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Application Note

July 5, 2023

Keywords or phrases:
BioPAT® MFCS, OSIsoft®, SCADA, OPC UA, Data Historian

Connecting BioPAT® MFCS to the AVEVA™ PI System™ via OPC UA

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Abstract

Acquisition of data in data historians is commonly used to aggregate data from different sources. A typical data historian is the PI System™ from AVEVA™.

With its built-in OPC UA server, Sartorius BioPAT® MFCS offers the capability to provide data to any kind of OPC UA client that also includes the AVEVA™ PI System™.

This guide outlines the procedure on how to connect BioPAT® MFCS and the AVEVA™ PI System™ via OPC UA.

Find out more: www.sartorius.com/biopatmfcs

Introduction

BioPAT® MFCS is a Supervisory Control and Data Acquisition (SCADA) system that monitors and controls a technical process. Since version 4.8, BioPAT® MFCS has been providing a built-in OPC UA server, which offers the possibility of connecting the widest variety of OPC UA clients.

The AVEVA™ PI System™ is a suite of software products that are used for collection, analysis and visualization of data. The PI System™ provides the capability of collecting data over different types of interfaces. One possible interface is OPC UA.

OPC Unified Architecture (OPC UA) is an open standard communication protocol for industrial automation developed by the OPC Foundation. It is manufacturer independent and can be used for different kinds of data exchange (machine to machine, machine to computer and computer to computer).

One possible equipment scenario could be to have different production facilities exchange data all across the globe. Each production facility would have one or more BioPAT® MFCS systems installed, ensuring reliable automated production (Figure 1). The large amount of data generated could then be archived and centralized in the AVEVA™ PI System™ via OPC UA.

In any case, the BioPAT® MFCS can be easily integrated into existing systems without the need for any special communication protocol. The following provides step-by-step guidance on how to connect the AVEVA™ PI System™ with BioPAT® MFCS via OPC UA.

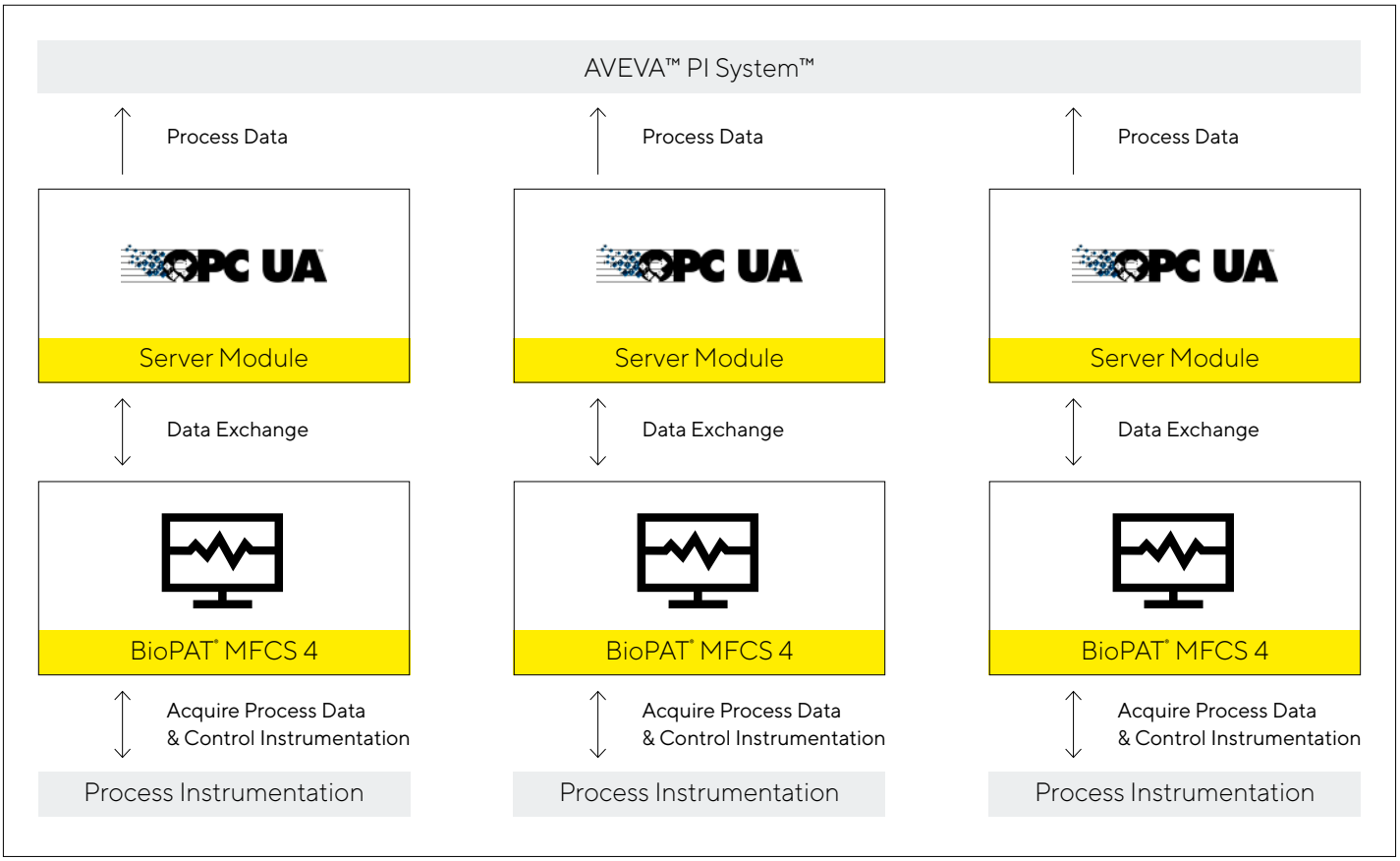

Figure 1: *Example of an AVEVA™ PI System™ Collecting Data From Various BioPAT® MFCS Systems Installed*

Prerequisites

Ensure that the BioPAT® MFCS OPC UA server is running and that PI Server 2018 SP3 (or newer) is installed (including the PI Data Archive and AF Server). Also make sure that the PI Connector Relay, PI Data Collection Manager (DCM) and the PI Connector for OPC UA are installed and that the ports used are known (Table 1).

AVEVA™ PI System™ Program	Port Used
PI Server 2018 SP3 (or newer)	–
PI Connector Relay	e.g. 5460
PI Connector for OPC UA	e.g. 5461
PI Data Collection Manager (DCM)	e.g. 5462

Table 1: *Prerequisites*

Configuring AVEVA™ PI System™

Set up a connector

Open PI Connector for OPC UA Administration in the start menu subfolder "PI System" or open it directly and use the hyperlink for the connector (Table 2).

Administration Section	Hyperlink
PI Connector for OPC UA Administration	https://<ComputerName>:<Port>/ui
	e.g., https://SartoriusServer:5461/ui
PI Data Collection Manager	https://<ComputerName>:<Port>/ui
	e.g., https://SartoriusServer:5462/ui

Table 2: *Administration Sections Overview*

Login with your user name and password of your domain account (e.g., "SARTORIUS\User"; the user must belong to the PI Connector Administrators group).

Click on Set Up Connector (Figure 2).

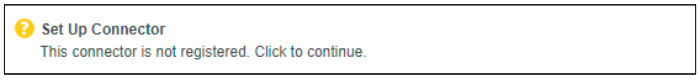

Figure 2: *PI Connector for OPC UA Administration, Set Up Connector Button*

Enter the address and port of the PI Data Collection Manager (Table 1) as the Registration Server Address, then click Request Registration and start the connector by clicking on Start Connector (Figure 3).

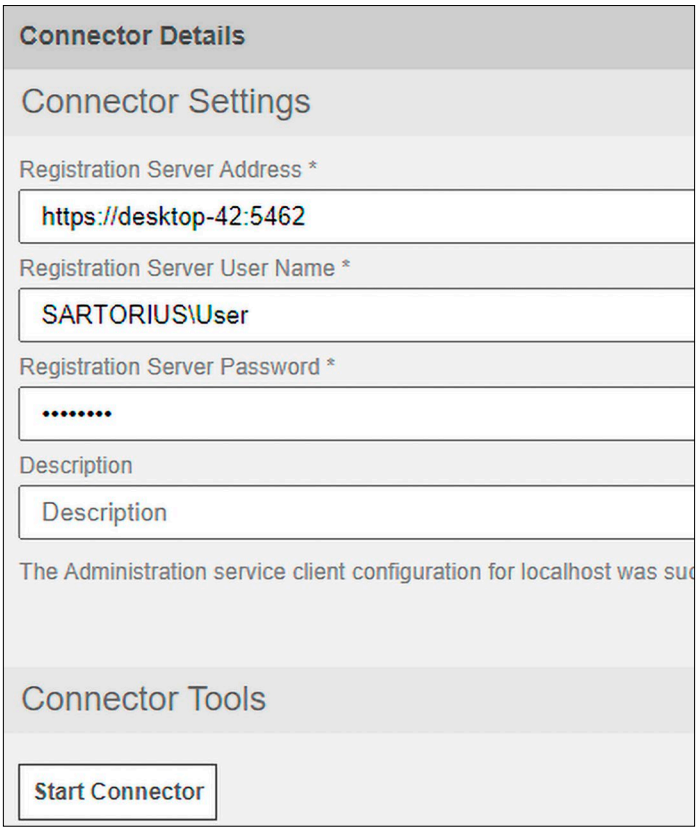

Figure 3: *PI Connector for OPC UA Administration; Connector Settings*

Open the PI Data Collection Manager (Table 2). Click on Untitled Connector 1 in the Connectors column to approve your registration. Type in a name, such as OPC UA Connector, and then click on Approve This Registration and Configure (Figure 4).

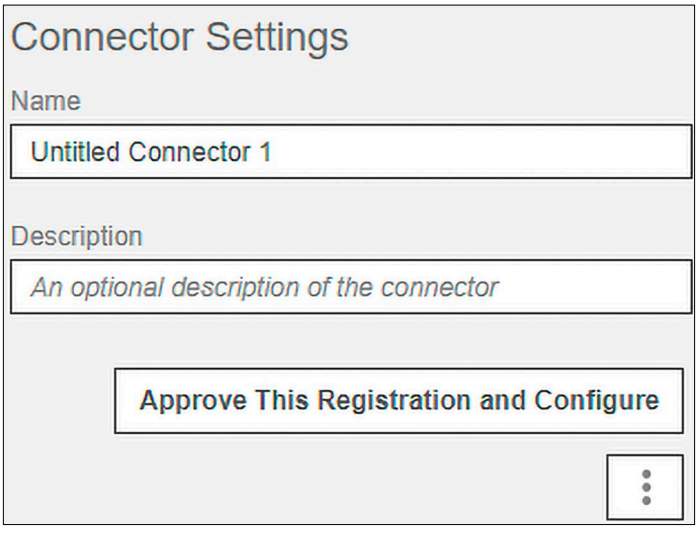

Figure 4: *PI Data Collection Manager; Connector Settings*

Set up a relay

Open the PI Data Collection Manager (Table 2). Login with your credentials (the same rules apply here as in Set up a connector). Ensure that the window is maximized so that the middle block with the four columns is visible. Click on the plus-sign button in the Relays column header to add a new relay. Enter the port of the installed PI Connector Relay (Figure 5).

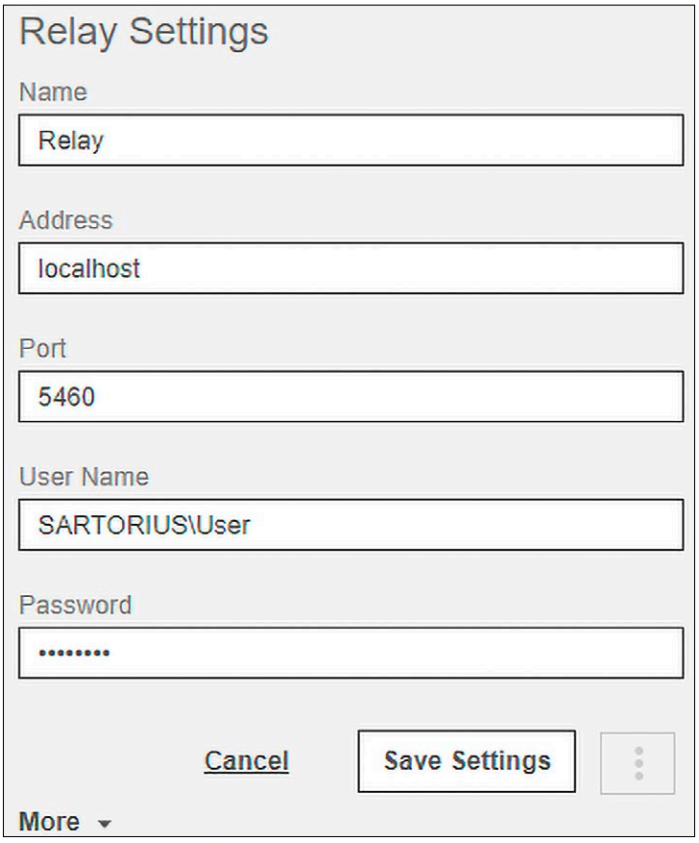

Figure 5: *Relay Settings Dialog*

Set up a destination

Open the PI Data Collection Manager (Table 2). Click on the plus button in the Destinations column header to add a data archive. Type in the address of the Data Archive and the AF Server and click on Save Settings (Figure 6).

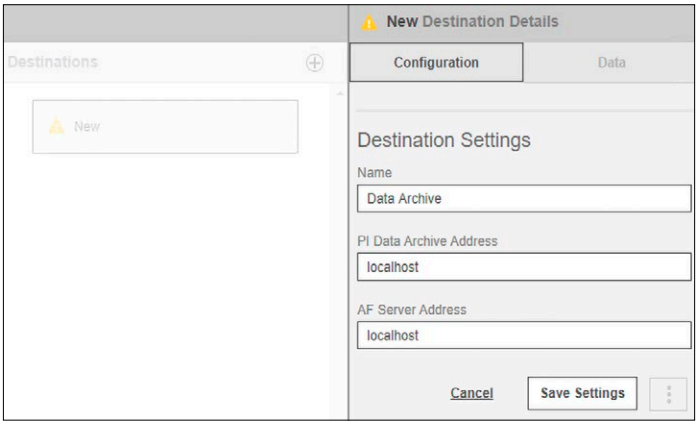

Figure 6: *Destination Settings Dialog Box*

Ensure that BioPAT® MFCS is running with variable type set to "DataItem"

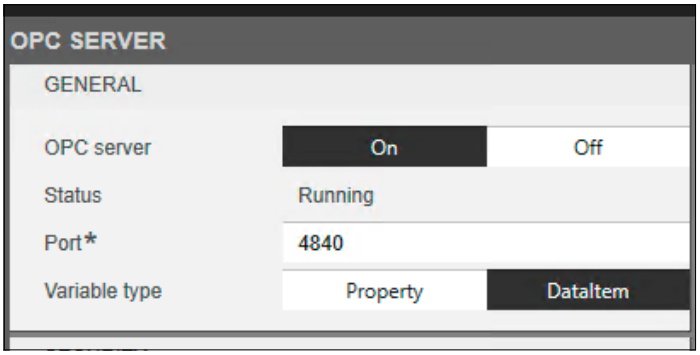

Figure 7: *Select the Variable Type in BioPAT® MFCS*

Connect BioPAT® MFCS

Select the newly created OPC UA connector in the Connectors column. In the right-hand side menu, navigate to the Data tab and click on Add Data Source (Figure 8).

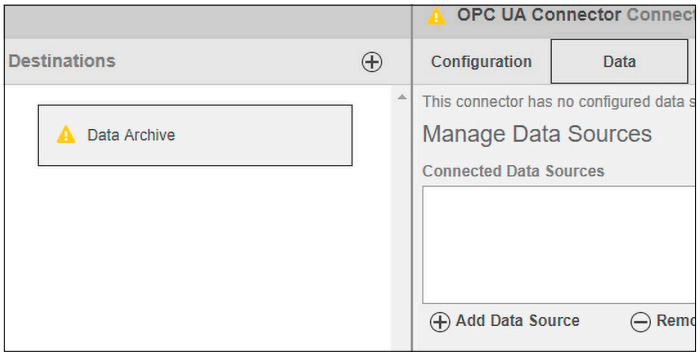

Figure 8: *Add a Data Source for the OPC UA Connector*

Enter the endpoint URL and, if defined, the credentials of the BioPAT® MFCS OPC UA server (Table 3). The port can be looked up in the BioPAT® MFCS Client; also ensure that the OPC UA server is running.

BioPAT® MFCS OPC UA server endpoint URL
opc.tcp://<ComputerName>:<Port>/BioPAT_MFCS
Example: opc.tcp://SartoriusServer:4840/BioPAT_MFCS

Table 3: *BioPAT® MFCS OPC UA Server Endpoint URL*

Under Additional Settings select:

Incoming Timestamp: Server
Enable Property Subscription: active
Override Reconnection Logic: active

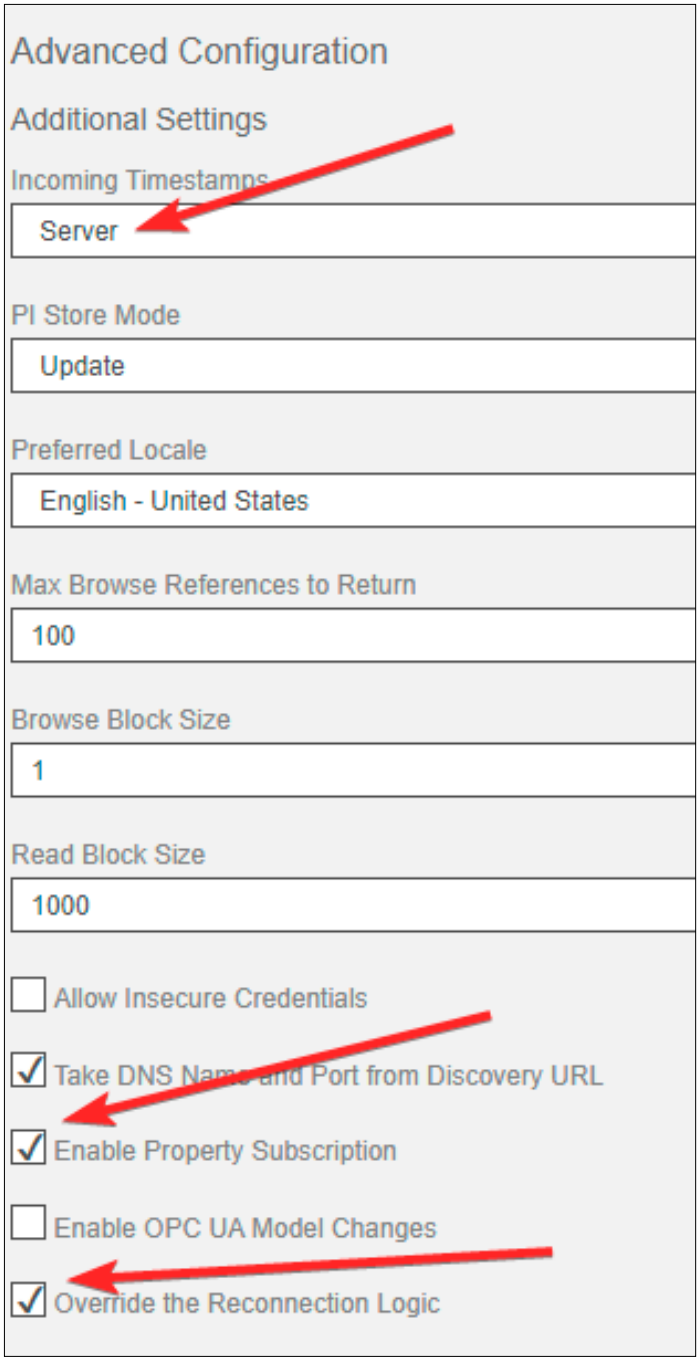

Figure 9: *Configure the Data Source in OSI PI*

Certificates

To establish a connection between AVEVA™ PI System™ and BioPAT® MFCS, it is necessary that they trust each other's certificate.

Step 1
First determine whether the BioPAT® MFCS certificate got rejected by checking if the **AVEVA™ PI System™ rejected folder** (Table 4) includes a certificate named similarly to BioPAT_MFCS_OpcServer.

Location	Path
AVEVA™ PI System™ own folder	%PIHOME64%Connectors\OPCUA\ pkiclient\own\certs
AVEVA™ PI System™ rejected folder	%PIHOME64%Connectors\OPCUA\ pkiclient\rejected\certs
AVEVA™ PI System™ trusted folder	%PIHOME64%Connectors\OPCUA\ pkiclient\trusted\certs
BioPAT® MFCS own folder	%ProgramData%\Sartorius\BioPAT_MFCS\ Services\OpcUa\Server\pki\own\certs
BioPAT® MFCS trusted folder	%ProgramData%\Sartorius\BioPAT_MFCS\ Services\OpcUa\Server\pki\trusted\certs

Table 4: *Certificate Paths*

If that is the case, then cut it out and paste it in the **AVEVA™ PI System™ trusted folder** (Table 4); then continue with Step 3.

Step 2
If the rejected folder is empty, go to the **BioPAT® MFCS own folder** (Table 4) and copy the certificate, named similarly to BioPAT_MFCS_OpcServer, into the **AVEVA™ PI System™ trusted folder** (Table 4).

Step 3
Go to the **AVEVA™ PI System™ own folder** (Table 4) and copy the certificate named similarly to OPCUA.ConnectorHost into the **BioPAT® MFCS trusted folder** (Table 4).

Connect All Components

Open the PI Data Collection Manager (Table 2). Click on a component in one of the four columns, e.g., Relay, to establish a connection to the other components by checking the checkboxes (Figure 10).

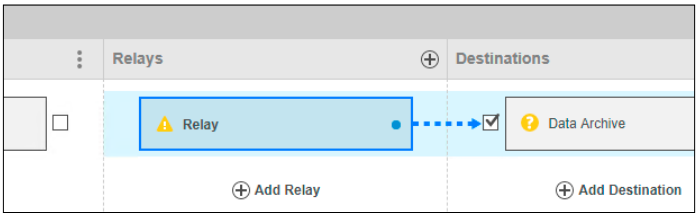

Figure 10: *Connect a Relay to a Data Archive*

Verify whether the relay and the connector are running by checking the Configuration tab on the right-hand side (Figure 11); otherwise, click on Start Relay or Start Connector.

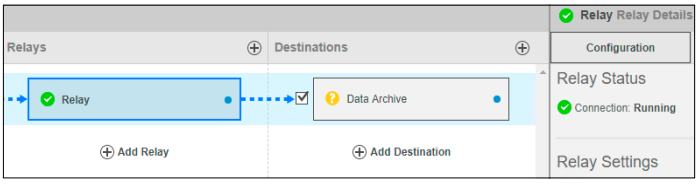

Figure 11: *Check the Connection Status*

Check if a destination path is defined (Figure 12).

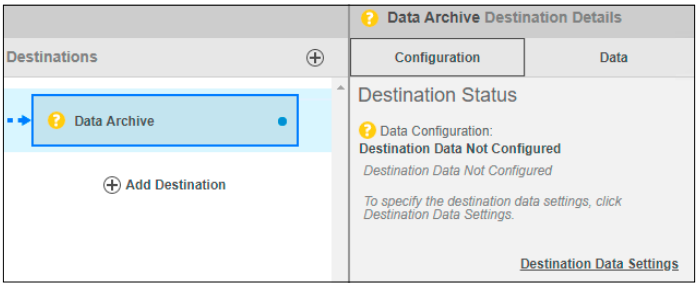

Figure 12: *Check the Data Configuration in the Destination Details*

If no destination path is defined, configure it by selecting a desired database (Figure 13).

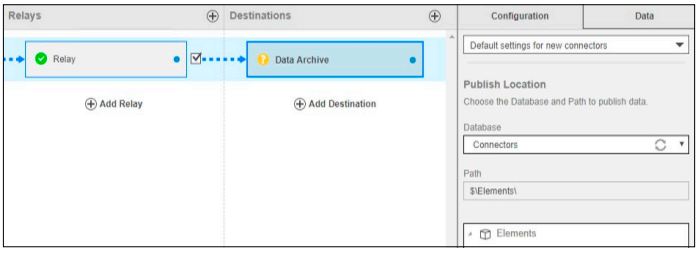

Figure 13: *Define Destination Path*

Add data

Select the Data Source that points to BioPAT® MFCS in the Data Source column, go to the Data tab and click on Discover Data Source Contents (Figure 14). This step must be repeated each time when changes are made to BioPAT® MFCS regarding the address space, such as by adding or deleting Control Modules.

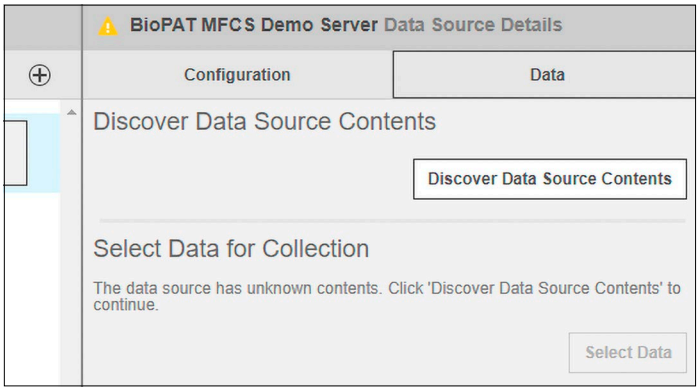

Figure 14: *Discover Data Source Contents*

Select the OPC UA connector in the Connectors column: go to the Data tab and click on Select Data (Figure 15).

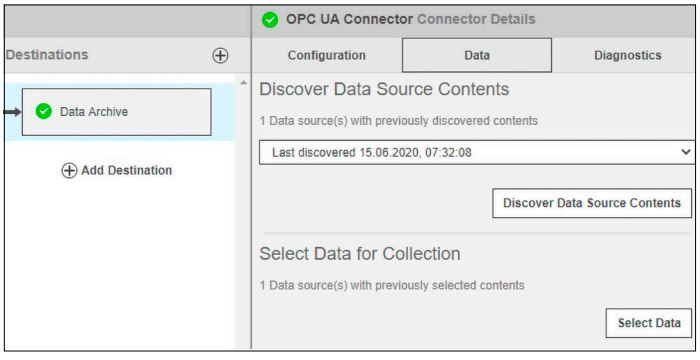

Figure 15: *Access the Select Data dialog box via the Connector Details*

Select every node of interest (Figure 16) and click on Next.

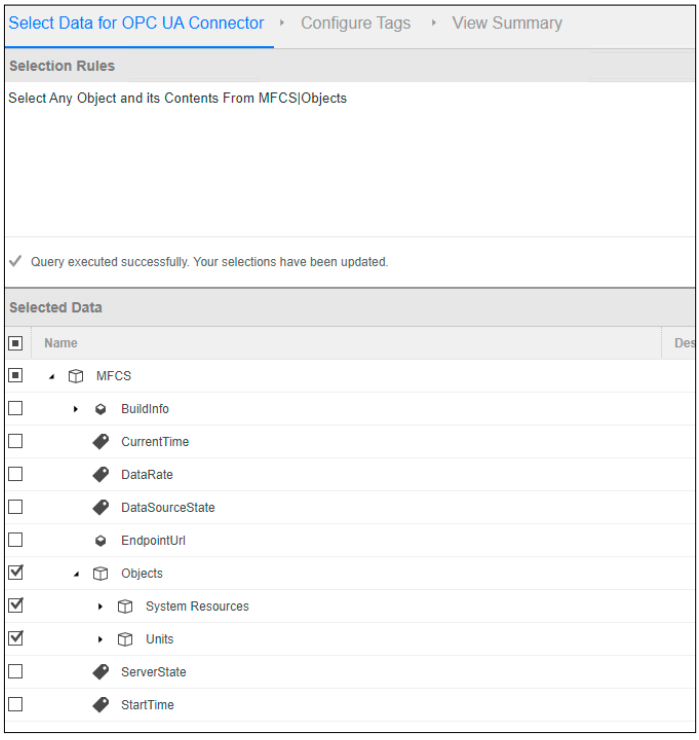

Figure 16: *Select the Data Dialog Box*

On the View Summary page, it is important to select "Use these selections as rules to automatically update destinations" (Figure 17) to ensure that the PI Point reference is not lost.

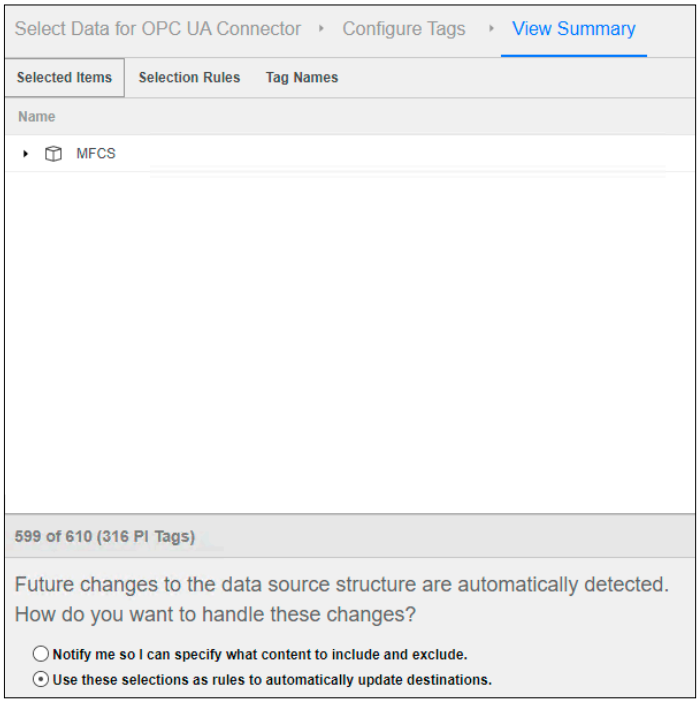

Figure 17: *Handle Changes by Automatically Updating Destinations*

Now as all components are marked green (Figure 18) – which might take some time for every component to refresh – click on Save Configuration (Figure 19).

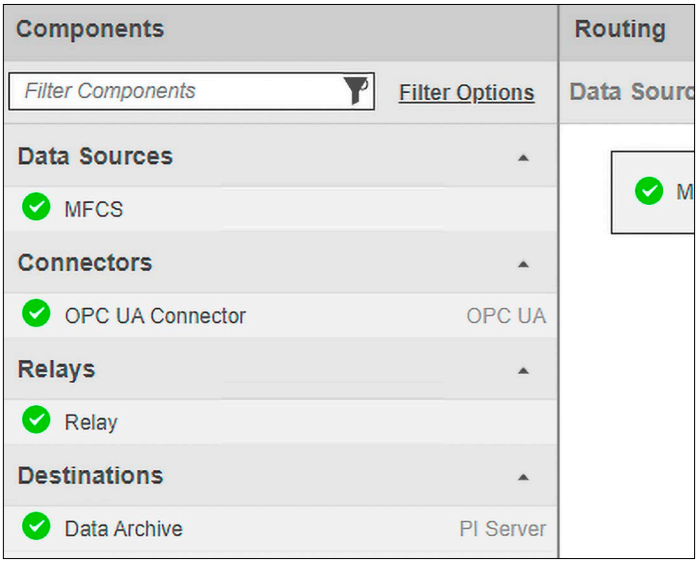

Figure 18: *Connection Established for All Components*

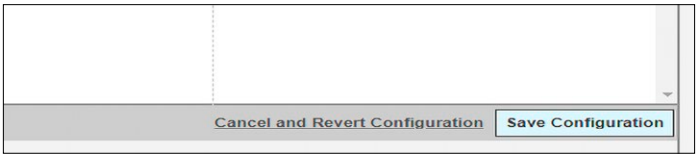

Figure 19: *Save Configuration Button*

Compare the values inside the PI System Explorer (Figure 20) to the values inside the BioPAT® MFCS Client to ensure that all values are received properly.

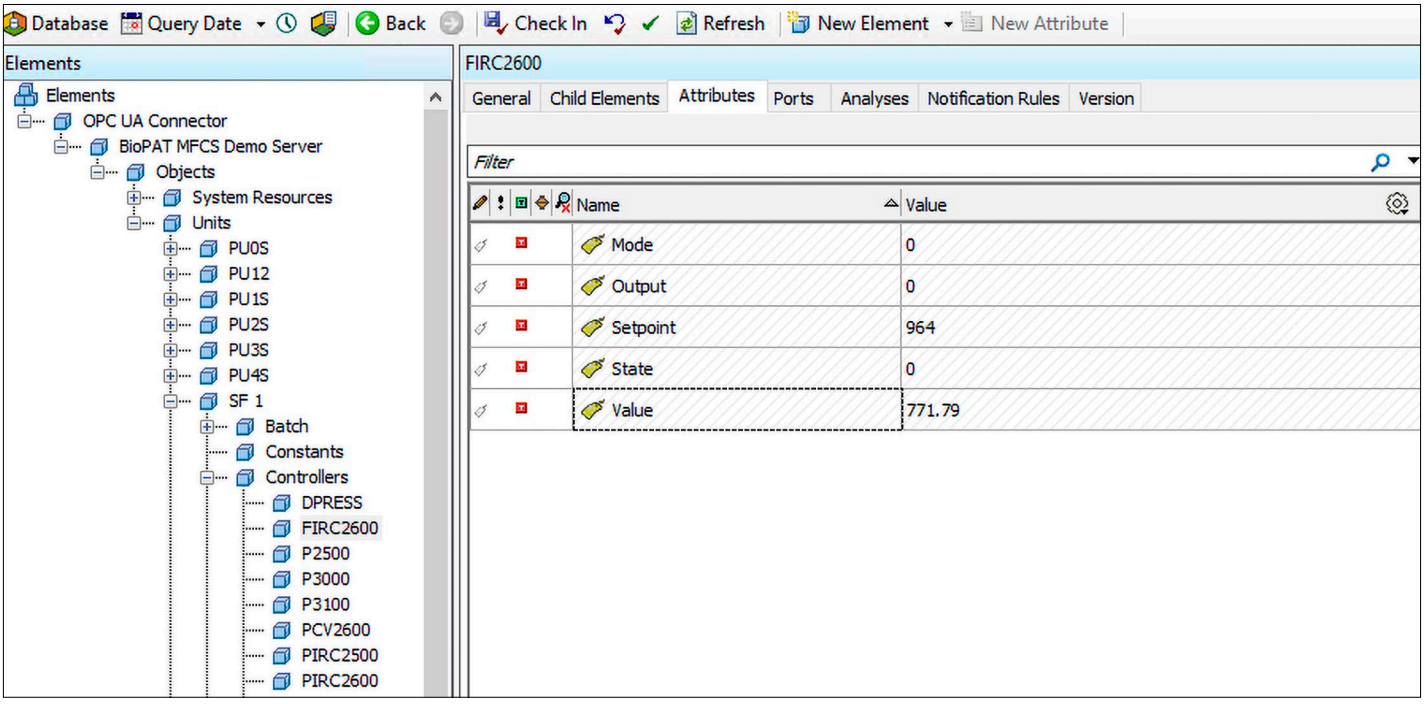

Figure 20: *An Example of a Node Tree Shown in the PI System Explorer*

Refresh data

If the OPC UA node tree provided by BioPAT® MFCS is static, the OSI PI connector works reliably. But once there are new nodes, e.g. by creating a unit, the OSI PI connector does not automatically discover the tree change. In those cases the "Discover Data Source Contents"-button (Figure 14) needs to be pressed manually.

Please note, that OSI PI can not handle nullable date-times. An example is the stopping of a BioPAT® MFCS batch. In this case, the MFCS OPC server sends 'null' for BatchStartTime. OSI PI would still show the old BatchStartTime in contrast to other OPC UA clients, that would display 'null'. See figure 21.

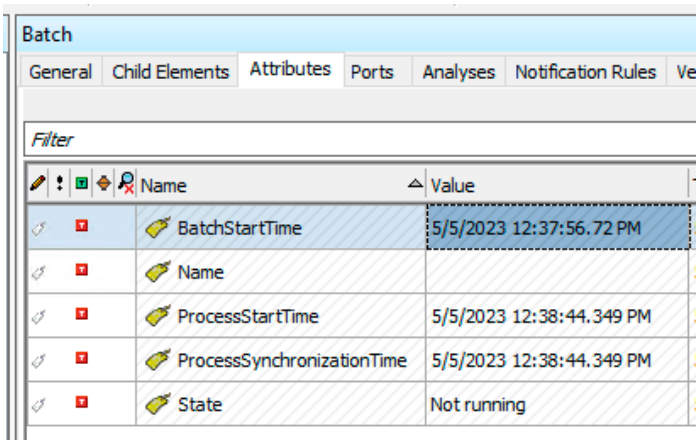

Figure 21: *Not Empty BatchStartTime in PI System Explorer*

Conclusion

This guide outlines how to successfully connect AVEVA™ PI System™ with BioPAT® MFCS via OPC UA and can be conveniently used for other data historians.

The OPC UA server functionality of BioPAT® MFCS offers a flexible and standardized way of integrating a BioPAT® MFCS server into an already existing infrastructure without the need for implementing any special communication protocol.

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DIR: 2617360-000-00

Status: 11 | 2023