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Application Note

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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.

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-bystep 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	https:// <computername>:<port>/ui</port></computername>
Administration	e.g., https://SartoriusServer:5461/ui
PI Data Collection Manager	https:// <computername>:<port>/ui</port></computername>
	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).

This connector is not registered. Click to continue.

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). **Connector Details**

Connector Settings

Registration Server Address *

https://desktop-42:5462

Registration Server User Name *

SARTORIUS\User

Registration Server Password *

•••••

Description

Description

The Administration service client configuration for localhost was suc

Connector Tools

Start Connector

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).

Connector Settings	
Name	
Untitled Connector 1	
Description	
An optional description of the co	nnector
Approve This Registr	ation and Configure
	•

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 plussign button in the Relays column header to add a new relay. Enter the port of the installed PI Connector Relay (Figure 5).

Relay Settings
Name
Relay
Address
localhost
Port
5460
User Name
SARTORIUS\User
Password
Cancel Save Settings

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"

OPC SERVER		
GENERAL		
OPC server	On	Off
Status	Running	
Port*	4840	
Variable type	Property	Dataltem

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).

	🛕 OPC UA Co	PC UA Connector Connect	
Destinations	\oplus	Configuration	Data
A Data Archive		This connector has Manage Data Connected Data s	s no configured data s a SOUICES Sources

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

Advanced Configuration Additional Settings Incoming Timestamps Server 4 PI Store Mode Update Preferred Locale English - United States Max Browse References to Return 100 Browse Block Size 1 Read Block Size 1000 Allow Insecure Credentials Take DNS Name and Port from Discovery URL Enable Property Subscription Enable OPC UA Model Changes Override the Reconnection Logic

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.

			📀 Relay Relay Details
Relays 🕀	Destinations	÷	Configuration
•• Relay	Data Archive	A	Relay Status
🕀 Add Relay	Add Destination		Relay Settings

Figure 11: Check the Connection Status

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

 Image: Configuration Data

 Destinations
 Configuration
 Data

 Image: Configuration Data Archive
 Destination Status
 Image: Configuration Data Not Configured

 Image: Configuration Data Archive
 Image: Configuration Data Not Configured
 Destination Data Not Configured

 Image: Configuration Data Not Configured
 Image: Configuration Data Settings
 Image: Configured
 Image: Configured

 Image: Configuration Data Settings
 Image: Configured
 Image: Configured
 Image: Configured
 Image: Configured

 Image: Configuration Data Settings
 Image: Configured
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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.

	A BioPAT MFCS Demo Server Data Source Details			
\oplus	Configuration	Data		
	Discover Data Source Contended Select Data for Collection The data source has unknown contents. Continue.	Discover Data Source Contents Dick 'Discover Data Source Contents' to Select Data		

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).

		OPC UA Connecto	or Connector Details	
Destinations	\oplus	Configuration	Data	Diagnostics
→ O Data Archive	<u> </u>	Discover Data Sou 1 Data source(s) with previo	Irce Contents	
Add Destination		Last discovered 15.06.20	20, 07:32:08	
			Discov	er Data Source Contents
		Select Data for Co	llection	
		1 Data source(s) with previo	ously selected contents	
				Select Data

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

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

Sel	lect Da	ta fo	r OPC UA Connector Configure Tags View Summary	
Sel	ection I	Rule	5	
Sele	ect Any	Objec	t and its Contents From MFCS Objects	
\checkmark	Query ex	ecute	d successfully. Your selections have been updated.	
Sel	ected D)ata		
	Namo			Dos
	Name	2 14	-09	Des
	• []			
	•	•	BuildInto	
		•	CurrentTime	
		P	DataRate	
		P	DataSourceState	
		Ŷ	EndpointUrl	
\checkmark	-	Û	Objects	
✓		•	D System Resources	
✓		,	D Units	
		₽	ServerState	
		₽	StartTime	

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).

Components		Routing
Filter Components	Filter Options	Data Sourc
Data Sources	*	
MFCS		M
Connectors	*	
OPC UA Connector	OPC UA	
Relays	*	
🛛 Relay		
Destinations		
Data Archive	PI Server	

Figure 18: Connection Established for All Components

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



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 datetimes. 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.

Batch							
General	eneral Child Elements Attributes Ports		Ports	Analyses	Notification Rules	Ve	
Filter							
∕!:⊡⇔	Name		2	△ Value		-	
0 🗖	🎺 BatchStartTime			5/5/2023 12:37:56.72 PM			
I 🗖	🍼 Name						
I 🗖	ProcessStartTime			5/5/2023 12:38:44.349 PM			
J 🗖	Process	ProcessSynchronizationTime			5/5/2023 12:38:44.349 PM		
<i>is</i> =	🍼 State			Not running			

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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