Technical Support Help Guide:

OPC UA

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How to enable OPC UA on Comtrol's IOLM?

Initial set-up for OPC UA on IO-Link Master.

Step one:

1. Check your IO-Link Master to confirm it has the following application base images installed:
   - **EIP v1.5.0.1 or higher**
   - **PNIO v1.5.0.1 or higher**
2. There are two methods to check your software version: embedded web page or PortVision DX. Choose whichever is most convenient for you.
   - Web page: proceed to **step two**.
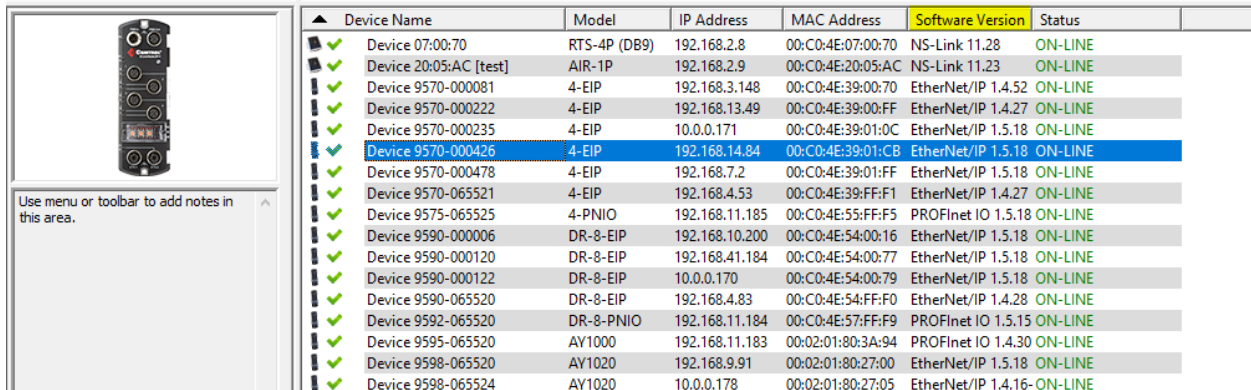   - PortVision DX: proceed to **step three**.

Step two – Web Page

1. To check your software on the **Web Page,** ensure you are connected to the same network as your IOLM.
2. Type in the IP address of your IOLM.
3. The software version will display on the Home page of the IP address.

Step three – PortVision DX

1. To check your software on **PortVision DX** launch the application, then left-click the IOLM or the folder to highlight it. In the example below, the folder is called "Scan Results [12/16]". **
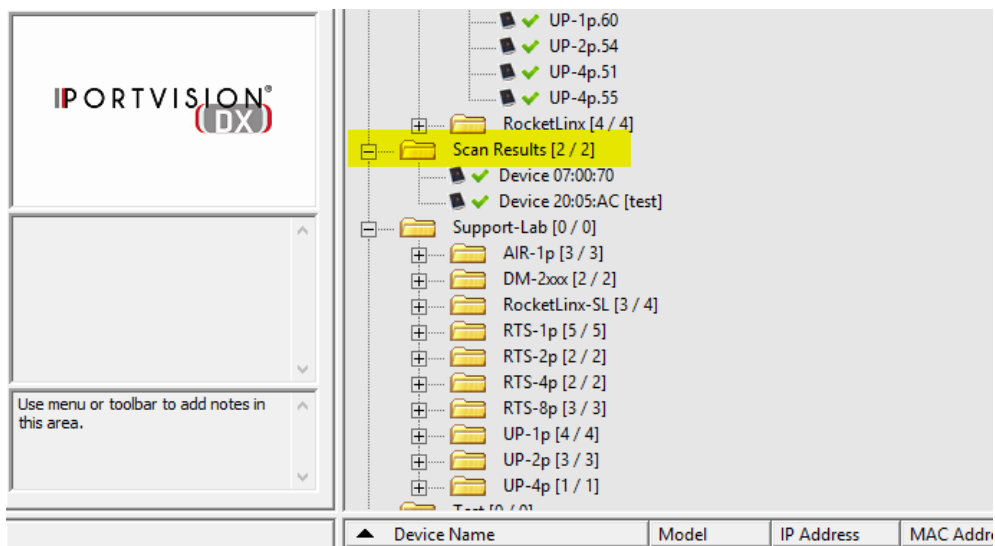
2. The IO-Link Master will appear on the bottom right of PortVision DX. Navigate to Software version and confirm its EIP / PNIO v1.5.0.1 or higher. Keep note of the IP Address – this'll be used in the next step.

Not the correct version?

- Depending on when the IO-Link Master was manufactured, you may need to send the IO-Link Master to Comtrol for image updates if below v1.5.0.1.

** If you do NOT have PortVision DX, please install it here: http://downloads.comtrol.com/html/IOLM_EIP_pvdx.htm; alternatively, using the webpage will be sufficient.

Step four:

1. After confirming your software version is correct, open a web browser and enter the IO-Link Master's IP address.
2. Once loaded, click on **Configuration**, then **OPC/UA**.
3. Click **Edit** on the right side.

4. Click on the drop-down menu and **enable** for **OPC UA Server Enable.**

Additional Parameter Settings:

Depending on the software version, there will be different parameter settings for OPC UA. Below are the available options for OPC UA configuration:

The following table provides information for OPC UA Configuration Settings.

Option	OPC UA Configuration Descriptions
OPC UA Server Enable (Default = disable)	This option controls whether or not the OPC UA server runs on the IO-Link Master.
Work-around for faulty OPC UA clients that require unique browsenames (Default = disable)	Enables an alternative set of browsenames where each node's browsename is unique. Normally only browsepaths are required to be unique.
Allow OPC UA clients to write PDO data (Default = disable)	Determines whether OPC UA clients are allowed to write PDO data to the IO-Link slaves.
Allow OPC UA clients to write ISDU data (Default = disable)	Determines whether OPC UA clients are allowed to write ISDU data to the IO-Link slaves.

Note: Allow OPC UA clients to write PDO data can be enabled / disabled through individual ports.

To check number of TCP connections, click on Diagnostics | OPC UA

If you have a connection, this page will display:

Client and Server: OPC UA

Before you connect to the client, here is a very basic rundown of how our IO-Link Master communicates with your OPC UA Client of choice.

Overview:

The IO-Link Master acts as the OPC UA Server. The OPC UA Client is your choice between HMI, SCADA, or a PC application. Once the Client is ready for the server, you will be required to enter an Endpoint to access the server, such as typing in the IP Address of the server. Your client connects to the OPC UA Server's endpoint to communicate. Comtrol does not use a Discovery Server between the client and server.
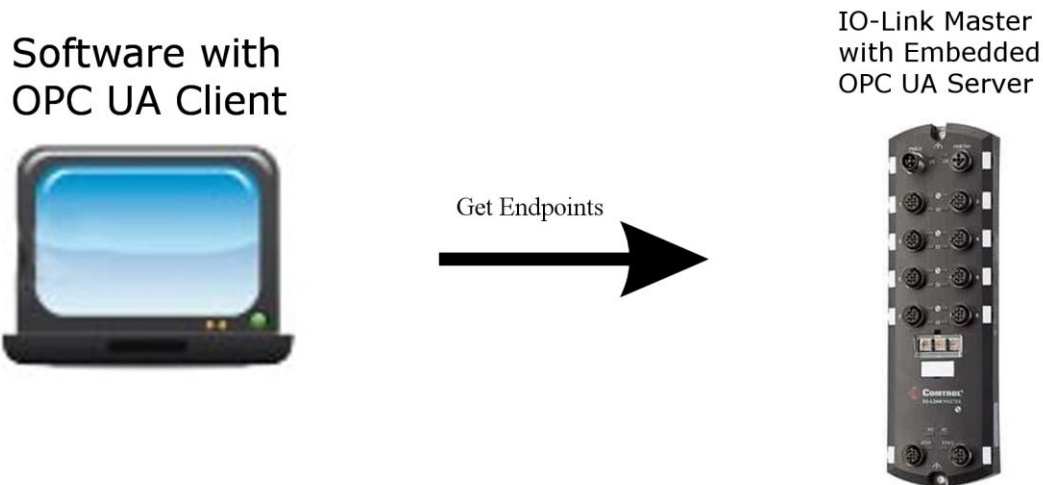
The design behind the connection isn't important at this time; however, it helps explain how your IO-Link Master is working behind the scenes.

 In order to start viewing tags and data from your IO-Link Master, you'll need to choose your OPC UA Client of choice. For this document UaExpert will be the example program.

Using an OPC UA Client to Connect to the IOLM Server

The material presented is solely for educational purposes to show the connection(s) between the OPC UA Client, OPC UA Server, and sensors/actuators.

UaExpert will be the example application for the OPC UA Client– it's free to download and quick to use. To download UaExpert, here is the link: https://www.unified-automation.com/downloads/opc-ua-clients.html. There will be two methods to connecting to the Server. **Method One** is for general OPC UA client connections; **Method Two** is designed specifically for UaExpert.

Method One:

Step one:

Once you have UaExpert downloaded (or your OPC UA Client of choice), your starting Client will appear like the image below. You may have to drag some windows around to get the same exact appearance:
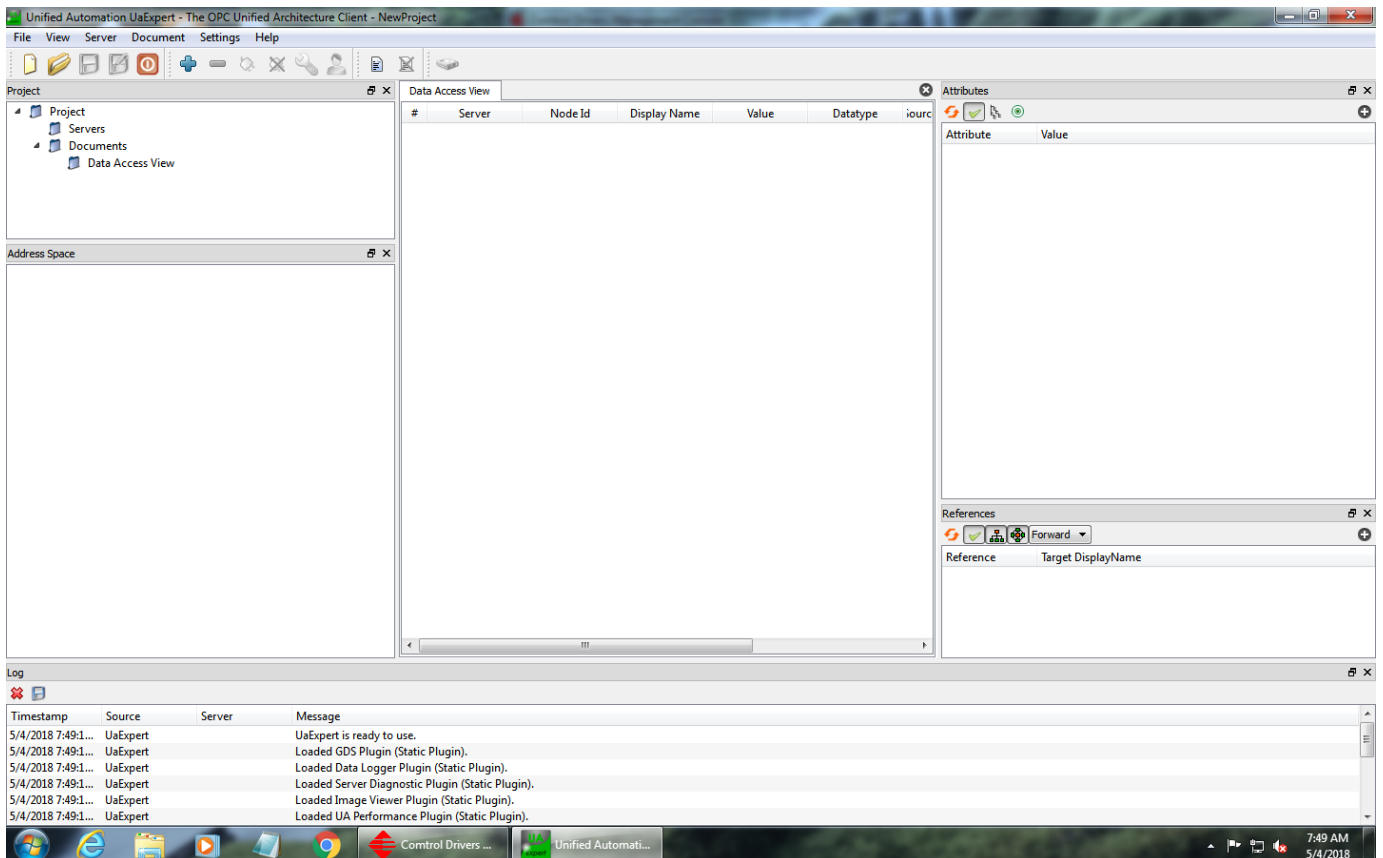
Step Two:

Next, find your **'add server'** option. In UA Expert, that will be the top left under Server, and then **Add**.
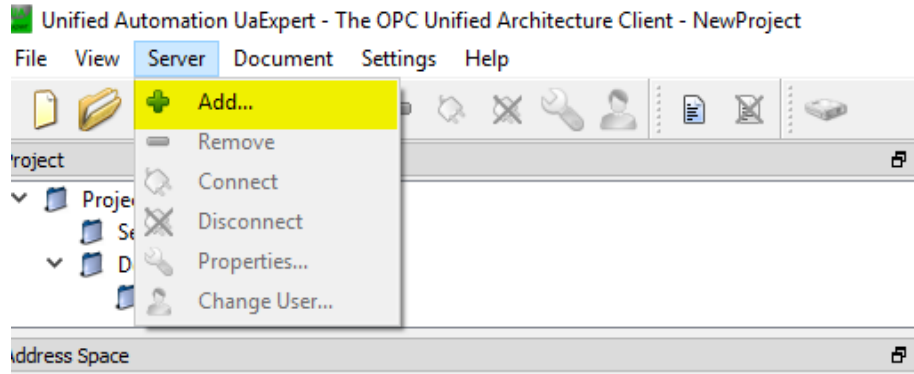
Step Three:

This will be your endpoint to connect to the server. Since you're working with OPC via TCP, choose the **opc.tcp option**.
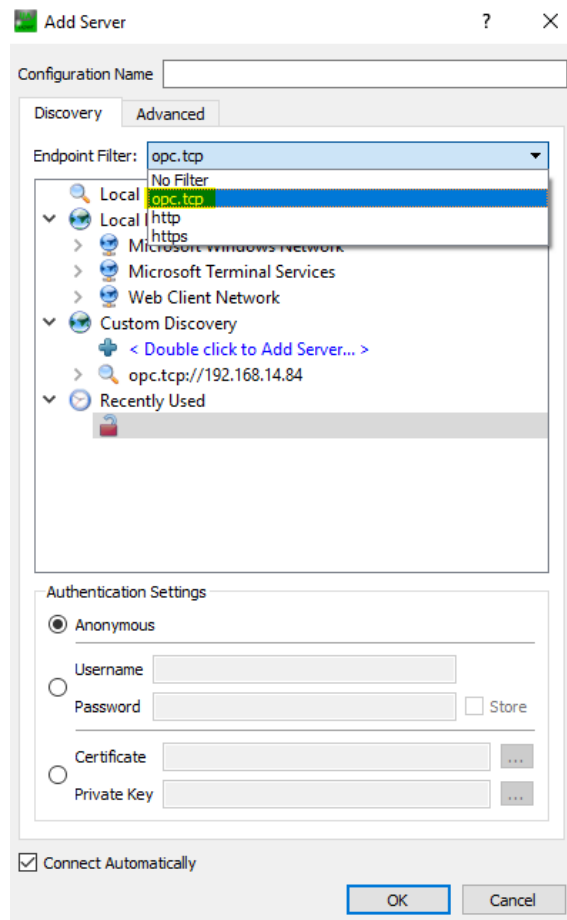
Step Four:

Now it's time to discover the server through the UA Client. Click on **< Double click to Add Server... >.**
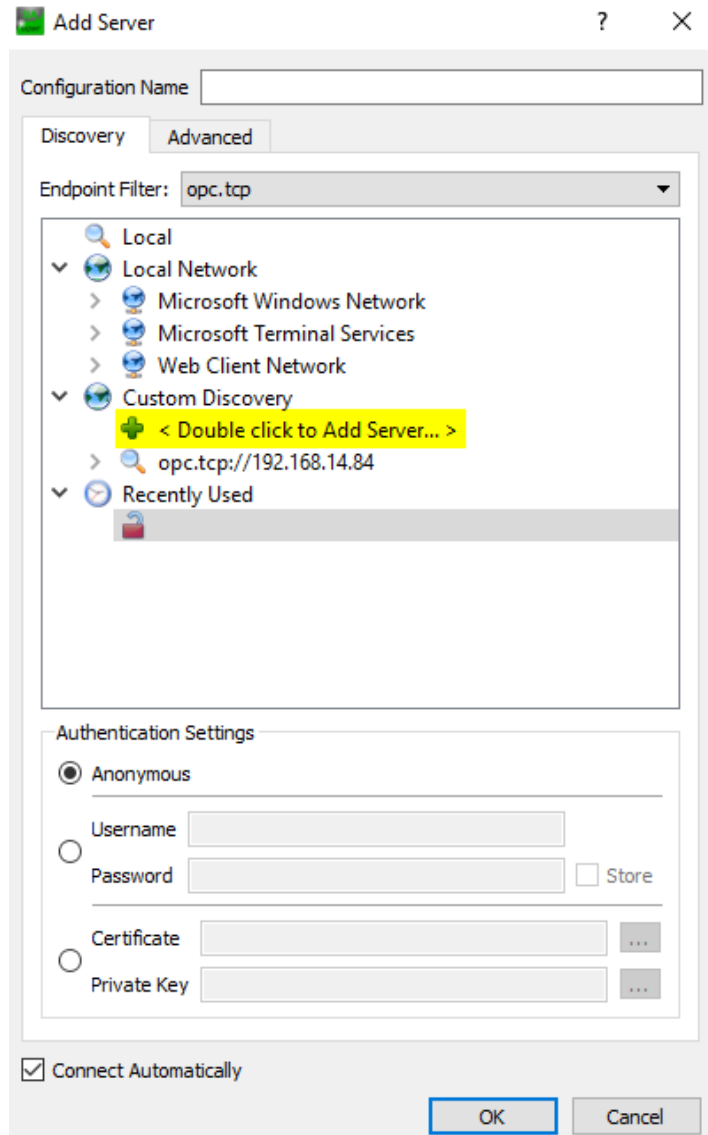
Step Five:

Enter in the **URL** of your IO-Link Master.
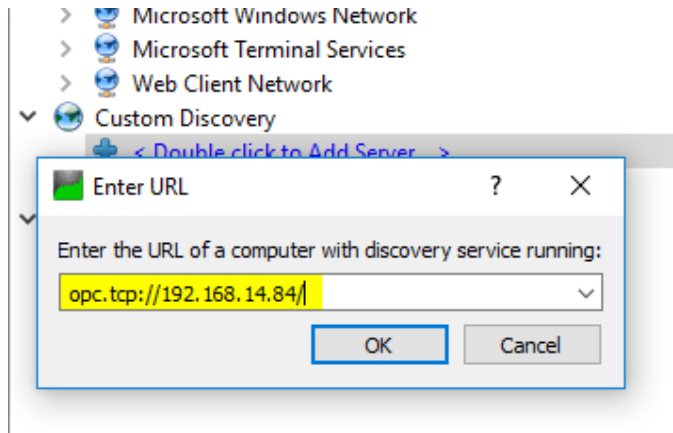
Step Six:

Then, at the top left go to your Servers, **right-click the server**, and press **connect**.
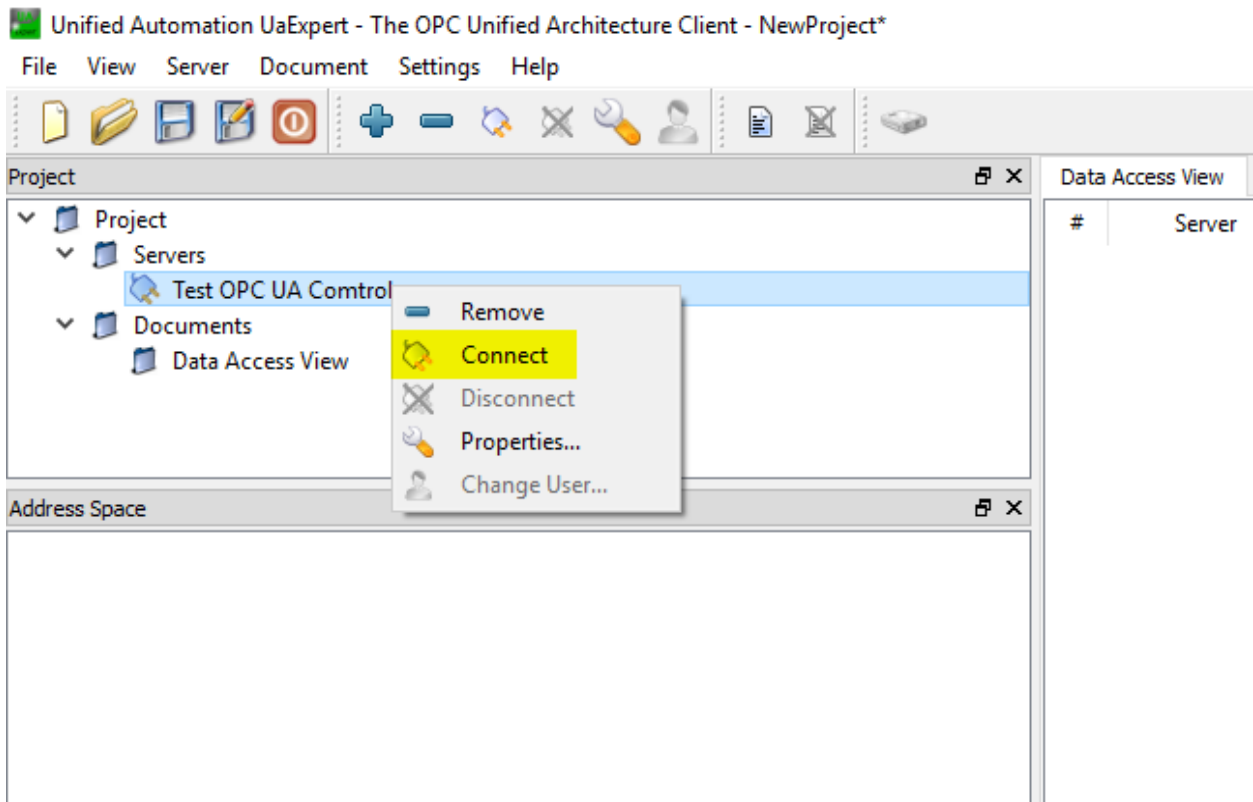
Step Seven:

The Server is now connected!
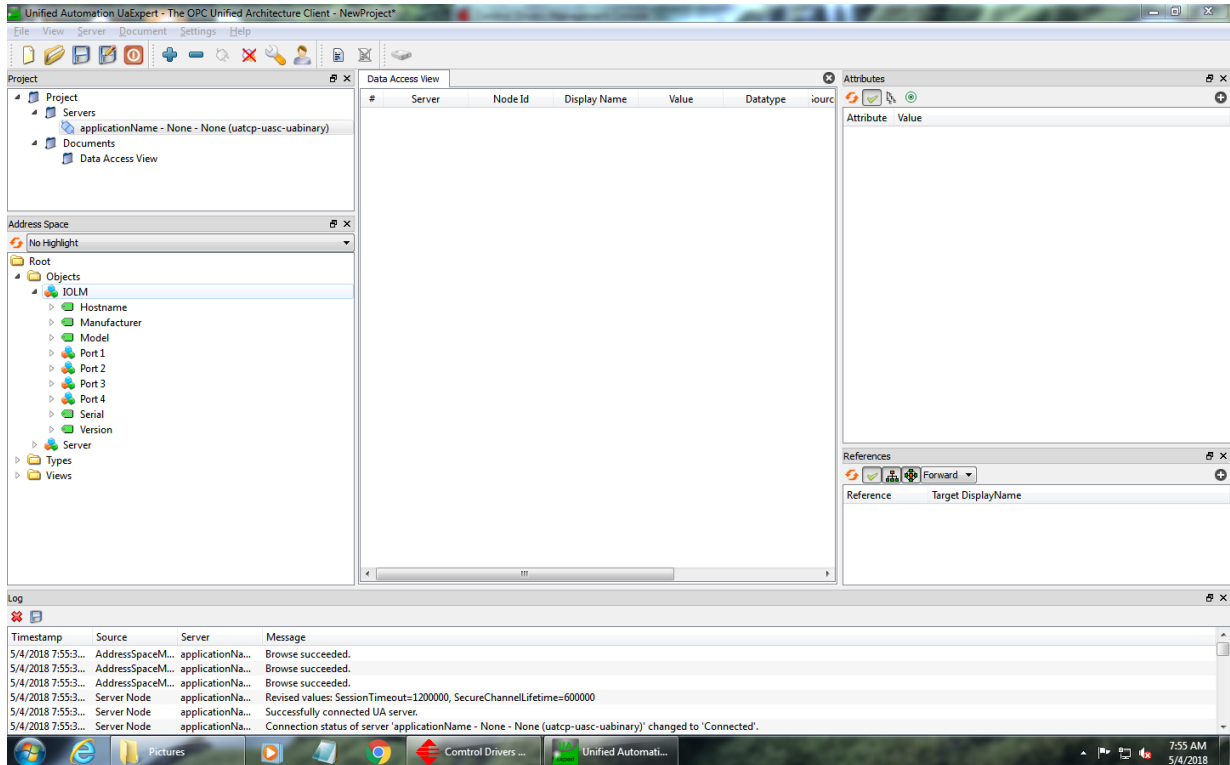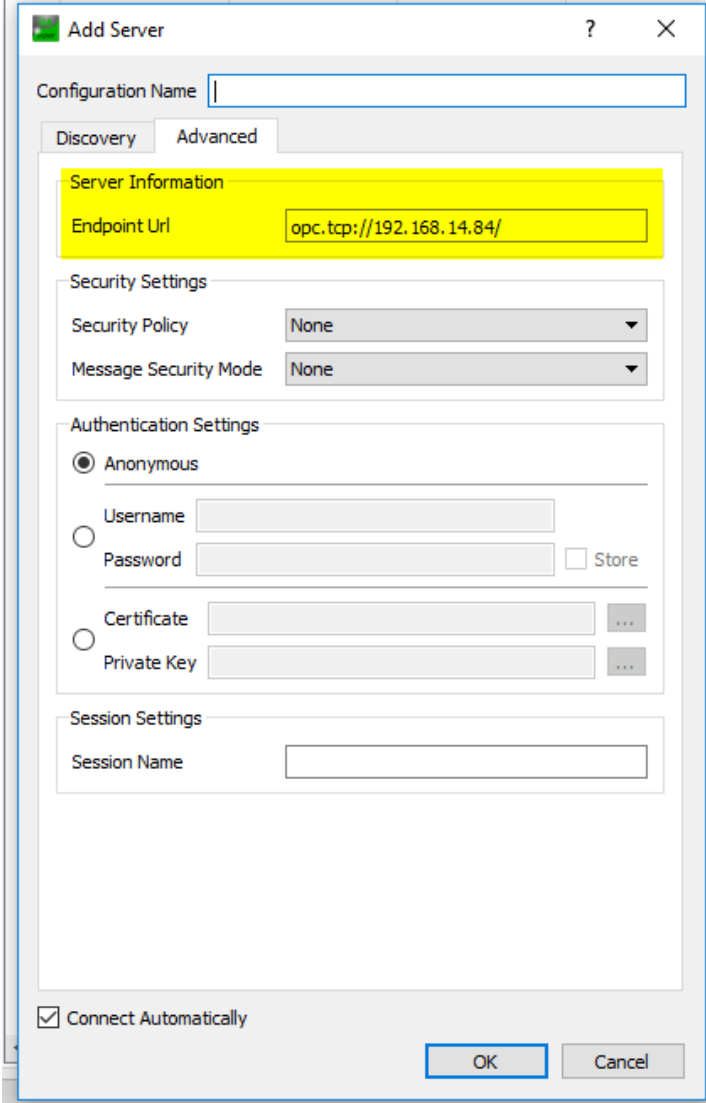
Next Steps:

1. If your server and client are not connected yet, please continue to the next page [13].

2. If you have successfully connected, please continue to page [14] to view tags inside your OPC UA client.

3. If you want to find a specific tag, please continue to page [19].

Method 2:

If the server did not connect, there are other options such as putting in the Endpoint URL directly for the server. In this case, opc.tcp is needed in front of the IO-Link Master's IP Address. You can find this on the Advanced tab for 'Add Server'. This will directly connect you to the OPC UA Server for your IO-Link Master.

Note: You may have to put port :4840 after the IP Address.

How to View Tags and Data on the Client

After successfully connecting your Client and Server, you can now start viewing your tags and data in the Client.

Steps:

1. In the Address Space on the left side, look for **IOLM**. The Address Space will provide all the IDs, Cycle Times, ISDU, PDI information, and additional tags.
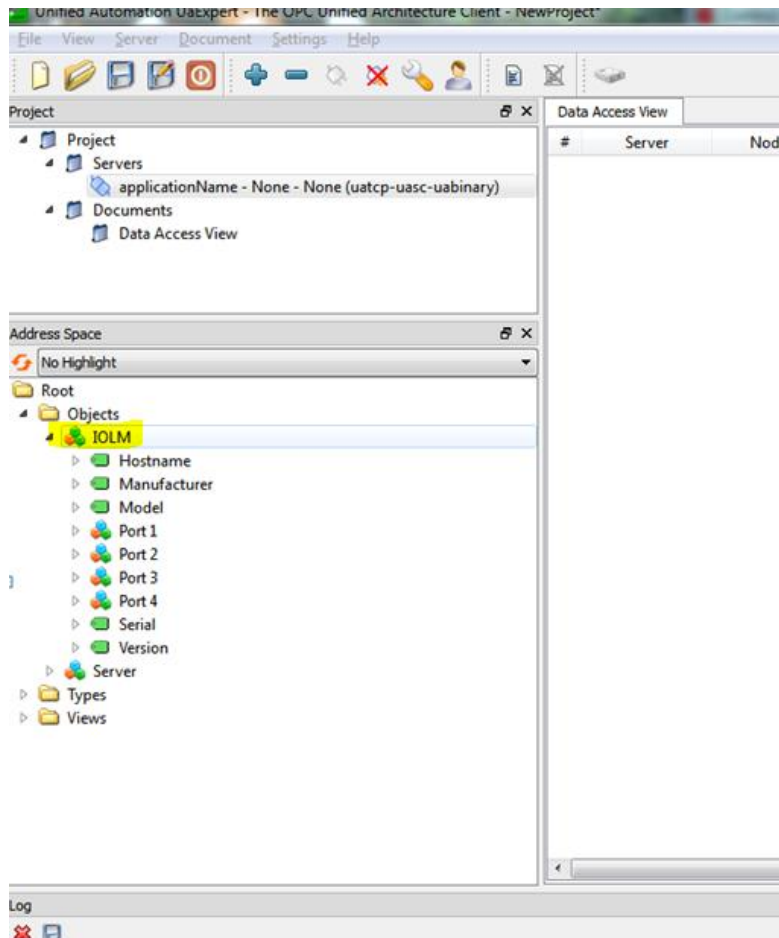
2. Expand one of your **Ports** that a sensor is attached to. In this example, a Leuze sensor (distance-measuring sensor) is attached to the port 2.
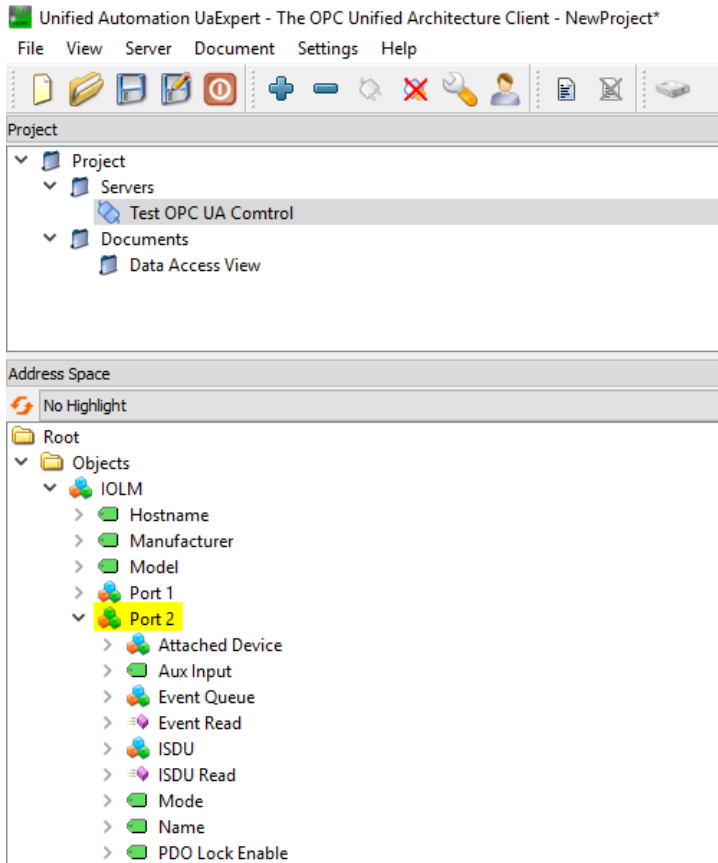
3. Expand **Attached Device**. This will be the destination for all your tags you want to view on your OPC UA client for that specific port.
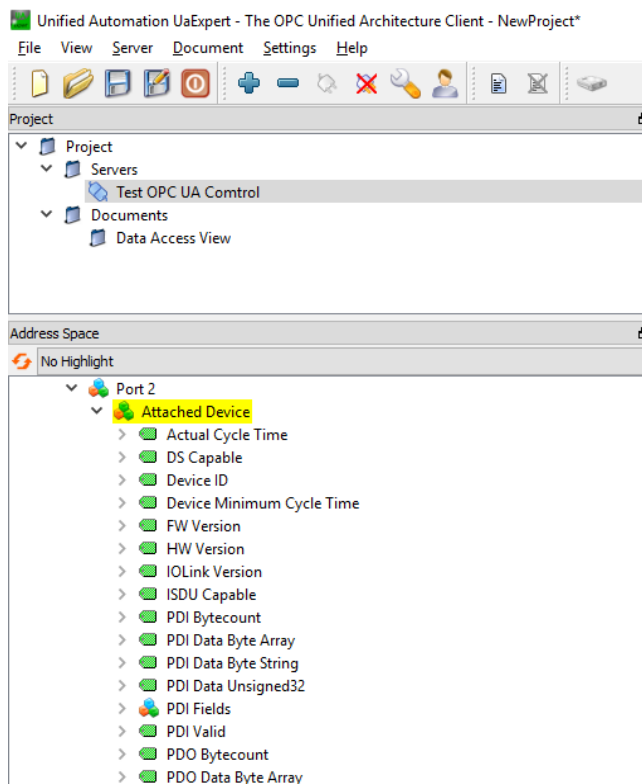
4. Now, you can explore the different tags and view whichever data you want. To test if the IO-Link Master is properly working with its respected sensor(s), click on **Vendor Name** tag (left side), then look over on the **Attributes** (right side). Under **Value**, the Vendor Name of our device (Leuze Electronic) for the port confirms that the Client, Server, and Port are all communicating – you can now freely view the data for whichever tag.
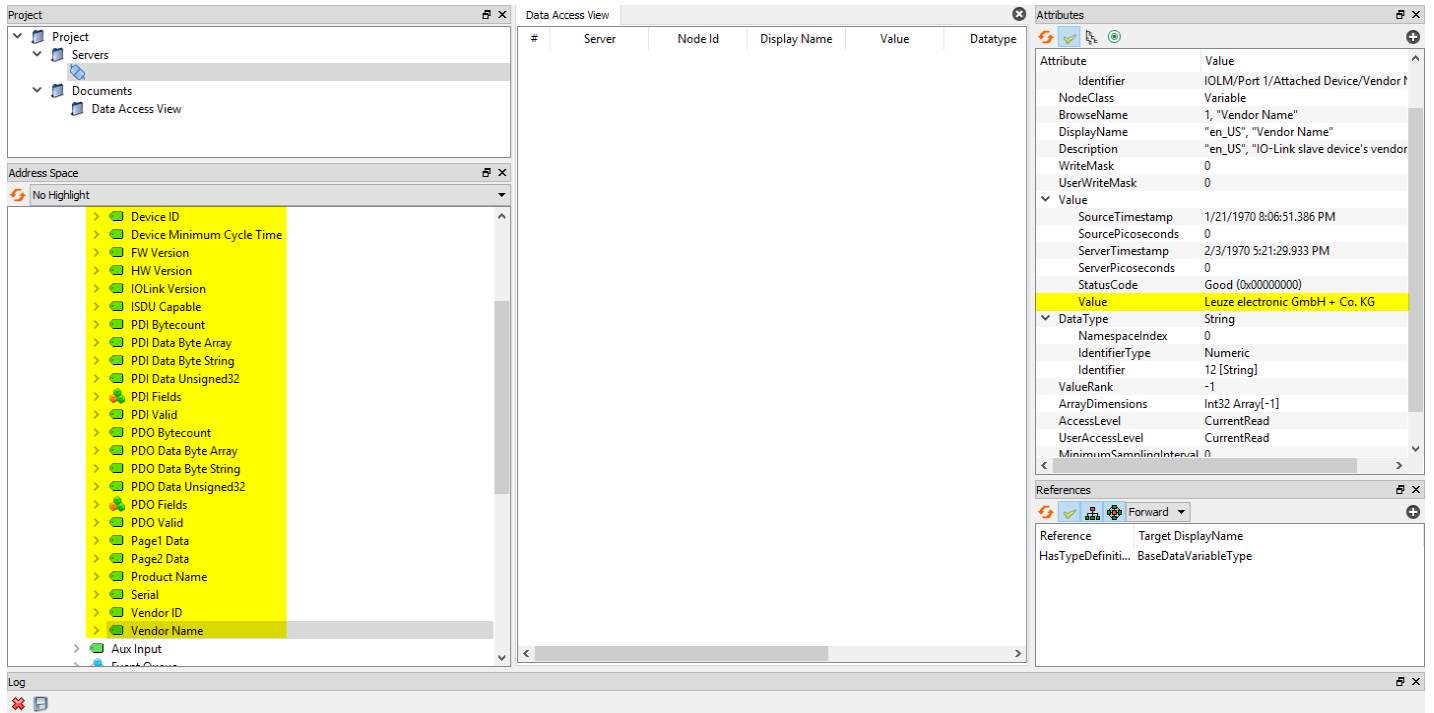
How to Read Tag Values - Practical Application

1. For the Leuze Electronic sensor, let's find out the value it is reading. Choose the tag **PDI Data Unsigned32.** The attributes will now change. Under **Values**, you can see the static value is 393. This means the sensor is measuring 393mm for our value. If nothing changed, try refreshing attributes.

2. To view the data change in real time, you'll need to use the **Data Access View** tab (middle one). This will give you live data while testing your sensor. To start using the Data Access View tab, pick the tag you want to track data for. In this case, PDI Data Unsigned32 will work - **drag** that to the Data Access View tab and it will now display it. We can see our value of 393 - 394 (mm).

3. Now, if you move the sensor, the value will start to change. In the image below, we changed it from 393 to 532 (mm) by moving the sensor.
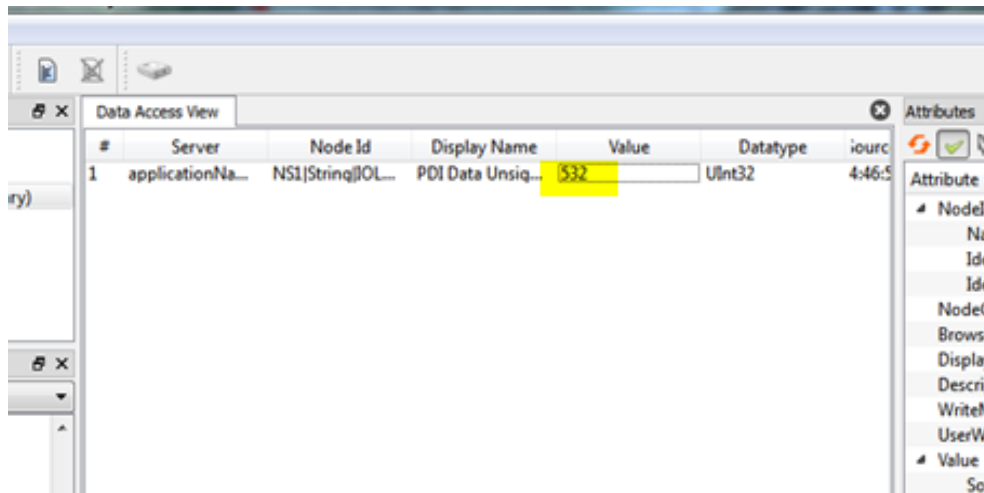
4. Lastly, if an error occurs or you don't know what's happening to your UA Client / IOLM, the **Error Logs** on the Client can help; they'll track your usage while using the OPC UA Client.

Timestamp	Source	Server	Message
7/19/2018 12:32...	Reference Plugin		Browse succeeded.
7/19/2018 12:32...	Attribute Plugin		Read attributes of node 'NS1|String|IOLM/Port 1/Attached Device/PDI Data Unsigned32' succeeded [ret = Good].
7/19/2018 12:27...	AddressSpaceM...		Browse succeeded.
7/19/2018 12:23...	Reference Plugin		Browse succeeded.
7/19/2018 12:23...	Attribute Plugin		Read attributes of node 'NS1|String|IOLM/Port 1/Attached Device/PDI Fields' succeeded [ret = Good].
7/19/2018 12:23...	Reference Plugin		Browse succeeded.
7/19/2018 12:23...	Attribute Plugin		Read attributes of node 'NS1|String|IOLM/Port 1/Attached Device/PDI Valid' succeeded [ret = Good].
7/19/2018 12:23...	TypeCache		Reading type info of NodeId NS0|Numeric|1 succeeded
7/19/2018 12:23...	Attribute Plugin		Read attributes of node 'NS1|String|IOLM/Port 1/Attached Device/DS Capable' succeeded [ret = Good].
7/19/2018 12:23...	Reference Plugin		Browse succeeded.
7/19/2018 12:20...	TypeCache		Reading type info of NodeId NS1|String|IOLM/Port 1/Attached Device/PDI Data Unsigned32 succeeded
7/19/2018 12:20...	DA Plugin		Item [NS1|String|IOLM/Port 1/Attached Device/PDI Data Unsigned32] succeeded : RevisedSamplingInterval=250, RevisedQueueSize=1, MonitoredItemId=
7/19/2018 12:20...	DA Plugin		CreateMonitoredItems succeeded [ret = Good]
7/19/2018 12:20...	DA Plugin		Item [NS1|String|IOLM/Port 1/Attached Device/PDI Data Unsigned32]: SamplingInterval=250, QueueSize=1, DiscardOldest=1, ClientHandle=1

IO-Link Master Tags

Here is Comtrol's list of tags for our IO-Link Master; RW = Read/Write, RO = Read Only.
Tags are '*Read Only'* unless noted otherwise.

Tag Names: Attached Devices	Description
Actual Cycle Time	When the Master sends a packet and receives it. This is noted as a period rather than a frequency (ex: 5ms). The Actual Cycle Time is a negotiation between the IO-Link Master and the IO-Link sensor / actuator; this time will vary depending on the device and master. It will be the greater of either the master or device min cycle time.
DS Capable	Determines if the attached device is data storage capable; Boolean. Data Storage allows saving and loading of multiple parameters as a single object. This object can be uploaded or downloaded to facilitate sensor cloning or effortless replacement of a bad sensor.
Device ID	A numerical identifier set by the device manufacturer into the sensor hardware that cannot be changed. Useful for basic identification and criteria to allow certain automated options such as automatic data storage download.
Device Min Cycle Time	At the low level hardware IO-Link information exchange, the Device Min Cycle Time is the minimum period of time at which the device can run. It may not necessarily be used, but rather an "Actual Cycle Time" is negotiated during IOL handshake which is acceptable to both master and device.
FW Version	Displayed under IOLM properties, this is the Firmware of the attached device if displayed under "Port X/Attached device. Cannot be changed.
HW Version	Displayed under IOLM properties, this is the Hardware of the attached device if displayed under "Port X/Attached device. It cannot be changed.
IOLink Version	This is the version of the IO-Link spec that the device conforms to. Version 1.0 or 1.1 is reported.
ISDU Capable	Implementation of the Index Service Data Unit; this tag is true when the device supports ISDU's.

Tag Names: Attached Devices	Description
PDI Bytecount	Size of the input process data payload.
PDI Data Byte Array	One of several different format options to read PDI; formatted in an array.
PDI Data Byte String	One of several different format options to display PDI; String.
PDI Data Unsigned32:	One of several different format options to read PDI; simple data type of UInt32 (4 bytes).
PDI Fields	Collection of tags; only available if a valid IODD file has been loaded for that particular device. Offers "*smart automatic formatting*" of the PDI payload by parsing PDI. You may observe, for example, a raw 32 bit value sorted into a flow rate and a temperature complete with engineering units, and the tags will be automatically labeled as "*flow rate*" and "*temperature*".
PDI Valid	This tag is true when the device is sending valid PDI data. The device (sensor) determines if the data is valid.
PDO Bytecount	Size of the output process data payload.
PDO Data Byte Array (RW)	One of several different format options to read PDO; formatted in an array.
PDO Data Unsigned 32	One of several different format options to read PDO; simple data type with of UInt32 (4 bytes).
PDO Fields	Collection of tags; only available if a valid IODD file has been loaded for that particular device. Offers "*smart automatic formatting*" of the PDO payload by parsing PDO.
Page 1 Data	ISDU Index 0; Index that tells critical information on the device such as Min Cycle Time, etc.
Page 2 Data	Used for devices that are minimalistic and do not implement ISDU. Used to store parameter data (16 bytes).

Tag Names: Attached Devices	Description
Product Name	Often called "model" or "family of devices". This tag is any string of alphanumeric characters. Ex: TD2807, Q4X.
Serial	Numerical Identifier assigned by the device (sensor) manufacturer at build time; unchangeable and unique for each device built.
Vendor ID	Assigned to each vendor in the IO-Link community. The Vendor ID will appear the same for every IO-Link compatible product made by that OEM.
Vendor Name	The common name of the vendor. Ex: Comtrol-US.

| Tag Names: ISDU	Description
Data (RW)	Data as ByteString. Multiple Bytes.
Data08 (RW)	Data as one Byte.
Data16 (RW)	Data as UInt16; Two Bytes.
Data32 (RW)	Data as UInt32; Four Bytes.
Index (RW)	Index of ISDU to read/write.
Request (RW)	Set to 1 for read ISDU and 2 for write ISDU. Set to 0 to clear RW.
Status (RO)	Indicates the status of the most recently executed request. 1 = Success; 2 = Failed; 0 = cleared state.
SubIndex (RW)	SubIndex of ISDU to read/write.

| Tag Names: Port	Description
Aux Input	Status of an auxiliary input; either Boolean or Binary (single bit). Pin 2 of the IOLM port.
Event Queue	Queue of device and master events. Allows events to be read using simple data types.
Event Read	Method that allows events to be read.
ISDU Read	Method for reading ISDU data.
ISDU Write	Method for writing ISDU data.
Mode	Displays the current status of the port (ex: IO-Link, digital input, digital output, reset, idle).
Name	Name of the port. Ex: IO-Link Port 3.
PDO Lock Enable	Protocol can lock PDO, if true.
PDO Locked	Protocol has PDO locked.
SIO Input	Indicates the Boolean status of pin 4 on a port that is configured to allow simple inputs (standard digital input); this would not be valid while in IOL mode.
SIO Output	Refer to SIO Input, but for simple outputs. Not valid for a port in IOL mode.
Status	Status of the port. Ex: pre-operate, operate, init.
Uptime	Amount of time the port has been actively connected to an IO-Link device.

Additional Tips for UaExpert

Helpful tips for UaExpert.

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1. When changing sensors, viewing new data, or updating the environment / Client / Server, you can use the **Rebrowse option**. To do this, right click in the margins of the Address Space and click Rebrowse. This is similar to a refresh for your Address Space.
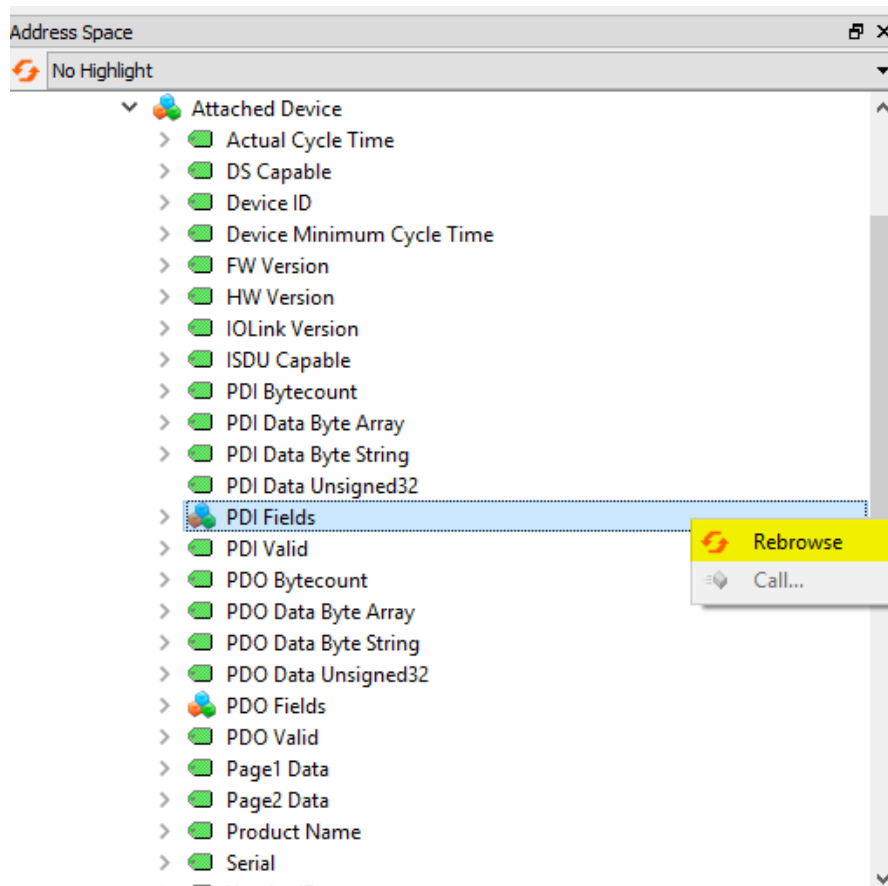
2. If you have the IODD loaded on your sensor(s), you'll be able to have more detailed information depending on your vendor. For example, under **PDI Field**, and **Measured Value** tag, you can view specific values regarding your device. You can also start using Byte Array, Byte String, etc to view your data.
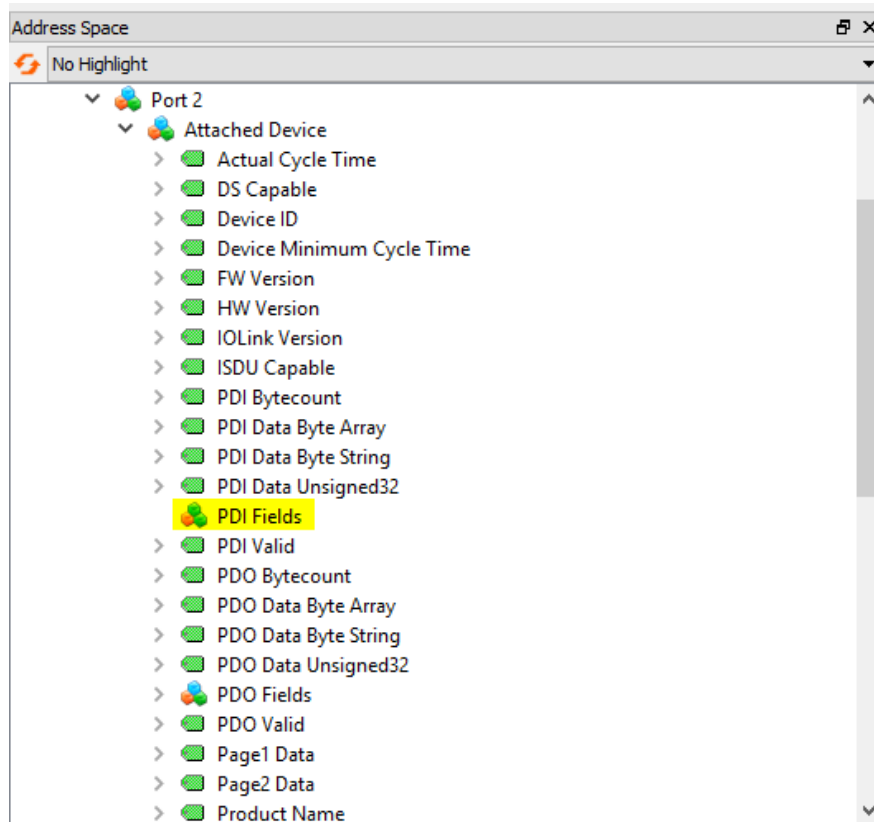
For additional information, please visit our IO-Link documentation on other field buses:
http://downloads.comtrol.com/html/IOLM_Main.htm

Website:	**Forum:**	**Phone:**
www.Comtrol.com	http://forum.comtrol.com/	(763) 957-6000

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