56eATM-OPC UA Server
Quick Start

IMPORTANT!

Downloads available at https://industrial.softing.com/us/support/downloads.html

FACTORY DEFAULTS:

Ethernet 1 = **192.168.1.250** Ethernet 2 = **DHCP**

Note: IP addresses will be scrolling on the module's 4-character display

LOGIN

Username = **admin** Password = **admin**

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If you wish to use the Knowledge Base or contact Customer Support, you can:
From within the Appliance Manager software, select the HELP icon and then ***Online Support***
or *Visit* https://industrial.softing.com/us/support/downloads.html *and select* ***Knowledgebase.***

INSTALLATION INSTRUCTIONS

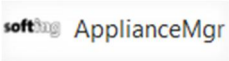
FOR USE WITH UL LISTED ALLEN BRADLEY POWER SUPPLY 1756-PA72/B OR 1756-PB72/B AND CONTROL LOGIX CHASSIS 1756-A4, -A7, -A10, -A13 OR -A17.

THIS EQUIPMENT IS AN OPEN-TYPE DEVICE AND IS MEANT TO BE INSTALLED IN AN ENCLOSURE SUITABLE FOR THE ENVIRONMENT SUCH THAT THE EQUIPMENT IS ONLY ACCESSIBLE WITH THE USE OF A TOOL.

Installing Appliance Manager (User Interface UI)

1. Download UI installation from the Softing website
2. Then, run setup.exe.

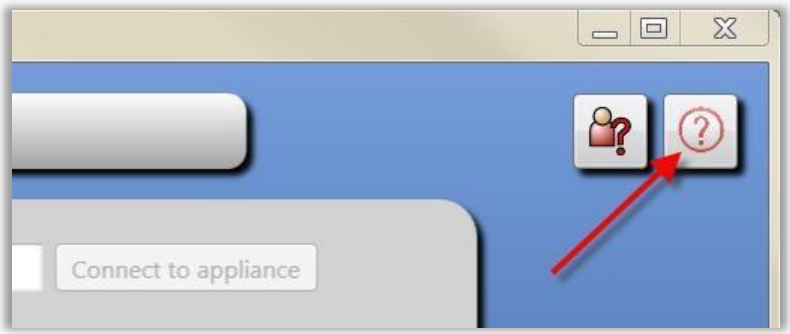
Launching Appliance Manager

- Click Start. Select Appliance Manager. 

- The UI will be using TCPIP port 443[1]

Finding Appliance Manager Help

1. In upper-right corner, click red circle question mark.



[1] Note: OPCUA module v1.x used port 4221

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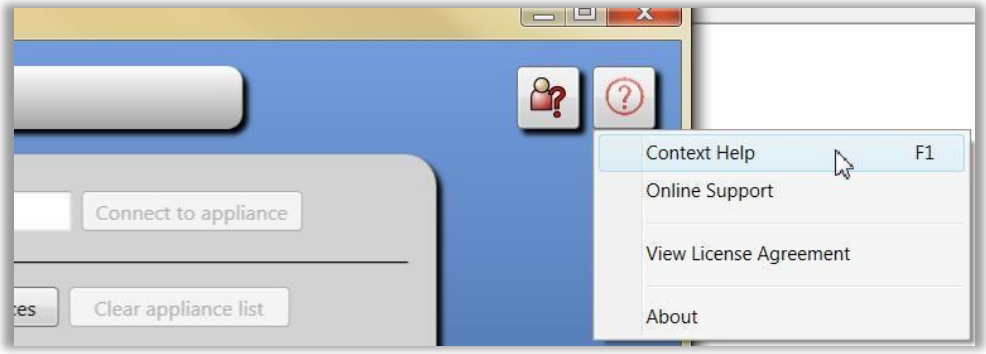
From within the Appliance Manager software, select the HELP icon and then ***Online Support***
or *Visit* https://industrial.softing.com/us/support/downloads.html *and select* ***Knowledgebase.***

2. Select Context Help or Online Support.



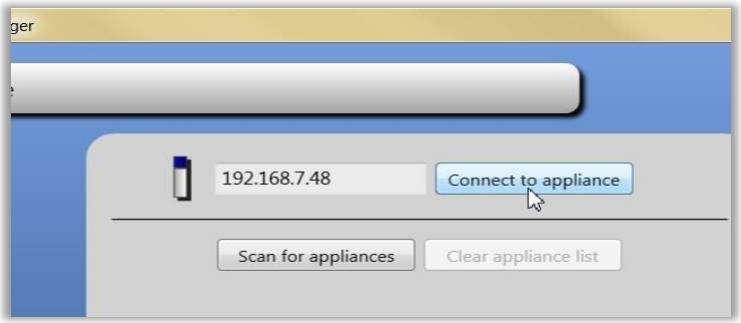
   a. Context Help may also be selected using the F1 key at any time, and as the name implies, you will be given help based on the current Appliance Manager context.
   b. If the machine on which you are running Appliance Manager has an Internet connection, Online Support will take you to https://industrial.softing.com/us/support/downloads.html . There, you may access Knowledgebase and browse other support-related pages.

3. Help that is specific to the OPC UA Server appliance may also be found as a menu item under the red circle question mark. OPC UA Help will appear in this list after your login to the module. The next section, entitled Connecting Appliance Manager to your appliance, will provide details.

Connecting Appliance Manager to your appliance

1. Physically connect the machine on which you are running Appliance Manager to the appliance using standard Ethernet cable(s) either directly or through a hub or switch.
   a. By default from the factory, Ethernet Port 1 is statically configured to 192.168.1.250 and Ethernet Port 2 uses DHCP.
   After the appliance boots, the IP address will be scrolling on the module's display.

   b. To connect, enter the IP address in the text field, and then click the Connect to appliance button. The Screen capture below uses the IP address 192.168.7.48.



If you wish to use the Knowledge Base or contact Customer Support, you can:
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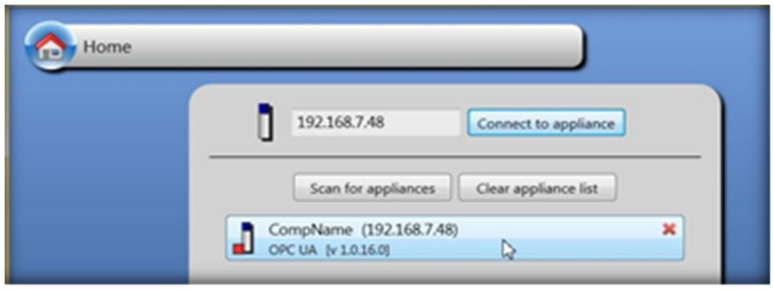
or *Visit* https://industrial.softing.com/us/support/downloads.html *and select* ***Knowledgebase.***

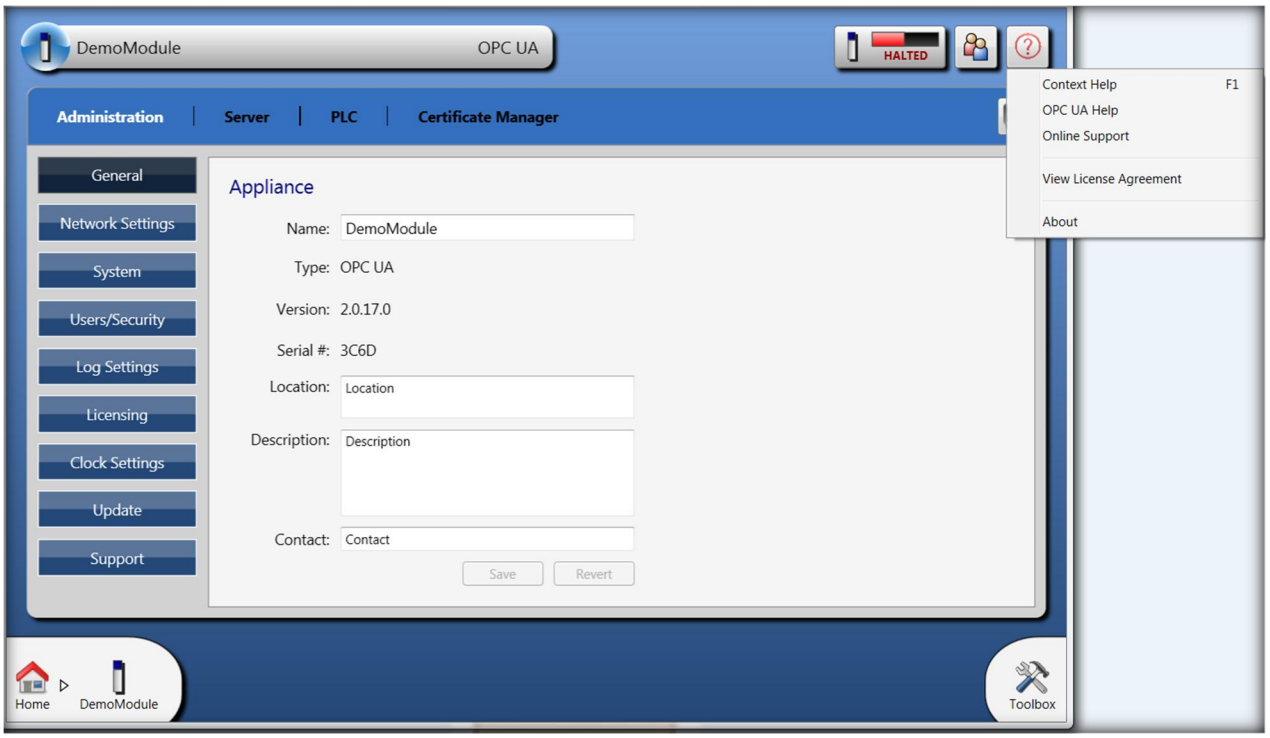
c. When Appliance Manager successfully connects to the appliance, the screen will be updated.



d. Click on the newly connected appliance and login. The default login is

Username: **admin**
Password: **admin**

2. After you have logged in successfully, the General tab of the Administration page will be displayed. Now, you can access OPC UA Help using the red circle question mark.



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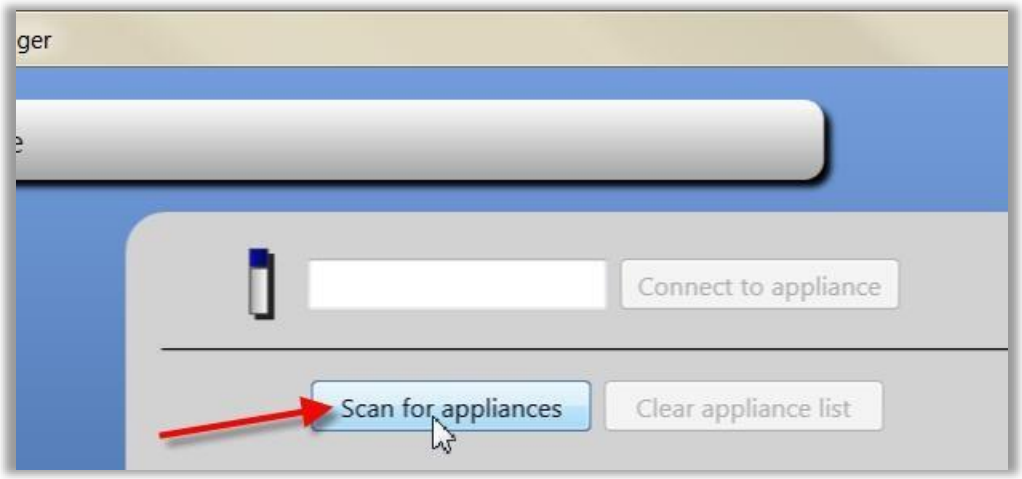
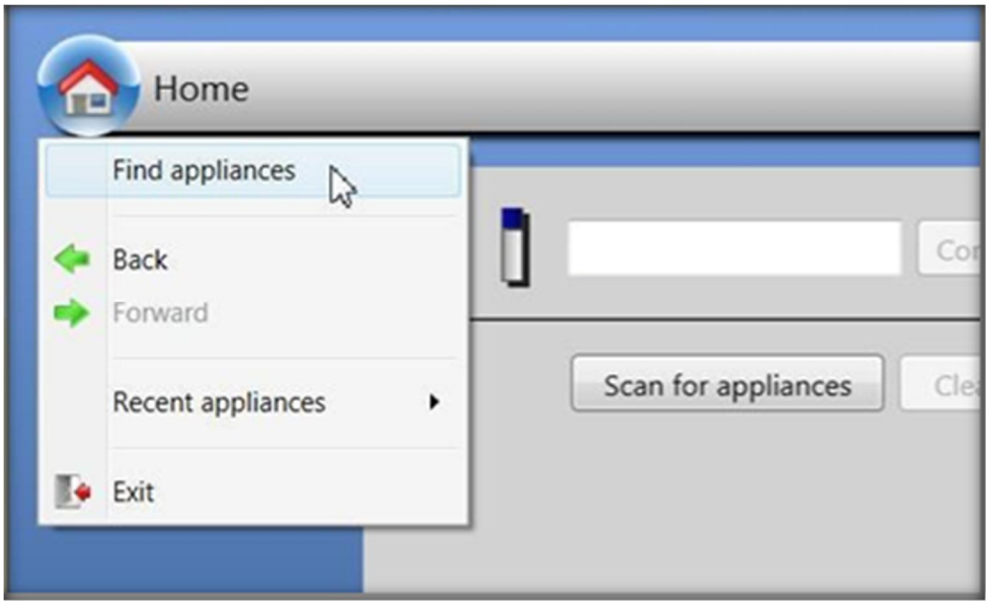
or *Visit* https://industrial.softing.com/us/support/downloads.html *and select* ***Knowledgebase.***

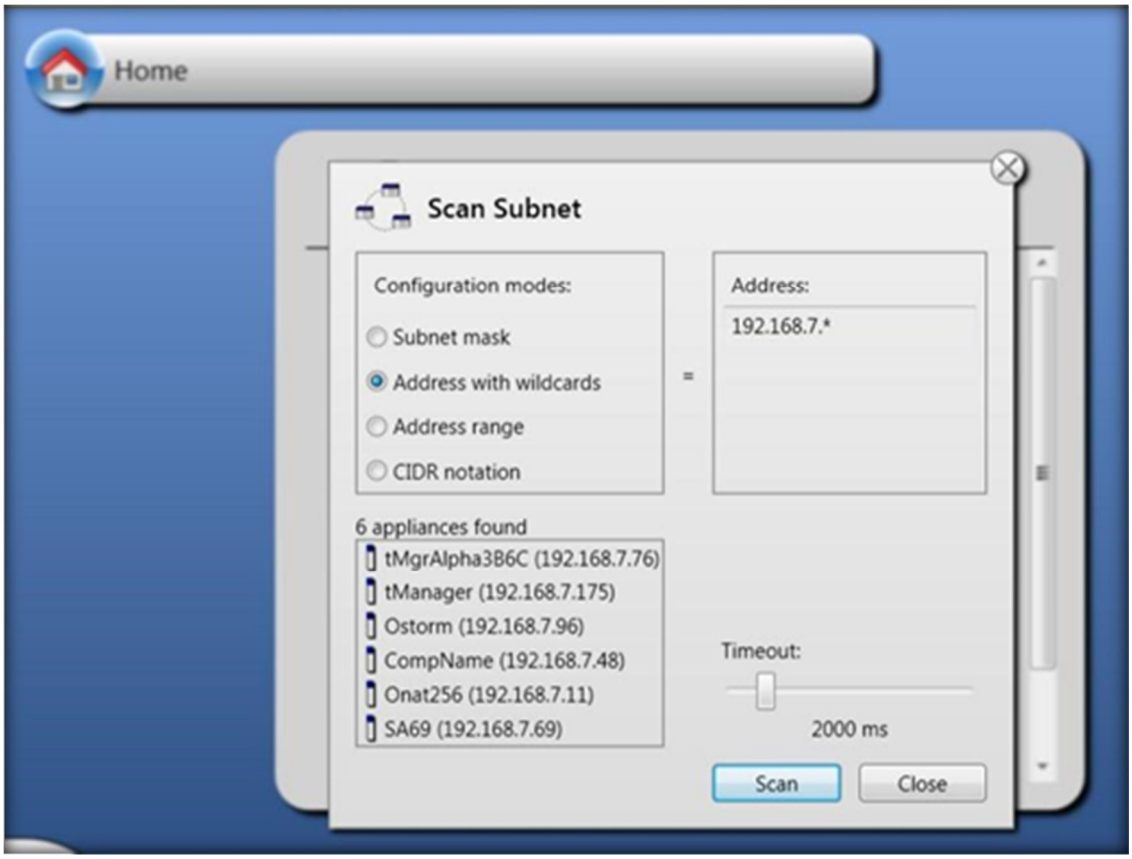
3. As an alternative, if you do not know the appliance's IP address, you can find your appliance by clicking either the Scan for appliances button or the Home icon in the upper-left corner and selecting Find appliances.



--- OR ---



a. Either of these selections will bring up the Scan Subnet dialog. Select a Configuration mode, fill-in the right-hand side accordingly, and then click Scan.



b. Use Context Help to get more details related to the Scan Subnet dialog.

Configuration Ethernet ports (IP address)

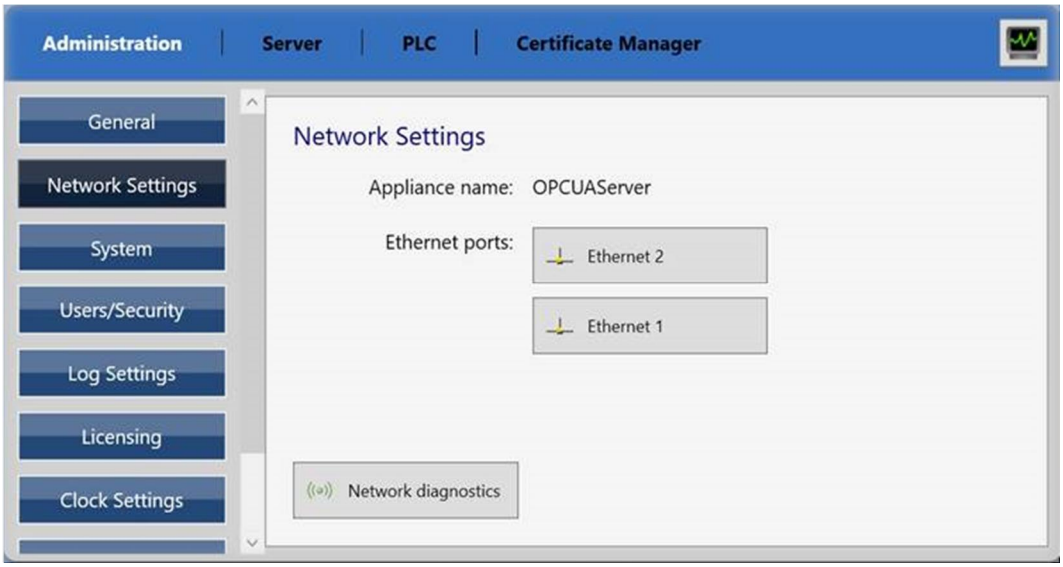
IMPORTANT: Never configure both ports to use DHCP at the same time.

IMPORTANT: Never configure both ports to use the same subnet.

1. To change the appliance network settings.

   a. Select the Administration page, then the Network Settings tab on the left side of the window.

   b. Select the Ethernet port you would like to change
      Ethernet 2 = labeled “2” on appliance’s front panel
      Ethernet 1 = labeled “1” on appliance’s front panel



   c. Make any necessary changes, and then click OK to save them.

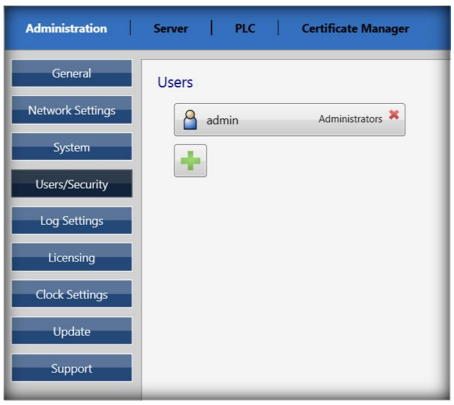
   d. You will be informed that an appliance restart is required to update the network settings, and then asked, “Do you want to continue?”

   e. If you respond with Yes, the appliance will make the change and reboot automatically. While the module is rebooting, the Appliance Manager will lose its connection to the module for a short time, it will attempt to reconnect.

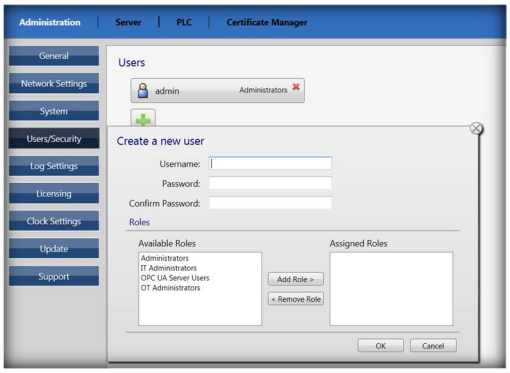
      IMPORTANT: If you change the address of the Ethernet port on which the Appliance Manager was connected, it will not be able to reconnect. You will need to exit Appliance Manager, re-launch it, and re-connect to the appliance using the newly configured IP address.

Configuration User logins

1. Select the Users/Security tab on the left side of the window.
   a. Either edit the admin user to change the password or create a new user instead.



   b. Click the green plus to add a new user.
      i. Enter Username and Password
      ii. Select one or more Available Roles
      iii. Click Add Role and save by clicking OK



Configuration OPC UA Client Authentication

1. On the Configuration page, select Client Authentication

    a. Check the available security policies and message security modes you wish to allow. Clients using any legal combination of the checked options will be allowed to connect.

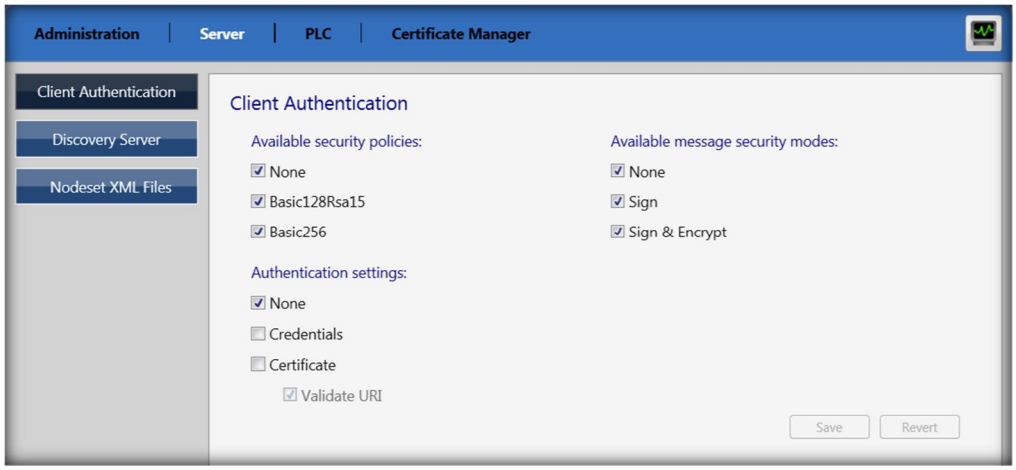
    b. Check the authentication settings you wish to use.

        i. None allows anonymous clients to connect

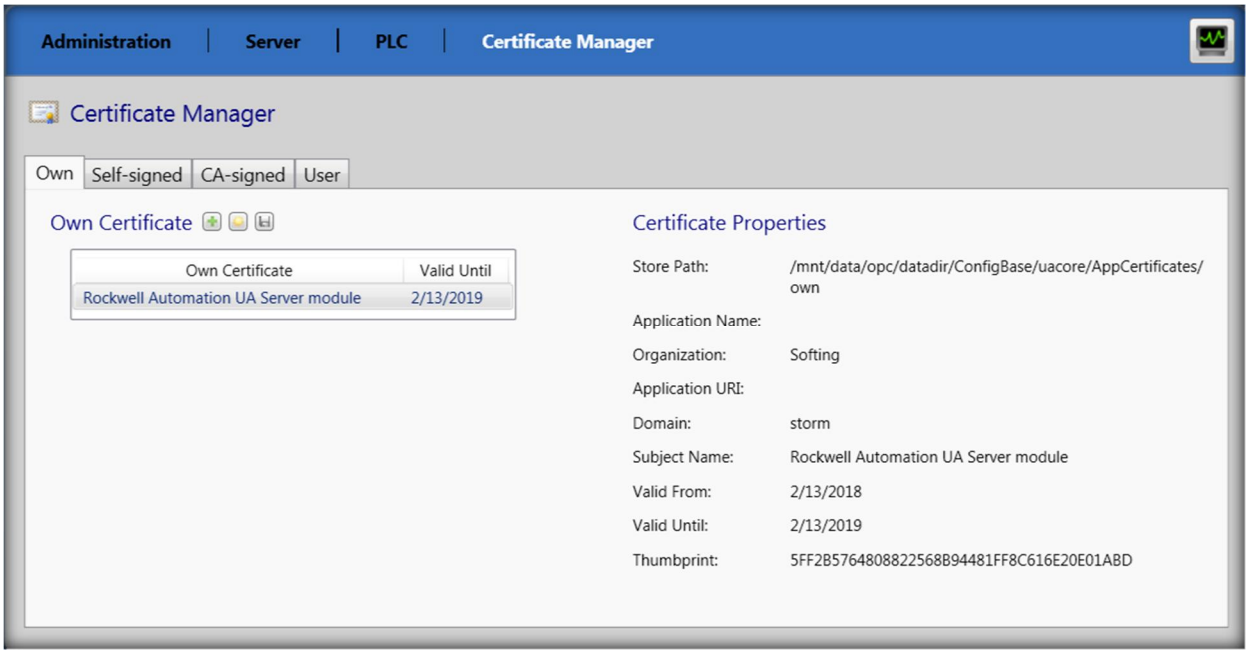
        ii. Credentials uses the accounts you have configured in the Users/Security screen to control access

        iii. Certificate will allow clients with a trusted certificate to connect. Use the Manage Certificates screen to install trusted certificates.

        iv. Validate URI causes the OPC UA Server appliance to ensure the validity of the client's application URI matches the one in the certificate.



2. The Manage certificates button provides access to the OPC UA Server's trusted client certificates store where you may add/delete client certificates or even regenerate the server certificate.



3. Click Add certificate in order to add a client certificate. Navigate to the client certificate, select it, click Open, and lastly click Save. Here are the locations where you might find two OPC UA client applications.

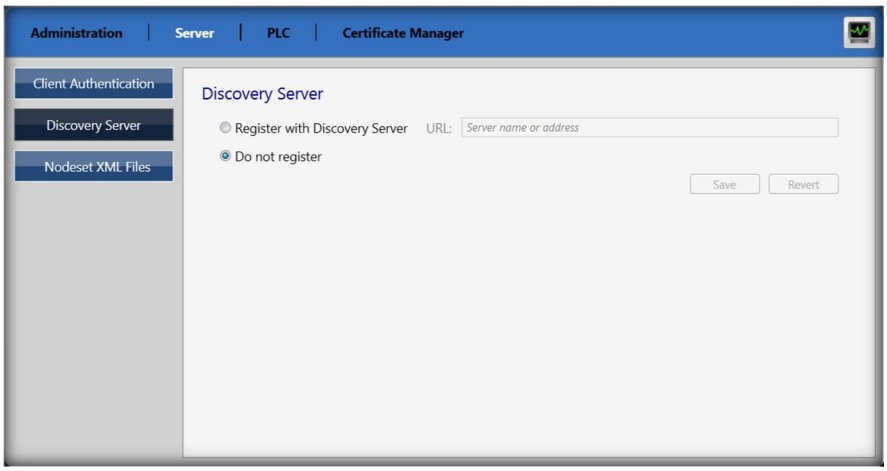
    a. Softing OPC Client: \ProgramData\Softing\OPCClient\pki\own\certs

    b. Unified Automation UaExpert: <user-appdatapath>\AppData\Roaming\unifiedautomation\uaexpert\PKI\own\certs

Configuration – Discovery Server

You will need to find and install a discovery server for this section. Suggest using OPC Foundation's Local Discovery Server (LDS). The following steps may be used to provide your OPC UA Client easy access to our OPC UA Server.

1. On the Configuration page, select Discovery Server



2. Select Register with Discovery Server

3. Enter URL. For example, opc.tcp://172.16.0.152:4840

4. Click Save

5. Restart the server, and after it boots, transition it from Halted to Running. The server will attempt to register with the Discovery Server every minute or so.

6. For LDS,
    a. Go to the \ProgramData\OPC Foundation\UA\Discovery\pki\rejected folder. You may see your server certificate. If so, move it to the trusted folder, \ProgramData\OPC Foundation\UA\Discovery\pki\trusted\certs

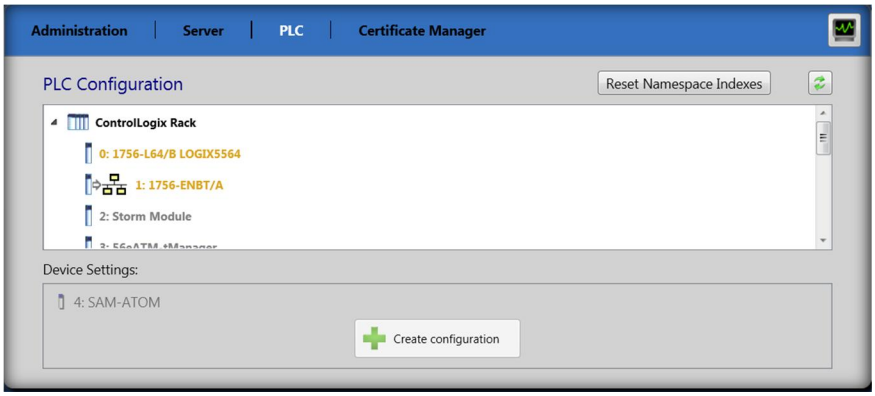
    b. Now, using Appliance Manager's Manage Certificates button, add the LDS certificate to the server's trusted certificate store. The LDS certificate, ualdscert.der, may be found at \ProgramData\OPC Foundation\UA\Discovery\pki\own.

7. Restart the server and the LDS. The server should now be register with the LDS.

Configuration – PLC Configuration

1. Select PLC Configuration Settings
    a. On the Configuration page, select PLC Configuration tab.

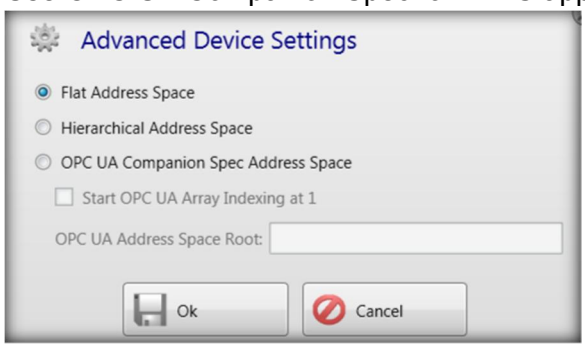
    b. After a few seconds, the contents of the local rack should be displayed.



    c. Select the PLC from which you wish to read tags, click the Create configuration button
        i. Assign the PLC a name (e.g., Logix1)

        ii. Select from the Advance options
            a. Use either Flat or Hierachical for OPCUA
                i. Flat supports mapping at the individual tag level[1]
                ii. Hierachical at the UDT/Array level[2]

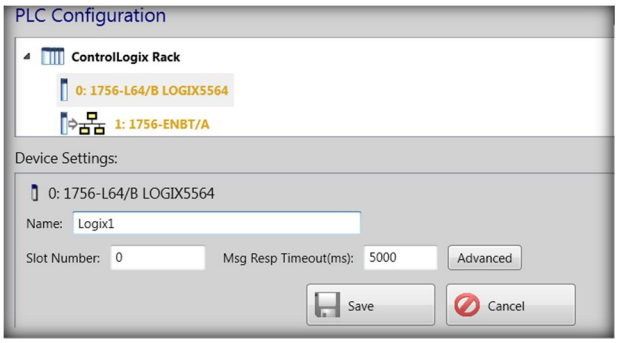
            b. Use OPC UA Companion Spec for MDIS applications



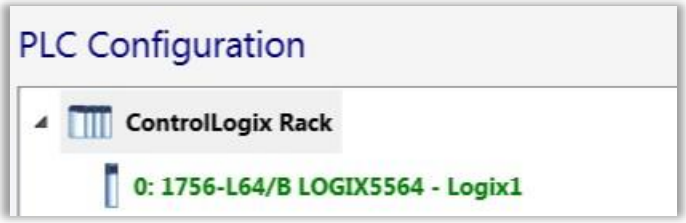
[1] When *Flat Address Space* is selected, the OPC UA address space is flat. Any arrays or user defined types are flattened out into individual tags. For example, an array of user defined types would have individual tags at the top level for each data item (i.e. myArray[0].myUDT.myMember). In this address space you can make individual data items visible and writable or you can make complete arrays and user defined data structures visible and writable. ***WARNING***: When making large arrays or user defined data structures visible it can significantly affect the performance of OPC browsing. The *Flat Address Space* should be selected for OPC UA clients that need to have finer resolution to control read/write access to individual elements of arrays and/or individual members of UDTs.

[2] When *Hierarchical Address Space* is selected, the OPC UA address space is hierarchical. Any arrays and user defined types are defined with hierarchy. You can only make the top-level array or user defined data structure visible and writable. This method of addressing allows large arrays and user defined data structures to be passed more efficiently. Each tag of complex data type in the device's tag list will be presented as a single entity that **CANNOT** be expanded into its component elements or members. Any or all of these tags of complex data type may be configured with one of the invisible (default) or visible/writable or visible/read-only attributes. Each tag would be configured in its entirety with the selected attribute (see examples 1 and 2).

iii. Click Save



iii. The appliance will automatically read all of the tags from the selected and named PLC, then that element in the view changes colors from brown to green indicating a successful read of all tags

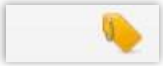


Select tags available to OPC UA Client

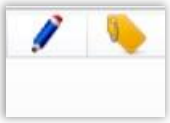
d. Click the Tag List button to view and select the tags you wish to be accessible by OPC UA clients.

i. By default, tags are invisible to OPC UA clients. ii. In the tag list, right-click tags to make them writable and/or visible

The selection of TAG WRITEABLE will result in the addition of these icons on that tag.



The selection of TAG VISIBLE will result in the addition of this icon on that tag.



If both the icons values are blank for a tag, then that tag is not visible to the OPC UA client.

2. Finally, start the appliance by clicking the Halted indicator in the upper right.

3. You should now be able to connect to the appliance via any OPC UA client.

Connecting an OPC UA Client – Manually

Below is an example showing the addition of our OPC UA Server in the Softing OPC Client.

1. Launch the client, and as it suggests, “<Double Click to add Session>”

2. In the Session Connect dialog, enter the Endpoint Information and the Authentication Settings.

   Select **REMOTE**

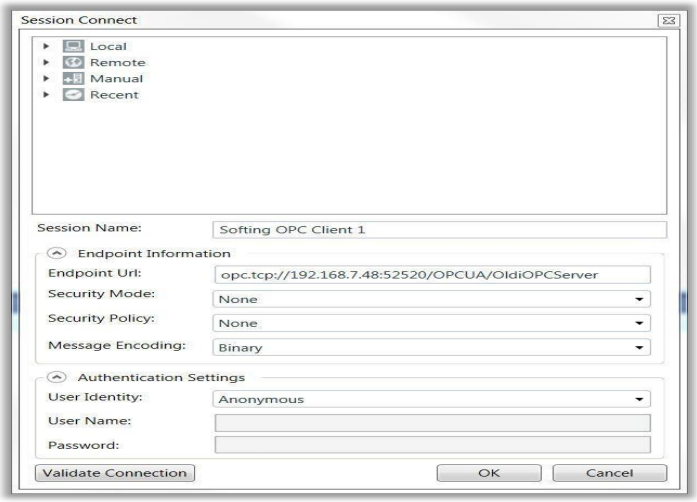
   For Endpoint Url, you would enter text that looks like this …

   for FW 2.x and greater[1] the format is
   opc.tcp://<IP Address>:4897/Softing/RockwellAutomationOPCUAServerModule

   For example, if you had changed the default static IP address of 192.168.1.250 to 192.168.7.48, you would connect using …

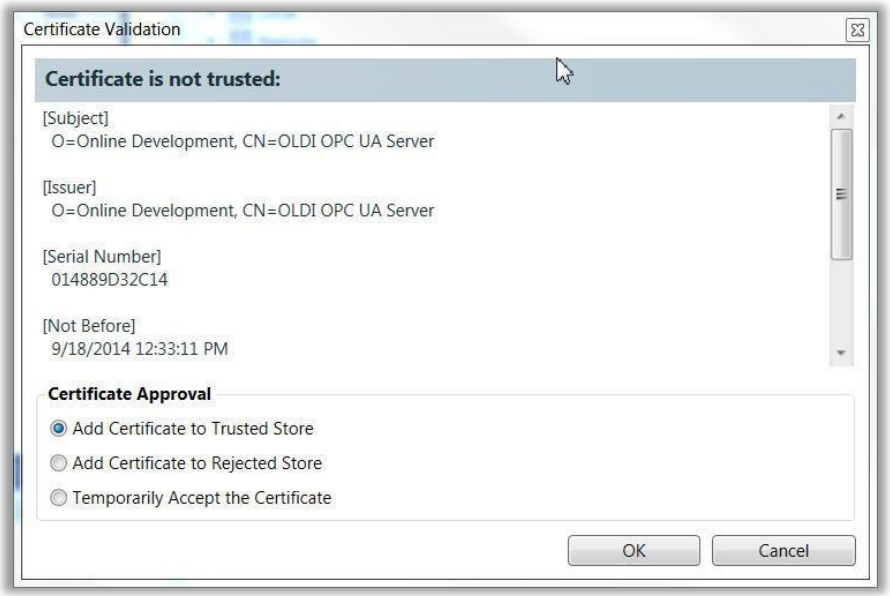
   opc.tcp://192.168.7.48:4897/Softing/RockwellAutomationOPCUAServerModule

   Since you are Getting Started, just use the default settings for Security Mode, Security Policy, and Authentication Settings. So, your Session Connect dialog might look something like this …

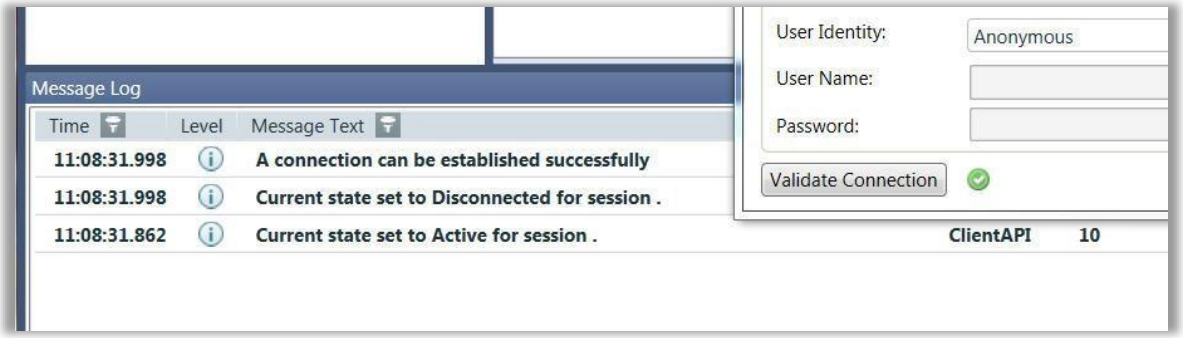


[1] **Note:** for FW 1.x the format was
opc.tcp://<IP Address>:52520/OPCUA/OldiOPCServer

Click the Validate Connection button to verify client/server communication and to approve the server certificate in the Certificate Validation dialog.

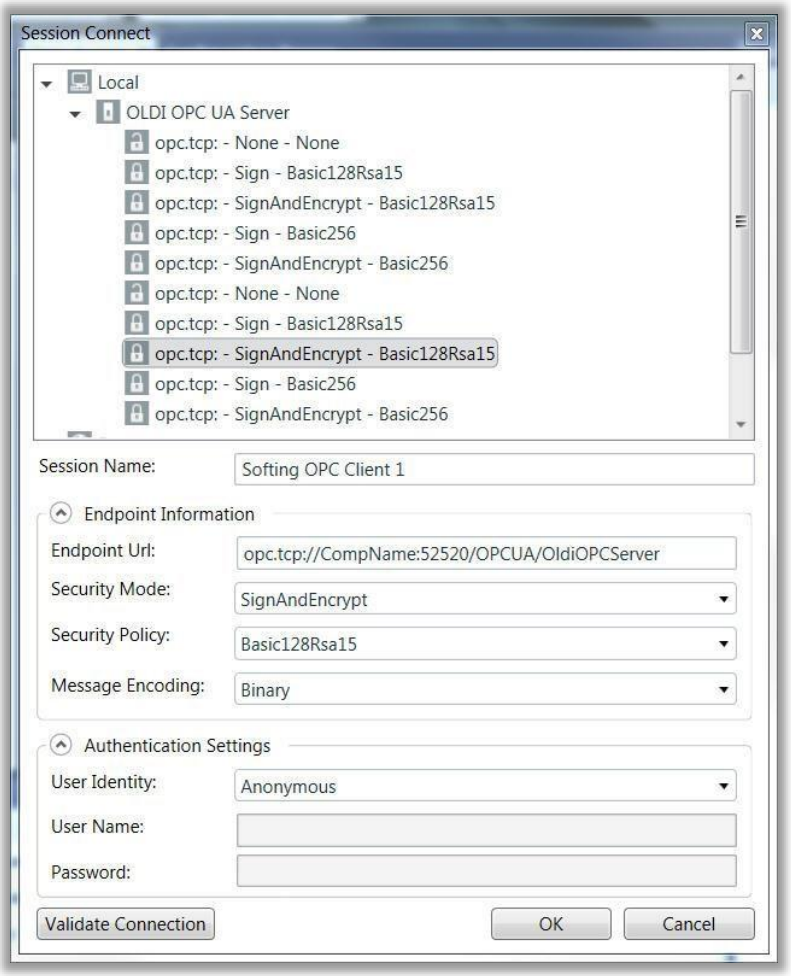


After you click OK, the client's Message log will update to show that the connection has been established.



Connecting an OPC UA Client – Using Discovery Server

If you are using a Discovery Server with our OPC UA Server, then you will want to expand the Local tree in the upper portion of the Session Connect dialog. If you have registered our server with a Discovery Server as explained earlier in this document, then it should find the SOFTING OPC UA Server along with all of the available security policies and modes.
NOTE: You may have to add your server's IP address and name to the hosts file where the OPC UA Client is running.

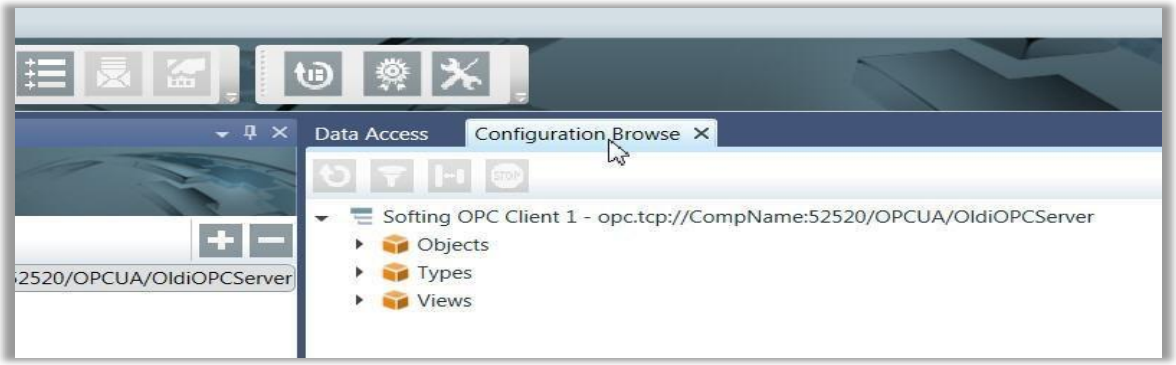


In this case, the Discovery Server has found two SOFTING OPC UA Servers. Each of these servers has registered with the Discovery Server and each of them is fully configured to support all combinations of security policies and modes. Simply select the correct server along with the appropriate security policy and mode, click OK, and then add the server certificate to the trusted store on the Certificate Validation dialog as explained earlier in this document.

The connection will appear on the left side of the Softing OPC Client application.

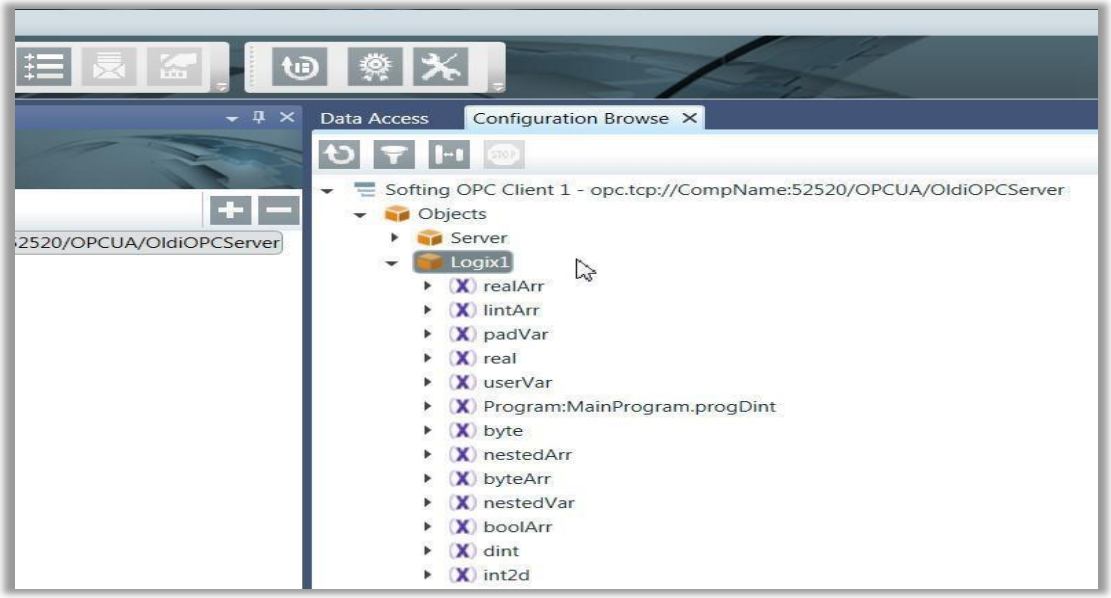
Browsing tags with OPC UA Client

After you have established a connection, you may now browse the tags you have made available in the server simply by selecting the Configuration Browse tab in the center pane of the client.



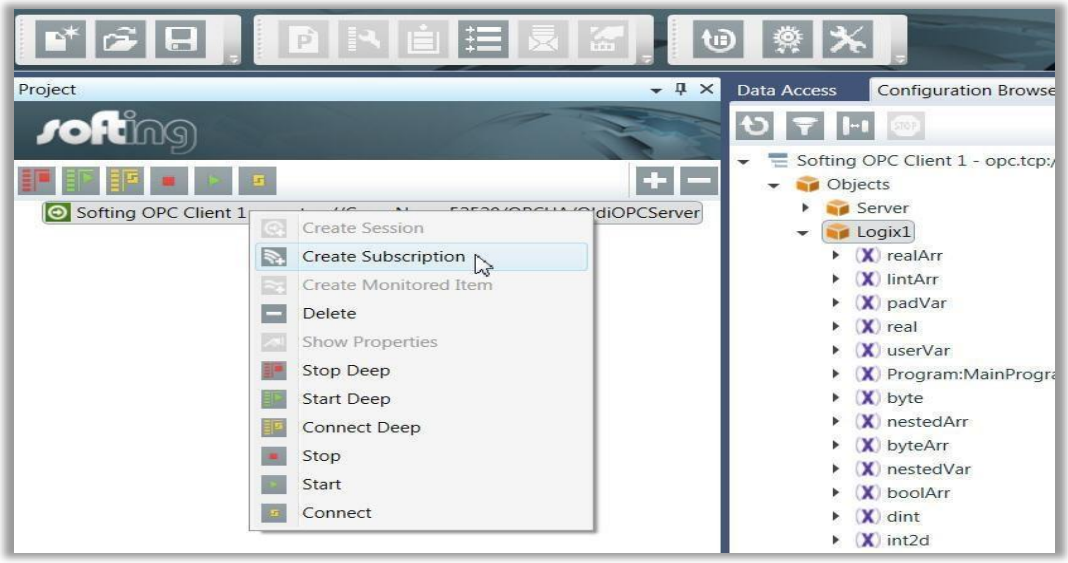
In order to browse the tags, first, expand Objects, and then expand Logix1. The tags will be displayed.

IMPORTANT: Only the tags that you selected to be visible and/or writable using the Appliance Manager configuration software will show up in this list.

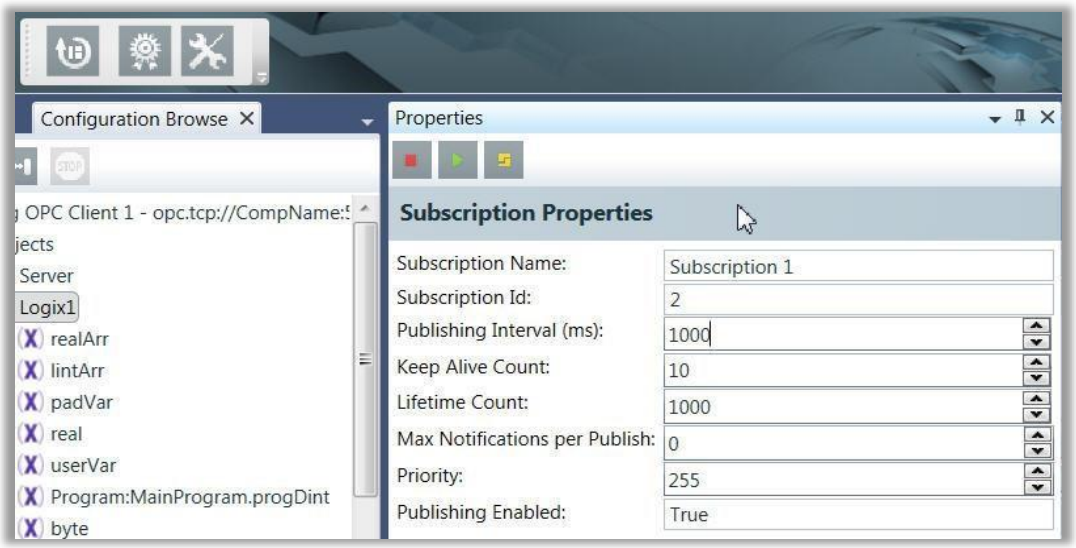


View and/or change tags in your OPC UA Client

In order to view or change the tag values, you must create one or more subscriptions and include the desired tags therein.
In the left pane, right-click on your connection and select create subscription.

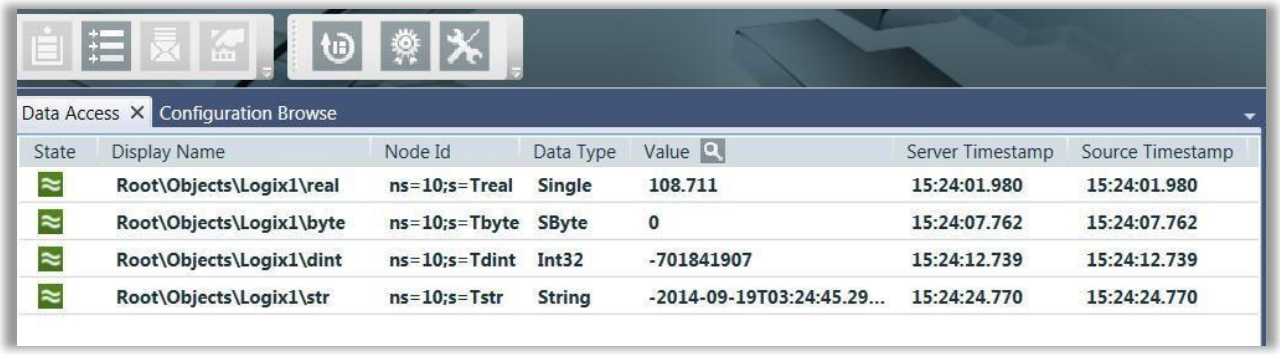


After the subscription is created, then in the right pane, you can modify the subscription properties however you desire. For example, you may need to change the Publishing Interval.



Drag and drop the tags you need to view and/or change from the center pane to the left pane.

Lastly, click on the Data Access tab in the center pane to view and/or change tag values in your Logix processor.



Appendix A

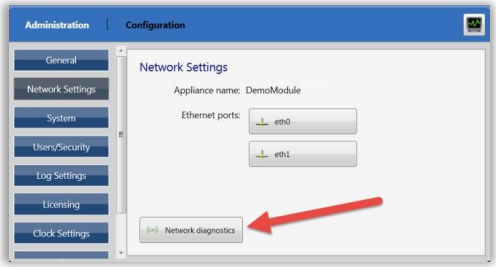
Module switches

There are 3 rotary switches on your module. They are accessed via the cutout in the lower right-side panel. These switch settings are only read by the module boot.

Description	Switch settings
Ethernet "normal" operation	**0-0-0**
Return Ethernet configuration to factory default values	**8-8-8** To reset the network settings to their factory default values, follow these steps: 1. Remove the module from the ControlLogix rack 2. Set the switches to 8-8-8. 3. Re-insert the module into the ControlLogix rack 4. After the change has been made, you will be provided instructions on the scrolling display. 5. Once the display prompts you to do so 6. Remove the module from the ControlLogix rack 7. Set the switches to 0-0-0 8. Re-insert the module into the ControlLogix rack 9. You may now connect to the module using the UI. The ports are set to the following: • Port 1 = 192.168.1.250 • Port 2 = DHCP

Network Diagnostics

If you are having network communication issues from the module to our OPC UA CLIENT, you have diagnostics available at the bottom of the NETWORK SETTING screen.



ControlLogix Profile (AOP)

The module supports the generic profile to provide the HALTED / RUNNING status back to the controller and the free-running counter which is used as an appliance heartbeat.

The configuration for the **Generic 1756 Module** profile uses the following parameters:

Comm Format: DINT
Input: 1 – 10
Output: 2 – 10
Configuration: 3 - 0

Information to controller (Inputs)

Index 0: Unused
Index 1: Module State - 0=Uninitialized, 1=Halted, 2=Running
Index 2: Free running counter
Index 3: Command trigger echo Index
4-9: Unused

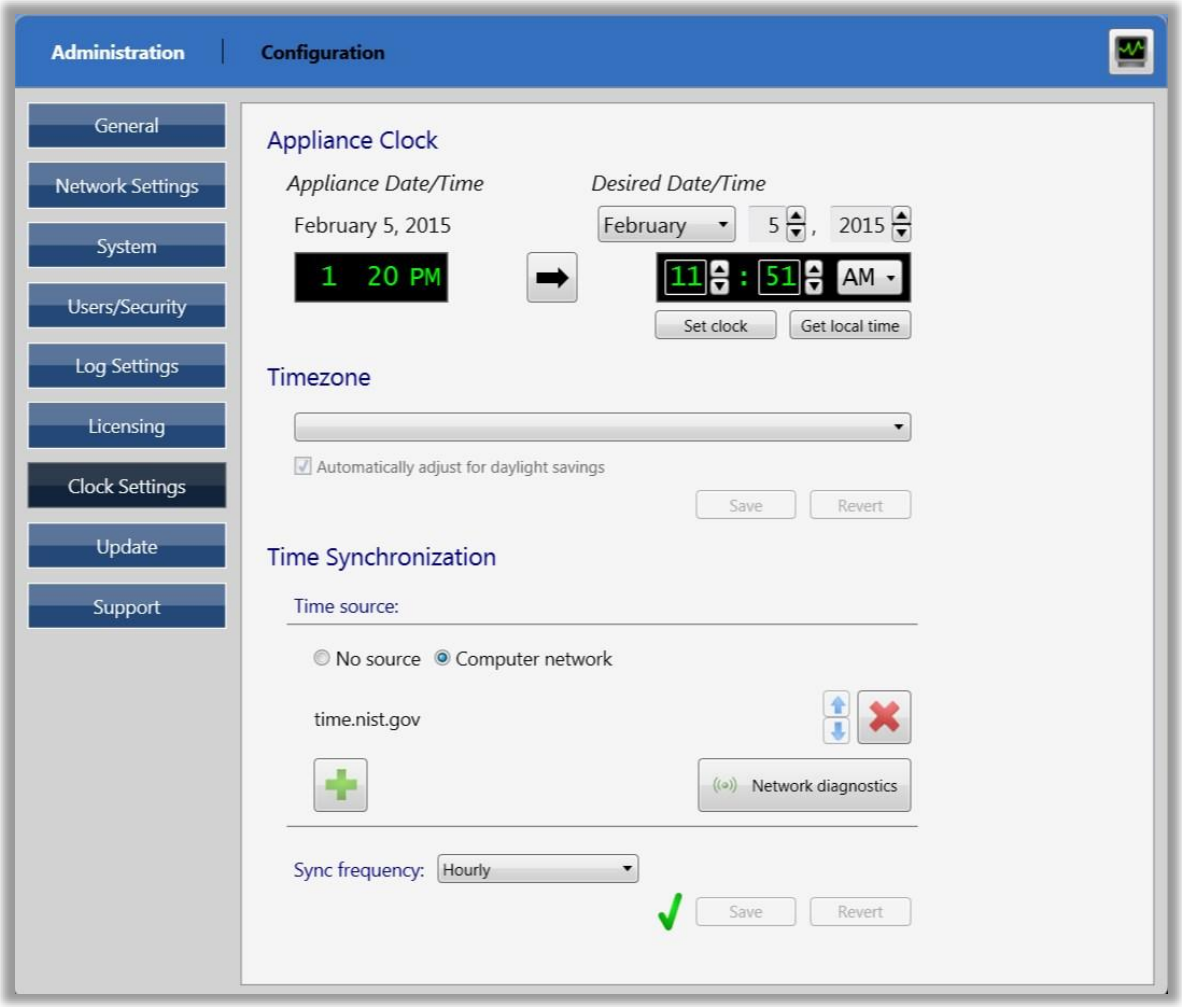
Information to OPCUA SERVER (Outputs)

Index 0: Command trigger
Index 1: Command code - 1=Stop, 2=Run, 3=Restart, 4=Shutdown, 5=Reset network settings
Index 2-9: Unused

Sending command using AOP

Step 1: Set the command code (in OutputIndex1)
Step 2: Change the trigger value (in OutputIndex0 changing to non-zero number)
Step 3: Confirmation on completion (When the command has finished executing, the trigger value is echoed in the input in InputIndex3)

Set module time and configuration of time synchronization



Set time and date

The Time may be set on this screen by either of the following two manual methods:

1. Select GET LOCAL TIME to get the time and date from your PC then select SET CLOCK
2. Select the date and time then select SET CLOCK

Time Synchronization

When defining a source for your time synchronization, you must use a Network Time Protocol (NTP) time source. Each time that synchronization occurs or errors, an INFO event will be shown in the module's SYSTEM LOG.

Example:

2015-02-05 13:17:19,215 [Timer-3] INFO - Starting time sync with time.nist.gov

2015-02-5 13:17:29,431 [Timer-3] INFO - Time sync result with time.nist.gov: 5 Feb 13:17:29 ntpdate[5689]: adjust time server 64.113.32.5 offset 0.023036 sec; timeout = 10 seconds

LED Table

The module has 2 LEDs

<table>
<tr><td>STS</td><td>
Normal operation (switches set to 0-0-0):
<table>
<tr><td>Off</td><td>1. No power to module
2. During power-up, until the boot codes are displayed 3. Module status is HALTED</td></tr>
<tr><td>Red Blinking</td><td>New entry in the SYSTEM log that has not been acknowledged.
  on UI

Solution:
Select this icon and the SYSTEM LOG will displayed. This will clear the icon and the LED will no longer be RED and blinking</td></tr>
<tr><td>Green</td><td>Module status is RUNNING</td></tr>
</table>
Network factory reset (switches set to 8-8-8):
<table>
<tr><td>Off</td><td>1. No power to module
2. During power-up, until the boot codes are displayed</td></tr>
<tr><td>Red Blinking</td><td>Signals that the module is now scrolling the instructions so you can continue the reset process</td></tr>
<tr><td>Green</td><td>N/A</td></tr>
</table>
During power-up or reboot (after the low-level boot codes are displayed), it is OFF.
</td></tr>
<tr><td>OK</td><td>
<table>
<tr><td>Off</td><td>No power to module</td></tr>
<tr><td>Red</td><td>During power-up or reboot (after the low-level boot codes are displayed), it is solid RED.</td></tr>
<tr><td>Green</td><td>Normal operations
After the OS is loaded and "Boot" is being displayed, it changes to solid GREEN and remains in that state until next reboot.</td></tr>
</table>
</td></tr>
</table>

Appendix B - Specifications

Power requirements	5.1 Vdc, 1.4 A , 7 Watts
Ambient temperature range	-25 C <= Ta <= 50 C in RA 1756 Series B chassis -25 C <= Ta <= 60 C in RA 1756 Series C chassis
Operating Temperature code	T5
PC Operating System Compatibility	User Configuration Application is compatibility with Windows 10

Appendix C

Difference between version 1.x, 2.x, and 3.x

1. 56eATM-OPC UA licenses

The v2.x module supports our standard OPC UA Server and adds our OPC UA MDIS[1] Server features. The access to these features is controlled via the module licenses.

The v3.x module supports move to new HW platform for its our standard OPC UA Server features. The access to these features is controlled via the module licenses.

2. Client "Endpoint URL changed:

This 56eATM-OPCUA FW 2.x & v3.x use a different URL than its FW 1.x.
For v2.x & v3.x format is defined as:

opc.tcp://<IP-Address-or-DNS-name-of-module>:4897/Softing/RockwellAutomationOPCUAServerModule

3. User Interface(UI) ports used:

While the Appliance Manager (UI) for v2.x & v3.x are very similar to v1.x, they are using difference TCP Port numbers.

- V1.x, UI used port 4221
- V2.x and greater, UI uses port 443

4. BACKUP file compatibility:

v1.x Module backup files cannot be used with v2.x modules

v2.x backup files can be used with v3.x modules

5. If you are running an Appliance Manager that is not 3.0.x

a. You will uninstall the Appliance Manager v1.x or 2.x
b. Then, you will install the Appliance manager 3.x. from your download.

[1] What is MDIS? To streamline the Master Control System (MCS) and Distributed Control System (DCS) communications on topside systems, a standard interface needs to be developed, including a standard communication protocol. The MCS-DCS Interface Standardization (MDIS) network has formed with involvement from key industry players in the subsea controls area, topsides specialists and oil companies. Standardization of the interface simplifies implementation of data communication links, whilst increasing the data quality. Using the network group as a collaborative resource to the industry, it is able to facilitate information exchange in furthering development of the standard MCS-DCS interface.