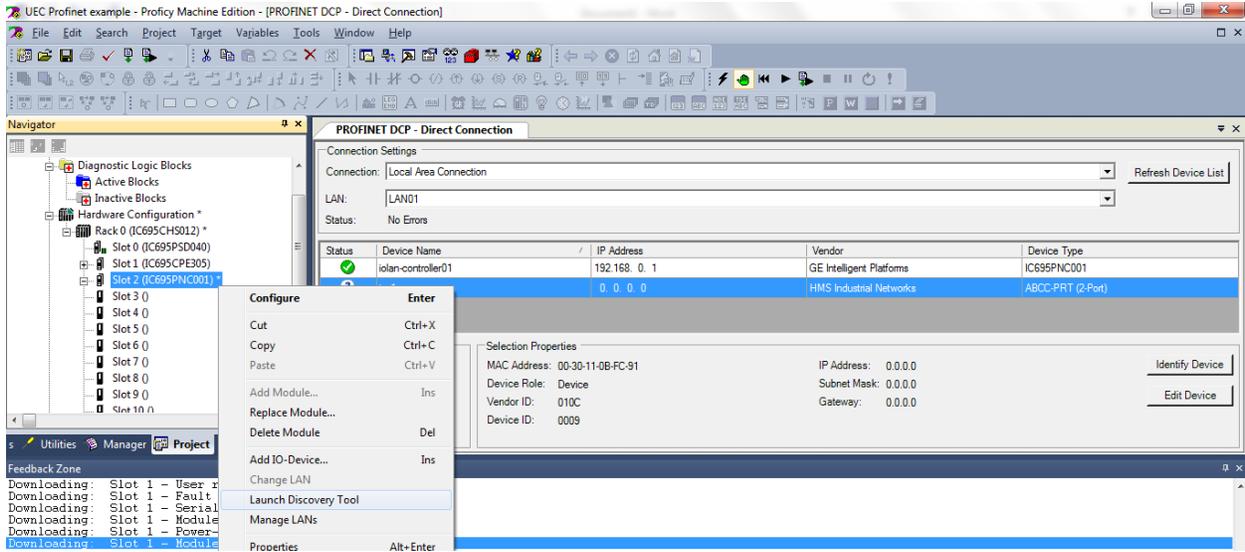
Figure 20 – ProfiNet Communication Continued

Navigate to the PNC001 card in the hardware configuration and right click on it and select 'Add I/O Device…'.
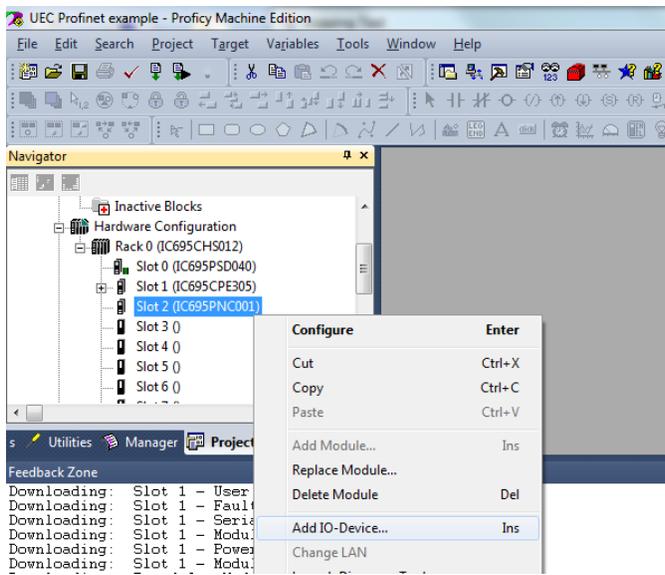

Figure 21 – ProfiNet Communication Continued

Select ABCC-PRT2P device from HMS Industrial Networks and click 'OK'. If it is not listed you will need to import the GSD file which can be found on the controllers web interface.
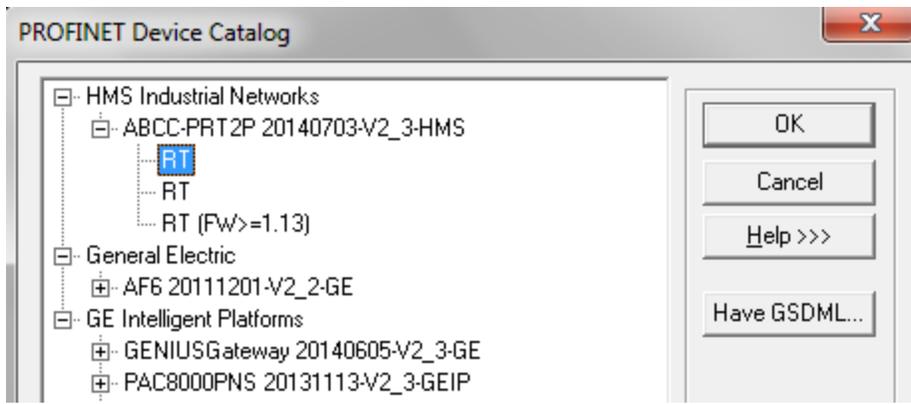
Figure 22 – ProfiNet Communication Continued

This will add a new device with the default device name of 'abcc-prt-2-port'. Edit the properties of this device and change its Device Name to tc-1 to match the controller we have on the network. This will also assign an IP address to the Device name.

Figure 23 – ProfiNet Communication Continued

Expand Slot 2 and right click on 'tc-1 (#1) [RT]' and select 'Change Module List…'. Add (in order) 3 'Output 1 word', 2 'Output 2 word', and 7 'Input 1 word'. Click 'OK' to save. These settings are due to the Gen 4 controller IO default values. The size of the elements & order (from output to input) must match the settings on the Gen 4 controller.
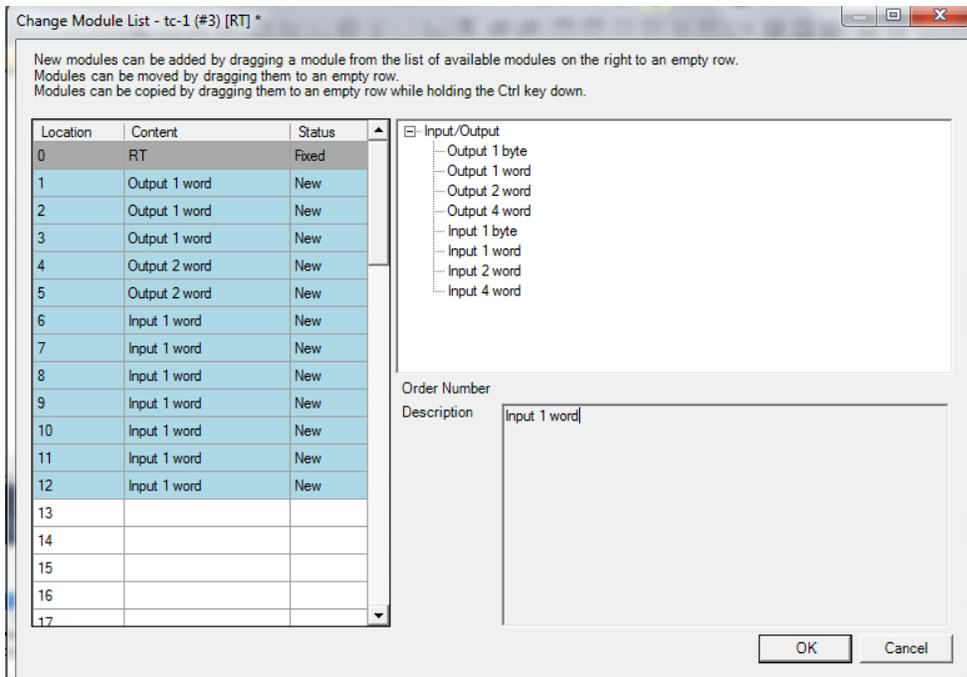
Figure 24 – ProfiNet Communication Continued

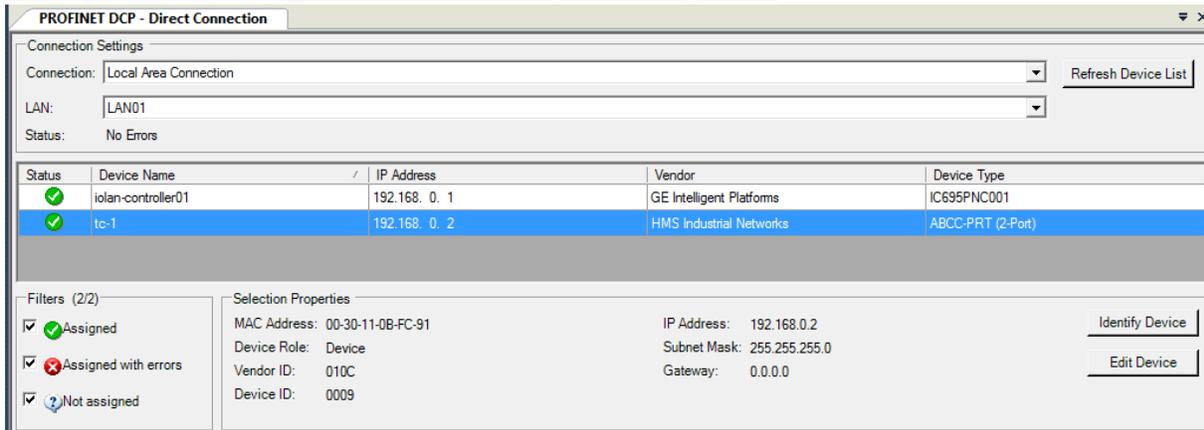The controller (tc-1) should now show up as 'Assigned'.

Figure 25 – ProfiNet Communication Continued

Downloading the configuration

The settings are now ready to be downloaded to the PLC. Make sure to take note of the symbol next to the target during this process. Figure 26 shows what the current state of the target is (offline).

Figure 26 – Download Process

In order to download any settings into the PLC controller, the PC must first be communicating with the PLC. To do so, right click on on 'Target1' and select 'Go Online'. Notice that the target symbol has changed to online/monitor mode and also indicates that the current settings do not match the existing PLC settings.
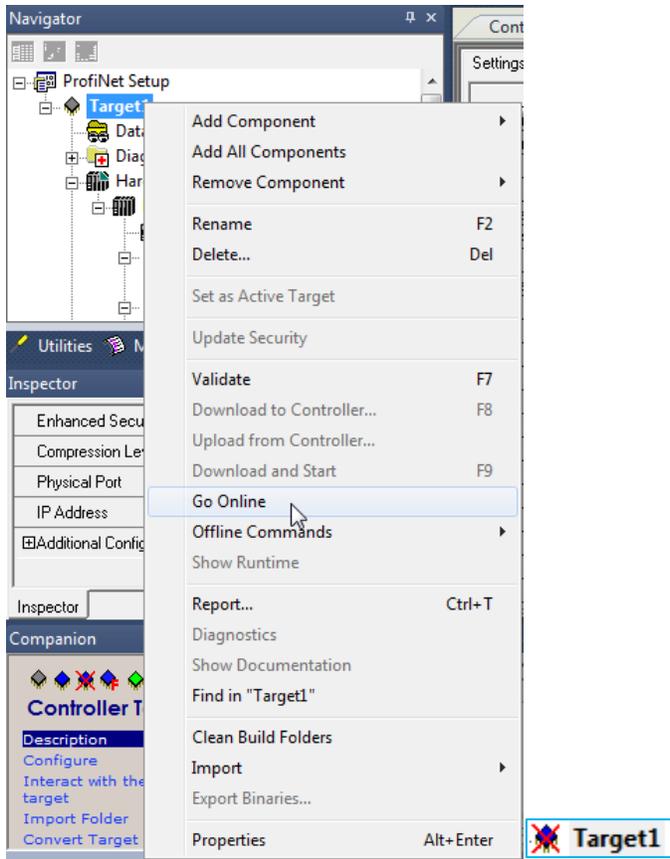
Figure 27 – Download Process Continued

Since the settings are not equal, right click on 'Target1' and navigate to 'Online Commands' and select 'Set Programmer Mode'.
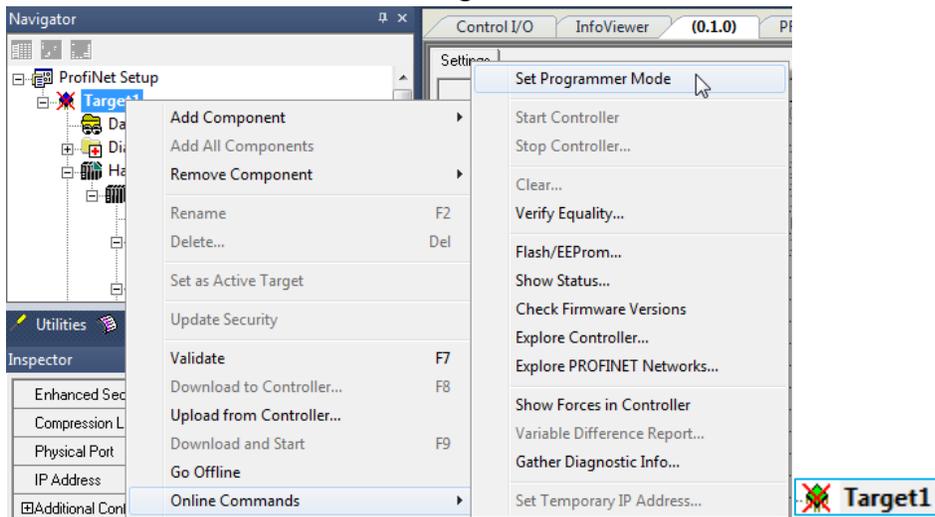

Figure 28 – Download Process Continued

Notice now that the target is in online/programmer mode, but it still shows that the settings are not equal. This is because we still need to download our current settings to the existing settings on the PLC. For the final step, right click on 'Target1' and select 'Download to Controller'
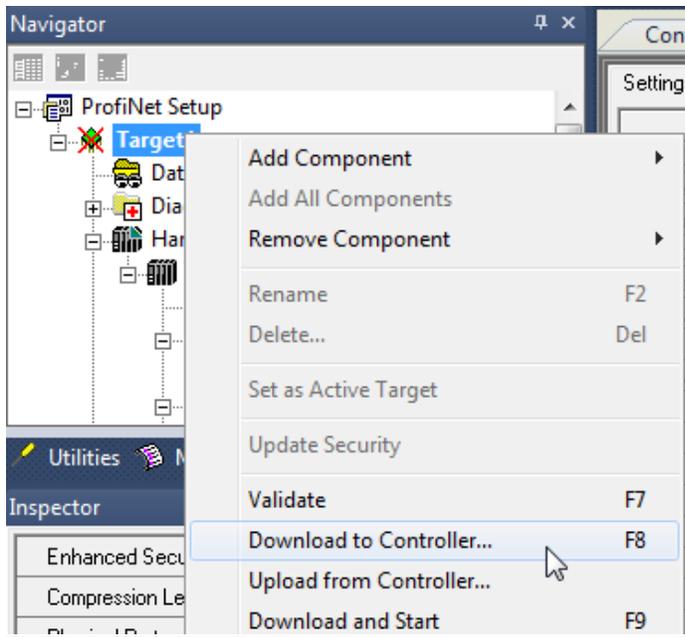
Figure 29 – Download Process Continued

For this example, we will not be changing anything other than the default settings shown in the 'Download to Controller' dialog box. Simply click 'OK' when this appears.
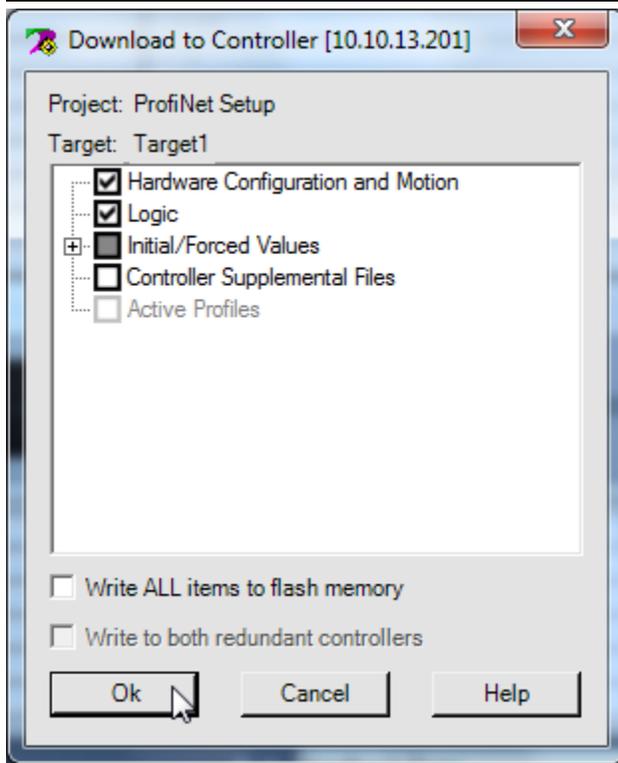

Figure 30 – Download Process Continued

Once the process finishes, 'Target1' will display as shown in Figure 31. This means we are in online/programmer mode and have the same settings on both the PC and PLC.

Figure 31 – Download Process Continued

Below are the default settings for Anybus on the Gen 4 controller. From the Home screen, navigate to 'Controller'→'IO' and select either 'ANYBUS Inputs' or 'ANYBUS Outputs'.
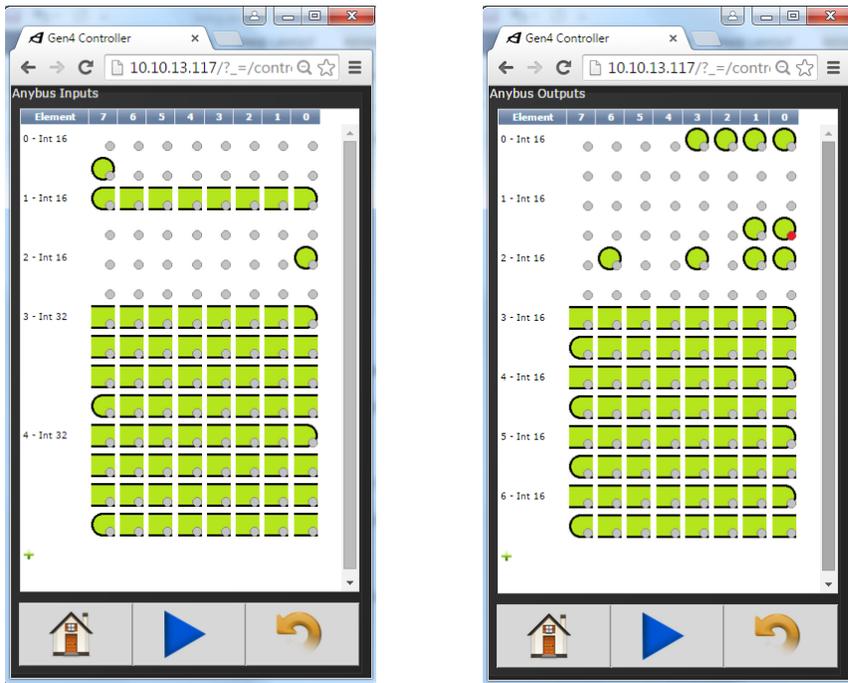

Figure 32 – Gen 4 Controller Anybus Settings

To verify that the communication is successful, navigate to the 'Default Tables' in the Proficy Machine Edition software and either look at the analog inputs coming in from the ANYBUS Outputs on the Gen 4 controller or force the analog outputs to the ANYBUS inputs. Make sure to start the PLC controller first.