LISTEN.
THINK.
SOLVE.®

PharmaSuite®

INSTALLATION – ENTERPRISE EDITION

RELEASE 8.4

TECHNICAL MANUAL

PUBLICATION PSEN-IN008E-EN-E-DECEMBER-2017
Supersedes publication PSEN-IN008D-EN-E

Allen-Bradley • Rockwell Software

Rockwell Automation

Contact Rockwell See contact information provided in your maintenance contract.

Trademark Notices FactoryTalk, PharmaSuite, Rockwell Automation, Rockwell Software, and the Rockwell Software logo are registered trademarks of Rockwell Automation, Inc.

The following logos and products are trademarks of Rockwell Automation, Inc.:

FactoryTalk Shop Operations Server, FactoryTalk ProductionCentre, FactoryTalk Administration Console, FactoryTalk Automation Platform, and FactoryTalk Security.
Operational Data Store, ODS, Plant Operations, Process Designer, Shop Operations, Rockwell Software CPGSuite, and Rockwell Software AutoSuite.

Other Trademarks ActiveX, Microsoft, Microsoft Access, SQL Server, Visual Basic, Visual C++, Visual SourceSafe, Windows, Windows 7 Professional, Windows Server 2008, Windows Server 2012, and Windows Server 2016 are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Adobe, Acrobat, and Reader are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries.

ControlNet is a registered trademark of ControlNet International.

DeviceNet is a trademark of the Open DeviceNet Vendor Association, Inc. (ODVA).

Ethernet is a registered trademark of Digital Equipment Corporation, Intel, and Xerox Corporation.

OLE for Process Control (OPC) is a registered trademark of the OPC Foundation.

Oracle, SQL*Net, and SQL*Plus are registered trademarks of Oracle Corporation.

All other trademarks are the property of their respective holders and are hereby acknowledged.

Warranty This product is warranted in accordance with the product license. The product's performance may be affected by system configuration, the application being performed, operator control, maintenance, and other related factors. Rockwell Automation is not responsible for these intervening factors. The instructions in this document do not cover all the details or variations in the equipment, procedure, or process described, nor do they provide directions for meeting every possible contingency during installation, operation, or maintenance. This product's implementation may vary among users.

This document is current as of the time of release of the product; however, the accompanying software may have changed since the release. Rockwell Automation, Inc. reserves the right to change any information contained in this document or the software at any time without prior notice. It is your responsibility to obtain the most current information available from Rockwell when installing or using this product.

Contents

Figures

Chapter 1

Introduction

This manual describes the installation of PharmaSuite Enterprise Edition on top of an installed FactoryTalk® ProductionCentre 10.4.106677 environment and how to set up the Live Data infrastructure and the Historian infrastructure for PharmaSuite. For all information on installing your FactoryTalk ProductionCentre system, please refer to the FactoryTalk ProductionCentre installation documentation [A1], [A2], and [A3] (page 53).

Intended Audience

The manual is intended for administrators of a PharmaSuite system.

Due to the nature of the tasks that need to be performed for an enterprise installation scenario, the administrator should have the same experience level as required to install the FactoryTalk ProductionCentre platform.
The setup of a Live Data infrastructure requires a thorough knowledge in the area of automation integration.

Typographical Conventions

This documentation uses typographical conventions to enhance the readability of the information it presents. The following kinds of formatting indicate specific information:

Bold typeface — Designates user interface texts, such as

- window and dialog titles
- menu functions
- panel, tab, and button names
- box labels
- object properties and their values (e.g. status).

Italic typeface — Designates technical background information, such as

- path, folder, and file names
- methods
- classes.

CAPITALS	Designate keyboard-related information, such as ■ key names ■ keyboard shortcuts.
`Monospaced typeface`	Designates code examples.

TIP

Instructions in this manual are based on Windows Server 2012 R2. Select the appropriate commands if you are using a different operating system.

Chapter 2

Installing PharmaSuite Enterprise Edition on FactoryTalk ProductionCentre with JBoss

IMPORTANT

PharmaSuite Enterprise Edition requires a pre-installed FactoryTalk ProductionCentre system. Please refer to the FactoryTalk ProductionCentre installation documentation [A3] (page 53) for installation instructions. It will guide you through all required steps to set up the FactoryTalk ProductionCentre system.

In the following you will find a description of all system requirements that have to be met and all information you will need to collect prior to installing PharmaSuite.

Installation Prerequisites and Information

The following two checklists cover all preparatory steps and information required for installing PharmaSuite.

Prerequisites Checklist

Before you start the installation, check the prerequisites:

	Prerequisite	Your Notes	Done?
1	Adequate hardware and software as defined in "FactoryTalk ProductionCentre Release 10.4 Supported Platforms Guide" [A1] (page 53) and "PharmaSuite Supported Platforms Guide" [A4] (page 53).		
2	FactoryTalk ProductionCentre has been installed and the basic configuration according to the "FactoryTalk ProductionCentre Plant Operations Release 10.4 Server Installation Guide - JBoss Advanced" [A3] (page 53) has been successfully performed.		
3	Only if you run multiple clients of different PharmaSuite versions on one computer: this setup requires a change of the default configuration of the download location during installation (see "Changing the Default Configuration" (page 5)).		
4	FactoryTalk ProductionCentre Support Home Page [B4] (page 53) has been checked for settings relevant to your system configuration (e.g. heap size for servers running on JBoss).		
5	Backups of the current FactoryTalk ProductionCentre databases have been created.		

Information Checklist

Please prepare the information you will need during the installation process:

	Information	Your Notes	Done?
1	FactoryTalk ProductionCentre Application Server: IP address or DNS-resolvable name		
2	System configuration considers the following settings: The JBoss application server, ActiveMQ, and the PharmaSuite upgrade engine run with the 64-bit version of Java 1.8.0_144. Each PharmaSuite client (including Shop Operations Server) is only supported for the 32-bit version of Java 1.8.0_144. Make sure that the specified programs use a JAVA_HOME environment variable pointing to the correct Java version.		

Changing the Default Configuration

PharmaSuite supports configurations where multiple clients of different PharmaSuite versions can run on one computer. However, this setup requires a change of the default configuration of the download location during installation.

For more information, please refer to chapter "Define the Download Location" in "FactoryTalk ProductionCentre Plant Operations Release 10.4 Server Installation Guide - JBoss Advanced" [A3] (page 53) and chapter "Best Practices for Managing User Accounts of a Client Operating System" in "Technical Manual Administration" [A9] (page 53). Please also consider to set the *clientHome* property to the client's user profile directory (e.g. replace "C:" with a tilde character: *clientHome=~/.FTPC*). Thus

- different users of the operating system can use the same workstation while keeping user-specific files separated,
- terminal services scenarios (e.g. Citrix) are supported, and
- issues caused by missing write access to *C:\.FTPC* are avoided.

If the default configuration was not changed during installation, it is not allowed to run multiple clients that belong to different PharmaSuite versions on one computer at the same time. This might cause corrupt system behavior and inconsistent log files.

Also, if the default configuration is not changed, but it is necessary to switch between clients of different PharmaSuite versions, the client-side file caches and log files have to be cleaned manually each time before another PharmaSuite version is started again.

Performing the Installation

To install PharmaSuite, perform the following steps:

1. Only if your PharmaSuite system operates with a Microsoft SQL database: Enable the READ_COMMITTED_SNAPSHOT option.
2. Enable object revisioning for all objects (page 6).
3. Adapt the JBoss configuration (page 6).
4. Download and expand the Enterprise Edition Installer (page 7).
5. Optional:
   Configure audit trail settings (page 7).
6. Execute the installation script (page 8).
7. Create indexes on your database system, either for Microsoft SQL (page 10) or for Oracle (page 11).
8. Deploy the PharmaSuite help system (page 13).
9. Set up the ActiveMQ JMS message broker (page 14).

10. Optional:
    Configure the ActiveMQ JMS message broker failover scenario (page 16).
11. Set up the Shop Operations Server for PharmaSuite event sheets (page 16).
12. Optional:
    Configure AI, EBR, OE, and TOM servers for the Shop Operations Server failover scenario (page 20).
13. Optional:
    Add support for heartbeat monitoring to non-standard Shop Operations Servers (page 21).

Configuring Object Revisioning in FTPC Administrator

PharmaSuite requires **object revisioning** to be activated in FactoryTalk ProductionCentre. Object revisioning is disabled by default. To activate object revisioning, proceed as follows:

1. Refer to chapters "Configuring Database Logging" and "Object Revisioning Logging" in "FactoryTalk ProductionCentre Administrator Release 10.4 User's Guide" [A5] (page 53).
2. Open your installation-specific configuration as described in chapter "Connect to a Datasource and Configure Security" in "FactoryTalk ProductionCentre Plant Operations Release 10.4 Server Installation Guide - JBoss Advanced" [A3] (page 53).
3. Set the **Object Revisioning Level** to **All Objects**.
4. Restart the JBoss Application Server to make the change take effect.
5. Continue with adapting the JBoss configuration (page 6).

Adapting the JBoss Configuration

To adapt the JBoss configuration, proceed as follows:

1. Navigate to the *standalone-full.xml* file in *<JBOSS_DIR>\standalone\configuration*.
   - Identify the `<idle-timeout-minutes>` entry and set the default value to `15` (instead of `0`).
   - Identify the `<subsystem xmlns="urn:jboss:domain:transactions:3.0">` section and add the following line at the end of the section:
     `<coordinator-environment default-timeout="600"/>`
2. Restart the JBoss Application Server to make the change take effect.
3. Continue with downloading and expanding the Enterprise Edition Installer (page 7).

Downloading and Expanding the Enterprise Edition Installer

The PharmaSuite Enterprise Edition Installer is available as an installation package on the Rockwell Automation Download Site.

To download and expand the installation package, proceed as follows:

1. Open Internet Explorer and navigate to the Rockwell Automation Download Site.
2. Navigate to the **PharmaSuite** section.
3. Select PharmaSuite Enterprise Edition to download.
4. On the Windows machine, expand the file that you have downloaded to extract the PharmaSuite Enterprise Edition Installer files to a target directory of your choice. From this directory, you will be able to execute the installation script.

   TIP
   Make sure the path to your target directory does not contain blanks.

5. Continue with the next step.
   - Only if you wish to modify the audit trail-related settings:
     Continue with configuring the audit trail settings (page 7).
   - Otherwise continue with executing the installation script (page 8).

Configuring Audit Trail Settings

PharmaSuite uses the generic audit trail mechanism of FactoryTalk ProductionCentre to keep track of changes to objects on the database level. If an object is modified, its previous representation is copied into an object-specific audit trail database table when the new object revision is written to the database. The Audit trail function in the Production Management Client makes use of audit trail database tables to display the corresponding data.

By default, PharmaSuite is configured to store audit trail data for all object types (see section "Configuring Object Revisioning in FTPC Administrator" (page 6)).
To avoid collecting unnecessary data and to reduce database growth, PharmaSuite allows to disable the collection of audit trail data on a per-object level.

The following rules apply when you disable the collection of audit trail data for specific objects:

- The installation script of the PharmaSuite Enterprise Edition is pre-configured to disable the collection of audit trail data for specific objects.
- To change the settings, edit the *installer\Utils\conf\DisableAuditTrail.properties* file before you execute the installation script.
- Add a line with the name of a database table to the configuration file to disable the collection of audit trail data for this database table.

- Prefix comments with the hash symbol (#).

To disable audit trail for standard **Process Designer objects**, proceed as follows:

- Add a line with the name of the object's database table to *DisableAuditTrail.properties*. If an object spans multiple database tables, all database tables related to this object have to be added to the exclusion list.
- Examples:
  Add the `MASTER_RECIPE` and `UDA_MasterRecipe` lines to disable the collection of audit trail data for **Master recipe** objects.
  Add the `APPLICATION` and `APPLICATION_ITEM` lines to disable the collection of audit trail data for **Application** objects.

To disable audit trail for **AT objects**, proceed as follows:

- Add a line with the name of the object's database table to *DisableAuditTrail.properties*. The database tables of AT objects are prefixed with **AT_** followed by the name of the AT definition.
- Example:
  Add the `AT_X_ObjectLock` line to disable the collection of audit trail data for **X_ObjectLock** AT objects.

When you have finished your changes, continue with executing the installation script (page 8).

Executing the Installation Script

To execute the downloaded and expanded installation script, proceed as follows:

1. Open Windows Explorer and navigate to the *cmds* subdirectory of the Enterprise Edition Installer package (the directory to which you have expanded the PharmaSuite Enterprise Edition Installer package).
2. Open the *settings.cmd* file for editing.
3. Adjust the following settings to match your system environment.
   - Replace `localhost` with an IP address or a DNS-resolvable name for your FactoryTalk ProductionCentre Application Server.
     You can keep the localhost default setting if your FactoryTalk ProductionCentre Application Server is on the same machine on which you plan to execute the installation scripts.
     - `JNPCONN`
       the JNP connection string of your FactoryTalk ProductionCentre Application Server. Example:
       `SET JNPCONN=remote://ftps01.myenterprise.com:8080`

- `HTTPCONN`
  the HTTP connection string of your FactoryTalk ProductionCentre Application Server. Example:
  `SET HTTPCONN=http://ftps01.myenterprise.com:8080`
- `JAVA_HOME`
  the Java environment (32-bit) setting of your FactoryTalk ProductionCentre client Application. Example:
  `SET JAVA_HOME=c:\32Bit\jdk1.8.0_144`
  Make sure that the `JAVA_HOME` path does not contain any blanks and that it is set according to section "Install the Required JDK", chapter "Third-Party Application Server Software" in "FactoryTalk ProductionCentre Plant Operations Release 10.4 Server Installation Guide - JBoss Advanced" [A3] (page 53).

Save and close the adjusted *settings.cmd* file.

4. Make sure the backups of the current FactoryTalk ProductionCentre databases have been created.
5. Open a command prompt.
   Start the installation script from the command prompt in the *cmds* directory:
   `install settings.cmd`
   - The script will request your confirmation for starting the installation process twice. To continue press any key. To abort the installation process press CTRL+C.
   - During the installation process, you can monitor the progress and the results of the various steps in the *logs* subdirectory of your installation package folder.
   - Depending on your machine's performance, the installation can take up to 15 minutes.
6. The installation script confirms the completion of the installation with **Finished successfully**.
7. Close the command prompt.
8. Restart the JBoss Application Server to make the configuration of the audit trail settings take effect.
9. Depending on the database system with which your PharmaSuite system operates, continue either with creating indexes on the Microsoft SQL Server database system (page 10) or with creating indexes on the Oracle database system (page 11).

Creating Indexes on the Microsoft SQL Server Database System

This section is only required if your PharmaSuite system operates with a Microsoft SQL database.
For improved performance of your system, a *Transact SQL* script file will create additional indexes. The file is provided along with the Enterprise Edition Installer package.

To execute the *Transact SQL* script file on your FactoryTalk ProductionCentre production database, proceed as follows:

1. Open Windows Explorer and navigate to the *sql/mssql* subdirectory of the Enterprise Edition Installer package.
2. Double-click the *CreateCustomIndexes.sql* script file to open it.

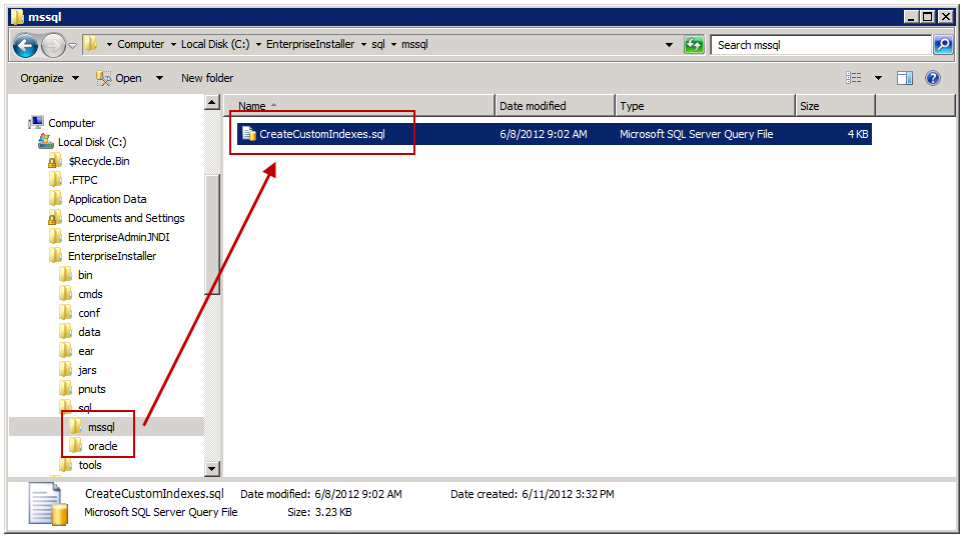

Figure 1: CreateCustomIndexes.sql script file for MS SQL

3. Now, Microsoft SQL Server Management Studio starts automatically and loads the script file.
   Connect to the server on which your production database is running.
4. Select your production database.
5. In the toolbar, click the **Execute** button to run the script.

6. After the successful execution of the script, the **Messages** pane lists the performed changes.

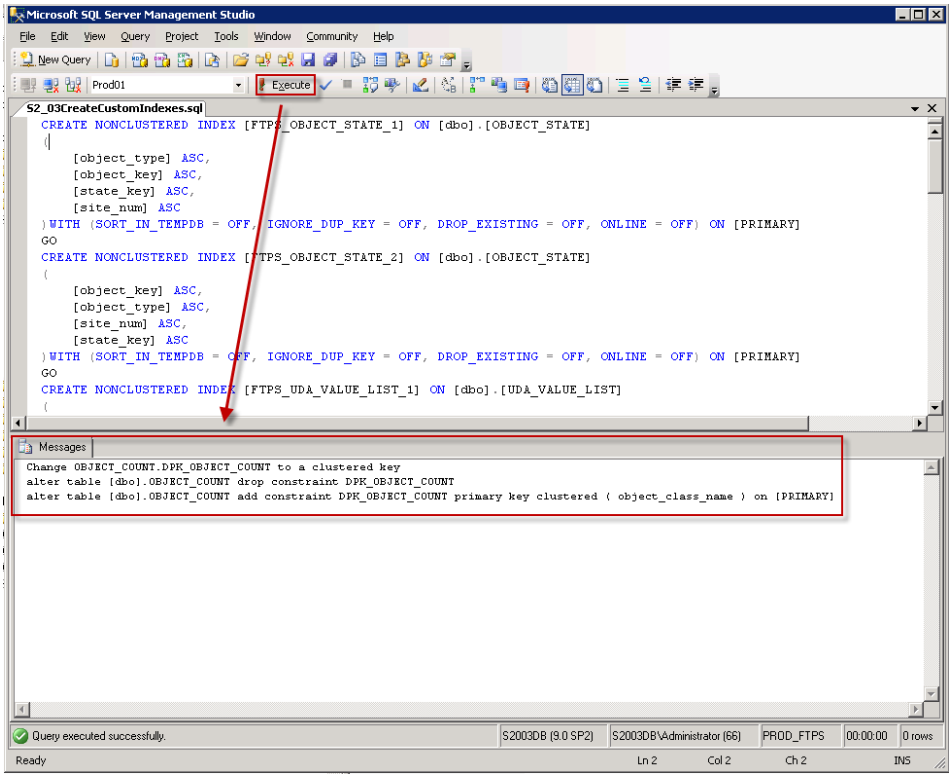

Figure 2: Execution of CreateCustomIndexes.sql for MS SQL

7. Execute the following SQL statements on your database to disable the trigger:

```
DISABLE TRIGGER [dbo].[dsOCIActivitySet] ON [dbo].[ACTIVITY_SET]
DISABLE TRIGGER [dbo].[dsOCDActivitySet] ON [dbo].[ACTIVITY_SET]
```

8. Close Microsoft SQL Server Management Studio.
9. Continue with deploying the PharmaSuite help system (page 13).

Creating Indexes on the Oracle Database System

This section is only required if your PharmaSuite system operates with an Oracle database.
For improved performance of your system, a *SQL* script file will create additional indexes. The file is provided along with the Enterprise Edition Installer package.

To execute the *SQL* script file on your FactoryTalk ProductionCentre production database, proceed as follows:

1. Open Windows Explorer and navigate to the *sql/oracle* subdirectory of the Enterprise Edition Installer package.

2. Open the *CreateCustomIndexes.sql* script file in a text editor.

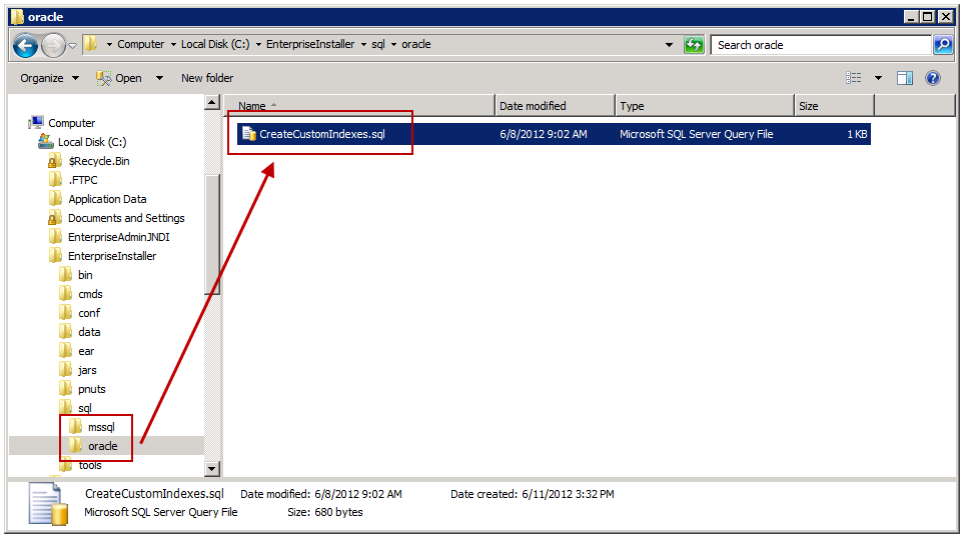

Figure 3: CreateCustomIndexes.sql script file for Oracle

3. Start Oracle SQLDeveloper or another tool of your choice to connect to the database.
4. To connect to the database, use the same user you used to create the tablespace for the production database.
5. Copy the content of the *CreateCustomIndexes.sql* script file into a SQL Worksheet and execute the script.
6. In the toolbar, click the **Run Script (F5)** button to execute the script.

7. After the successful execution of the script, the **Script Output** tab displays **Task completed in ... seconds** and lists all indexes created.

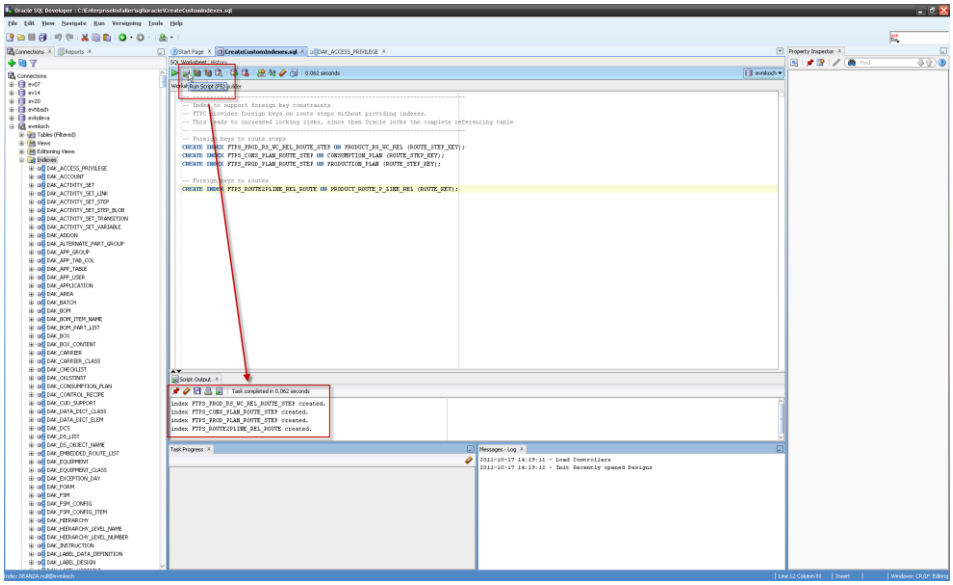

Figure 4: Execution of CreateCustomIndexes.sql for Oracle

8. Close Oracle SQL Developer.
9. Continue with deploying the PharmaSuite help system (page 13).

Deploying the PharmaSuite Help System

The PharmaSuite start page and the online help system of PharmaSuite are included in an Enterprise Archive (EAR) file. This file needs to be deployed in the same manner as for the installation of the FactoryTalk ProductionCentre system. You can find the file in the *ear* subdirectory of the Enterprise Edition Installer package.

To deploy the file, proceed as follows:

1. Copy the content of the *ear* subdirectory to the *deployments* subdirectory of your JBoss Application Server active configuration. This is the directory into which you have copied the *DSPlantOperations.ear* file.
2. As soon as the copy process is completed, the application server's EARDeployer immediately starts to work on the new file.
   Depending on your server's performance, the deployment process will take some time.
   You can monitor the progress at the JBoss console output or in the log files. Look for the line:
   `[org.jboss.as.server.deployment] (MSC service thread …: Starting deployment of "PharmaSuite-Help.ear" (runtime-name: "PharmaSuite-Help.ear")`
   If the deployment is complete following lines appears in the log file:
   `[org.jboss.web] (ServerService Thread Pool … Register web`

```
context: /PharmaSuite [org.jboss.as.server]
(DeploymentScanner-threads … Deployed "PharmaSuite-Help.ear"
(runtime-name : "PharmaSuite-Help.ear")
```

3. To verify the deployment, launch the PharmaSuite start page in your web browser (e.g. Internet Explorer). Use *PharmaSuite* instead of *PlantOperations* as address (e.g. *http://localhost:8080/PharmaSuite/*)

Figure 5: Verify deployment of PharmaSuite-Help.ear

4. Continue with setting up the ActiveMQ JMS message broker (page 14).

Setting up the ActiveMQ JMS Message Broker

For the JMS communication of the PharmaSuite clients with the Transition server, the EBR server, the Automation Integration server, the Triggered Operation Management server, and the Operation Execution server, PharmaSuite employs the widely used open source messaging server Apache ActiveMQ. The ActiveMQ Java process is typically run as a Windows service. It is the prerequisite for the usage of the **PharmaSuite_Transition_Server**, **PharmaSuite_EBR_Server**, **PharmaSuite_AI_Server**, **PharmaSuite_TOM_Server**, and **PharmaSuite_OE_Server** event sheets.

For more information, see ActiveMQ website [D1] (page 54).

To install the ActiveMQ JMS message broker, proceed as follows:

1. Download the windows binary distribution (i.e. apache-activemq-5.15.0.zip).
2. Extract the file (e.g. to C:\apache-activemq-5.15.0).
3. Adapt the ActiveMQ configuration for PharmaSuite:
   In *c:\apache-activemq-5.15.0\conf\activemq.xml*, perform the following steps:
   - Set up messaging port:
     In the **uri** attribute of the **<transportConnector ... />** tag, replace the original port of **61616** with the default PharmaSuite messaging port of **61646**. This should only be done for the **openwire (tcp)** protocol. Disable the entries of the other protocols.
     You may also choose another port, if you do so, you have to adapt the **MessageBrokerURL** configuration key in your **DefaultConfiguration**

application (see chapter "Managing Configurations" in Volume 4 of the "Technical Manual Configuration and Extension" [A6] (page 53)).

- Adapt store limit and temporary store limit:
  In the **<storeUsage limit="..." />** tag, set the value to **10 gb**.
  In the **<tempUsage limit="..." />** tag, set the value to **5 gb**.
- Adapt the dead letter strategy to discard expired messages.
  These messages are no longer needed by PharmaSuite and would lead to out-of-memory situations if not discarded.
  In the existing **<policyEntries>** section, add this entry:

```
<policyEntry queue=">" >
<!-- Tell the dead letter strategy not to process expired
     messages so that they will just be discarded instead
     of being sent to the DLQ. -->
<deadLetterStrategy>
  <sharedDeadLetterStrategy processExpired="false" />
</deadLetterStrategy>
</policyEntry>
```

- Optional: Disable message persistence
  Since PharmaSuite components do not rely on JMS message persistence, you may disable it for a better performance.
  However, if you are using failover or if any of your other components rely on message persistence, then you must not disable it.
  In the **<broker.../>** tag, add the **persistent="false"** attribute.
  Below the **<persistenceAdapter>** tag, replace **<kahaDB directory="${activemq.data}/kahadb"/>** with **<memoryPersistenceAdapter/>**.

4. Adapt the service naming:
   In *c:\apache-activemq-5.15.0\bin\win64\wrapper.conf*, adapt the settings listed below as follows:

```
wrapper.console.title=PharmaSuite ActiveMQ Broker
wrapper.ntservice.name=PharmaSuite ActiveMQ Broker
wrapper.ntservice.displayname=PharmaSuite ActiveMQ Broker
wrapper.ntservice.description=PharmaSuite ActiveMQ Broker
```

5. Adapt the settings of the service wrapper related to log file size and number of rolled log files:
   In *c:\apache-activemq-5.15.0\bin\win64\wrapper.conf*, adapt the settings listed below as follows:

```
wrapper.logfile.maxsize=1024k
wrapper.logfile.maxfiles=5
```

6. In *c:\apache-activemq-5.15.0\conf\jetty.xml*, adapt the port setting:
   In the **<bean id="jettyPort" ..>** tag, change the value of the port from **value="8161"** to **value="8162"** (or another free port).

7. In *c:\apache-activemq-5.15.0\bin\win64\wrapper.conf*, make sure that `wrapper.java.command` references the correct Java version. For details, see item 2 in the "Information Checklist" (page 4).
8. Run *C:\apache-activemq-5.15.0\bin\win64\InstallService.bat* to install the ActiveMQ service.
   We recommend to start the task with the *Run as administrator* option enabled.
9. To start the ActiveMQ service, open a command prompt and type `sc start "PharmaSuite ActiveMQ Broker"`.
10. Continue with configuring the ActiveMQ JMS message broker failover scenario (page 16).

Configuring the ActiveMQ JMS Message Broker Failover Scenario

To configure the ActiveMQ JMS message broker failover scenario, proceed as follows:

1. Set up message brokers on two different machines.
   Example: **amqmasterserver** and **amqslaveserver**
2. Configure the message brokers for the master/slave usage. For details, see ActiveMQ - Features - Clustering - MasterSlave [D2] (page 54).
3. Set the value of the **MessageBrokerURL** configuration keys in your **DefaultConfiguration** application as follows:
   - **tcp://amqmasterserver:61646,tcp://amqslaveserver:61646**
4. Continue with setting up the Shop Operations Server (page 16) for PharmaSuite event sheets.

Setting up Shop Operations Servers

PharmaSuite uses the following event sheets: **PharmaSuite_Transition_Server**, **PharmaSuite_EBR_Server**, **PharmaSuite_AI_Server**, **PharmaSuite_TOM_Server**, and **PharmaSuite_OE_Server**.
For each event sheet, a Shop Operations Server must be set up according to the description given in chapter "Shop Operations Server" in "FactoryTalk ProductionCentre Plant Operations Release 10.4 Server Installation Guide - JBoss Advanced" [A3] (page 53).
You can configure each Shop Operations Server individually (as described here) or configure one Shop Operations Server, copy this configuration, and adapt it for each further Shop Operations Server.

To assign the PharmaSuite event sheets in the Shop Operations Server, proceed as follows for each event sheet:

1. Set up the required number of Shop Operations Servers, one per event sheet.

- Name the Shop Operations Servers similar to their event sheet, e.g. **PharmaSuite Transition server**, **PharmaSuite EBR server**, **PharmaSuite AI server**, **PharmaSuite TOM server**, and **PharmaSuite OE server**.
- Users accessing the EBR, AI, Transition, TOM, and OE servers must be a member of the **MinimalAccess** and **PlantOpsOperator** user groups.
- In the following, *<path_to_service>* is used as a placeholder for the location of your servers (e.g. *C:\Rockwell\PharmaSuite\installation\services\PharmaSuite_EBR_Server*).

2. Configure each Shop Operations Server with the Shop Operations Server administration console.
   - In the Shop Operations Server configuration page of each server, select and assign the corresponding event sheet.
3. Configure the Java command (32-bit) for launching a JVM for each Shop Operations Server.
   - In each *<path_to_service>\conf\wrapper.conf* file, make sure that the command is set as follows:
     `wrapper.java.command=<Java installation path>/bin/java`
     Example:
     `wrapper.java.command=C:/32Bit/jdk1.8.0_144/bin/java`
   - You will continue to process the *<path_to_service>\conf\wrapper.conf* files in the next step.
4. Configure the maximum size of the heap space of each Shop Operations Server.
   - In each *<path_to_service>\conf\wrapper.conf* file, adapt the following line:
     `wrapper.java.additional.1=-Xmx512m`
     to
     `wrapper.java.additional.1=-Xmx1024m`
   - You will continue to process the *<path_to_service>\conf\wrapper.conf* files in the next step.
5. Verify the settings related to thread pooling for each Shop Operations Server.
   - Make sure that in the **PharmaSuite_AI_Server**, **PharmaSuite_EBR_Server**, **PharmaSuite_OE_Server**, **PharmaSuite_TOM_Server**, and **PharmaSuite_Transition_Server** event sheets, the FactoryTalk ProductionCentre activity set, activity set step, and phase related to thread pooling is configured.
     This means that in each *<path_to_service>\conf\wrapper.conf*, the following line must be available (where **X** is the number of the configuration parameter):
     `wrapper.java.additional.X=-DActivitySetContainerWithThreadPool.numberOfThreads=10`

For **X**, use the highest unused number of the `wrapper.java.additional` property. The configuration parameters are sequentially numbered (without gaps).
Example:
`wrapper.java.additional.11=-DActivitySetContainerWithThreadPool.numberOfThreads=10`

- You will continue to process the *<path_to_service>\conf\wrapper.conf* files in the next step.

IMPORTANT
EBR server: A thread pool manages the execution of procedures and unit procedures of all orders processed on the EBR server. Hence, the number of orders processed at the same time is not restricted by the maximum of threads on the EBR server.
As the threads of the thread pool can be used by several procedures and unit procedures, a transition, e.g. between two operations, must not block the processing of the corresponding thread, since thread pooling may block the execution of further orders by the EBR server.
Blocking transitions can easily be introduced accidentally by using Pnuts code in the expression editor of Recipe and Workflow Designer when it includes blocking code, such as an infinite wait condition for some event. Therefore, we strongly recommend to refrain from using Pnuts code. Instead, use PharmaSuite functions only, since they return their result in a finite time.
However, blocking transitions can also occur due to the fact that transitions are only evaluated exactly once after each phase completion (within an operation run). This means that you must not create conditions that wait for a certain time or an external event to take place. What could happen in this situation is that at evaluation time the condition does not apply and thus blocks the transition, which then remains blocked as there is no further evaluation of the condition. If you wish to model a delay (directly or by waiting for an external event), we recommend to use a dedicated phase that periodically checks for the expected change in the condition.
OE server: The phase thread pool manages the execution of server-run phases in the OE server. Hence, the number of phases processed at the same time is not restricted by the maximum number of threads on the OE server. However it has to be ensured that those phases do not block their threads. This is considered as a programming error, the phase must use the schedule API call provided by PharmaSuite. For details, see chapter "Sever-side Client API for Phases" in "Technical Manual Developing System Building Blocks" [A8] (page 53).

6. Configure the resource handling inside the running JVM of each Shop Operations Server.

   - In each *<path_to_service>\conf\wrapper.conf* file, add the following line:
     `wrapper.java.additional.X=-server`
     For **X**, use the highest unused number of the `wrapper.java.additional` property. The configuration parameters are sequentially numbered (without

gaps).
Example:
`wrapper.java.additional.12=-server`

- You will continue to process the *<path_to_service>\conf\wrapper.conf* files in the next step.

7. Configure the event sheet-specific wrapper log file for each Shop Operations Server.
In each *<path_to_service>\conf\wrapper.conf* file:
   - To combine all logging information of an event sheet in a single log file, add the event sheet name and **-ftps** to the log file name configuration by adapting the following line (the file location is relative to the current directory):
     `wrapper.logfile=../logs/wrapper.log`
     Example:
     `wrapper.logfile=../bin/logs/PharmaSuite_EBR_Server-ftps.log`
   - Make sure the size of a wrapper log file is set to 10 Mbytes:
     `wrapper.logfile.maxsize=10m`
   - Make sure the Java service wrapper property is configured as follows:
     ```
     # Allow the service to interact with the desktop.
     wrapper.ntservice.interactive=false
     ```
8. Optional: Configure logging specific to an event sheet for each Shop Operations Server.
   - Add a *log4j* configuration to *<path_to_service>\bin\logs\log4j_custom_local.properties*.
   - As a template use a suitable property file (e.g. *log4j_PharmaSuite_AI_Server.properties*, *log4j_PharmaSuite_EBR_Server.properties*, *log4j_PharmaSuite_TOM_Server.properties*, *log4j_PharmaSuite_OE_Server.properties*, *log4j_PharmaSuite_Transition_Server.properties*) located in the *installer\Utils\conf* subdirectory of the Enterprise Edition Installer.
9. Only if an OE server is used.
Define a station for the OE server.
   - The OE server must have a defined station. Per default, the **OE_Server** station is used. This station must be added to the generated XML configuration file of the event sheet. Proceed as follows:
   1. Adapt the XML tag in *<path_to_service>\bin\ShopOperationsServer.xml*:

- Example:
  C:\Rockwell\PharmaSuite\installation\services\PharmaSuite_OE_Server\bin\ShopOperationsServer.xml
- Adapt the XML tag for the **OE_Server** station:
  `<station>OE_Server</station>`

2. Restart the event sheet service.

TIP
Alternatively, the station can be configured with the Shop Operations Server administration console. For details, see section "Configuring the Server", "Administering Shop Operations Server", chapter "Shop Operations Server" in "FactoryTalk ProductionCentre Plant Operations Release 10.4 Server Installation Guide - JBoss Advanced" [A3] (page 53).

The **OE_Server** station is provided with the system. You can configure your own station to be used by the OE server. This station must not have a work center assigned.
If no station is defined for the OE server or a work center is assigned to the configured station, the service will stop its processing and provide an appropriate information in the log file.

10. Continue with the next step.
    - Only if you wish to modify the Shop Operations Server Failover Scenario:
      Continue with configuring AI, EBR, OE, and TOM servers for Shop Operations Server failover scenario (page 20).
    - Only if you wish to perform heartbeat checks for non-standard Shop Operations Servers:
      Continue with adding support for heartbeat monitoring to non-standard Shop Operations Servers (page 21).
    - Otherwise continue with verifying the installation (page 22).

Configuring AI, EBR, OE, and TOM Servers for Shop Operations Server Failover Scenario

The EBR server and the TOM server support failover by using the FactoryTalk ProductionCentre Shop Operations Server Master/Slave failover mechanism.

To configure the failover, proceed as follows:

1. Set up two Shop Operations Server instances on two different machines.
2. Follow the instructions in section "Configuring Failover" in chapter "Shop Operations Server" in "FactoryTalk ProductionCentre Plant Operations Release 10.4 Server Installation Guide - JBoss Advanced" [A3] (page 53).
3. Continue with the next step.

- Only if you wish to perform heartbeat checks for non-standard Shop Operations Servers:
  Continue with adding support for heartbeat monitoring to non-standard Shop Operations Servers (page 21).
- Otherwise continue with verifying the installation (page 22).

Adding Support for Heartbeat Monitoring to Non-standard Shop Operations Servers

All PharmaSuite Shop Operations Servers support the server heartbeat monitoring mechanism (see section "Basic Operations" in "Production Execution User Documentation" [C1] (page 54).

However, other Shop Operations Servers in your PharmaSuite environment (e.g. for ERP integration) can be included in this monitoring. For this purpose, you have to adapt your configuration.

To add heartbeat support, proceed as follows:

1. In your event sheet, add support for messaging if it is not already done:
   In the **Event Explorer**, click **Event Actions**, select **Add Activity**, and then **MessagingActivity**.
2. In your event sheet, add startup and shutdown callbacks:
   In the **EventSheetDefinitions**, select the **afterStart** function and add the following lines:

```
import("com.rockwell.mes.commons.messaging.ifc.serverheartbeat
       .ServerHeartbeatProducer")
ServerHeartbeatProducer::INSTANCE.startup()
```

   In the **EventSheetDefinitions**, select the **beforeStop** function and add the following two lines:

```
import("com.rockwell.mes.commons.messaging.ifc.serverheartbeat
       .ServerHeartbeatProducer")
ServerHeartbeatProducer::INSTANCE.shutdown()
```

3. Add your event sheet to the configured list of mandatory servers:
   In the **MandatoryServerEventSheets** list, add the name of your event sheet (see **MandatoryServerEventSheets** configuration key in Volume 4 of the "Technical Manual Configuration and Extension" [A6] (page 53).
4. Continue with verifying the installation (page 22).

Verifying the Installation

To verify the PharmaSuite installation, open the start page (*http://<MES-PS-HOST>:8080/PharmaSuite/*) in a web browser (e.g. Internet Explorer), and click the **PHARMASUITE** link in the browser window.
<MES-PS-HOST> is the name of your PharmaSuite server.

Now you can log in either as PMC administrator or as PEC administrator. A PEC administrator also has the necessary rights to the Exception Dashboard in the Production Responses application.
For the PMC administrator role, use the **pmcadmin** login and **pmcadmin** password.
For the PEC administrator role, use the **pecadmin** login and **pecadmin** password.

Ensuring Synchronized Date and Time Settings

Make sure that the date and time settings are synchronized between the machines that run the PharmaSuite clients, PharmaSuite servers, and the ActiveMQ JMS message broker.

We recommend to

- use the Active Directory mechanism for time synchronization (if available) or
- set up an automated task to frequently synchronize the times. For example, run `hourly:schtasks /create /TN HourlyTimeSync /SC HOURLY /RU SYSTEM /TR "W32tm.exe /resync"` as administrator.
  The **Windows Time** service must be started. Its **Startup Type** should be set to **Automatic**.
  All systems should be synchronized with the same NTP server.

Chapter 3

Troubleshooting Installation Issues

If issues occur during the installation process that prevent the installation from completing successfully, you will usually be notified by the system. It is recommended, however, that you verify the successful installation by viewing the log files (page 23).

TIP

If the installation fails and you cannot identify the reason by viewing the log files, please contact our customer support.

Log Files

The installation log files are located in the *logs* subdirectory of the Enterprise Edition Installer package (the directory to which you have expanded the PharmaSuite Enterprise Edition Installer package).

To identify what caused the issue, proceed as follows:

1. Open the *InstallationProgress.log* file and find the step that caused the installer to abort.
2. Then open the log file of that step and read the reason why the installation failed.

Chapter 4

Setting up the Live Data Infrastructure for PharmaSuite

This section contains general information about the system setup when PharmaSuite reads, writes, and browses process data values from automation devices on a factory floor network by means of FactoryTalk Live Data, a part of the FactoryTalk Services Platform (FTSP) from Rockwell Automation.

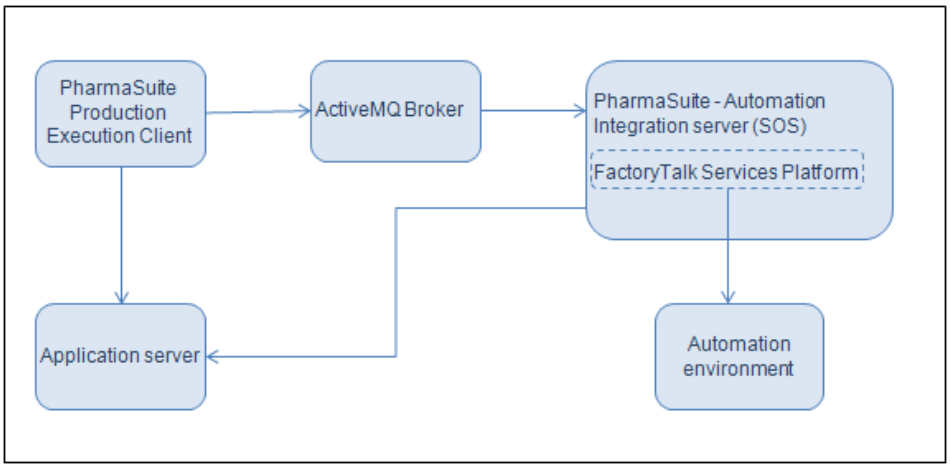

Figure 6: Overview of applied components

TIP

For more information, refer to FactoryTalk Help [B2 (page 53)], the online help of FactoryTalk Services Platform.

The PharmaSuite Automation Integration server is also used as Historian Integration server, see section "Setting up the Historian Infrastructure for PharmaSuite" (page 45).

Step 1: Network Considerations

Define a network node to be used by the Windows-based PharmaSuite Automation Integration server with access to all of the following systems:

- FactoryTalk ProductionCentre with JBoss as application server
- PharmaSuite Production Execution Clients
  For the ports used by the ActiveMQ JMS message broker, see "Setting up the ActiveMQ JMS Message Broker" (page 14).
- Data servers (e.g. OPC servers) (This includes access to the automation network through an installed and configured FactoryTalk Services Platform.)

Step 2: Topology Considerations

You may consider the following alternatives for various reasons:

- Performance, install the FactoryTalk Services Platform on the same computer as the Production Execution Client of PharmaSuite for direct access between Production Execution Client and the Live Data server (without JMS via the Automation Integration server).
- Scalability, install several Automation Integration servers to achieve load balancing (see "Step 11: Optional: Installing an Additional PharmaSuite Automation Integration Server" (page 38)).
- High availability, install several redundant Automation Integration servers to provide failover support (see "Step 10: Optional: Redundant PharmaSuite Automation Integration Servers for High Availability" (page 34)).
- Network segmentation, allow access to separated automation networks. Example: Each of your n different production lines is configured as a separate network and each production line has its own set of data servers. As a consequence you may need N Automation Integration servers.

For other configuration scenarios, see section "Automation Integration Configuration Scenarios" (page 40).

Step 3: FactoryTalk Services Platform Installation

Please refer to section "FactoryTalk Compatibility" in "FactoryTalk ProductionCentre Release 10.4 Supported Platforms Guide" [A1], for the version of the FactoryTalk Services Platform (FTSP) compatible with the current FactoryTalk ProductionCentre version.
FactoryTalk Services Platform is available from the Rockwell Automation Download Site.

Install FactoryTalk Services Platform to make the LiveData infrastructure available.

TIP

Installation of FactoryTalk Services Platform is not necessary, if you have already an automation infrastructure based on LiveData available and if one of the computers on which FactoryTalk Services Platform is installed shall be used to host the Automation Integration server.

When you install FactoryTalk Services Platform make sure that you are logged-on with an Administrator account into the console of the computer where the installation will take place (Remote Desktop connections cannot be used to successfully install FactoryTalk Services Platform).

If you plan to use data servers or the LiveData directory on other computers, we recommend to have all these computers in a common domain and all users administered with ActiveDirectory (setup in a workgroup environment is not recommended).

For details, see FactoryTalk Help [B2 (page 53)], the online help of FactoryTalk Administration Console.
The FactoryTalk Services Platform installer also installs FactoryTalk Administration Console, which is required in "Step 6: FactoryTalk Services Platform Configuration" (page 27) and Rockwell Software Data Client, which is required in "Step 7: Installation Verification" (page 28).

Step 4: Optional: OPC Simulator

We recommend to install and set up an OPC simulation server for training and testing purposes.

Step 5: Data Server

Install and set up a data server (e.g. RSLinx [A7] (page 53)). Define some test tags to verify the connection and the communication between the data server and PharmaSuite.

Step 6: FactoryTalk Services Platform Configuration

It is necessary to configure a network directory even for standalone installations.

Optional task:

- If you have set up another server to host the FactoryTalk directory or if you already have a FactoryTalk directory infrastructure, specify that directory. For this purpose, proceed as follows:

  1. In FactoryTalk Directory Server Location Utility, browse for the computer hosting the Network Directory Server and log on with one of the configured FactoryTalk users.
  2. Select the **Remote computer** option and browse for the server on which the FactoryTalk directory has been set up.
  3. When prompted, log on to the server with the credentials of a configured FactoryTalk user.

For details, see FactoryTalk Help [B2 (page 53)], the online help of FactoryTalk Directory Server Location Utility.

To configure the connection to the data servers with FactoryTalk Services Platform, proceed as follows:

1. In FactoryTalk Administration Console, select the **Network** option for the FactoryTalk directory.

2. To access the **Security Network Properties**, in the **Explorer** window, navigate to **System | Policies | System Policies**, right-click **Security Policy**, and define the **Computer policy settings** according to your environment.
3. To create FactoryTalk users, in the **Explorer** window, navigate to **System | Users and Groups**, and create a new user to be used to start the Shop Operations Server service.
   A FactoryTalk user can be created as an internal user or from a Windows-linked user.
4. Add the newly created user to the **Administrator** user group.
5. In the **Explorer** Window, right-click **Network** to create the hierarchy of Application, Area, and Data servers to connect the data servers.
   The default path (*RNA://$Global/LiveDataArea*) configured by PharmaSuite uses the **LiveDataArea** application without an area.

For details, see FactoryTalk Help [B2 (page 53)], the online help of FactoryTalk Administration Console.

TIP

Depending on your configuration it may be necessary to apply additional settings, e.g. configure DCOM security settings at the operating system level for each LiveData client computer and the data servers.

Step 7: Installation Verification

To verify the installation and configuration of the FactoryTalk Services Platform, proceed as follows:

1. On the computer on which FactoryTalk Services Platform was installed, start Rockwell Software Data Client (Live Data Test Client) and select the **Network** option for the FactoryTalk directory.
   For details, see Live Data Test Client Help [B3 (page 53)].
2. In the **Initial Connection** dialog box, navigate to your FactoryTalk Area or FactoryTalk Application containing your OPC simulator or data server.
3. In the **Create Group** dialog box, click **OK** to create a group for your data items.
4. In the **Add Item** dialog box, navigate to your tags, click **Add Branch** and **OK**.
5. The Live Data Test Client window displays the added data items from the created group.
   If you can change the items by means of the **Write Items | Async Write** context menu item, the configuration of FactoryTalk Services Platform was successful.

6. On the computer on which FactoryTalk Services Platform was installed and the Automation Integration server is to be installed, start Process Designer.
7. Create a **LiveData TagSet Definition** object.
   For details, see section "LiveData TagSet Definitions" in "Process Designer Online Help" [B1] (page 53).
8. Use the FactoryTalk ProductionCentre **Live Data Browser** to browse to the Area or Application containing your OPC simulator or data server. If you see the already created tags and can create LiveData tags from them, then the FactoryTalk ProductionCentre connectivity to FactoryTalk Services Platform is verified.

Step 8: Installing the PharmaSuite Automation Integration Server for Live Data

PharmaSuite offers an interface for synchronous service calls to read, write, monitor, or verify tags. For this purpose, it internally uses JMS (ActiveMQ) for the communication between the PharmaSuite Automation Integration server and PharmaSuite clients. The requests are performed on FactoryTalk Live Data to return the result to the client.

To install the Automation Integration server observe the instructions in section "Setting up Shop Operations Servers" (page 16) and assign the **PharmaSuite_AI_Server** event sheet.

The user rights to access FactoryTalk Live Data can be configured as follows:

- By default, the event sheet runs as a Windows service under the system account.
- Alternative 1: Run the service with a Windows user account that has access to FactoryTalk Live Data. For this purpose, in the Windows service management, adapt the **PharmaSuite AI server** service (**Log On** tab).
- Alternative 2: Configure the Automation Integration server to use a specific Live Data user. For this purpose, adapt the **Equipment/LiveDataUsername** and **Equipment/LiveDataPassword** configuration keys (see chapter "Configuration Keys of PharmaSuite" in Volume 4 of the "Technical Manual Configuration and Extension" [A6] (page 53)).

IMPORTANT

Make sure that the date and time settings are synchronized between the machines that are running the PharmaSuite clients, the ActiveMQ JMS message broker, and the Automation Integration server.
We recommend to

- use the Active Directory mechanism for time synchronization (if available) or
- set up an automated task to frequently synchronize the times. For example, run `hourly:schtasks /create /TN HourlyTimeSync /SC HOURLY /RU SYSTEM /TR "W32tm.exe /resync"` as administrator.

The **Windows Time** service must be started. Its **Startup Type** should be set to **Automatic**.
All systems should be synchronized with the same NTP server.

Step 9: Verifying the Access from Production Execution Client to Automation Integration Server

After you have installed and configured the required components, we recommend to verify the access to the Automation Integration server.

The **Automation Integration Test** tool supports you with functions for checking the Live Data infrastructure (e.g. communication from a data server to PharmaSuite and vice versa).

- High level functions to verify the interface used by PharmaSuite phase building blocks (page 31)
  Read, write, and verify tags (value, timestamp, quality, and errors) of the data based on the S88 equipment-related master data (equipment entity and property), which are maintained in Data Manager.
- Low level functions to verify and expose the pure interface without accessing S88 equipment-related master data (page 31)
  Read, write, monitor, and verify tags (value, timestamp, quality, and errors).

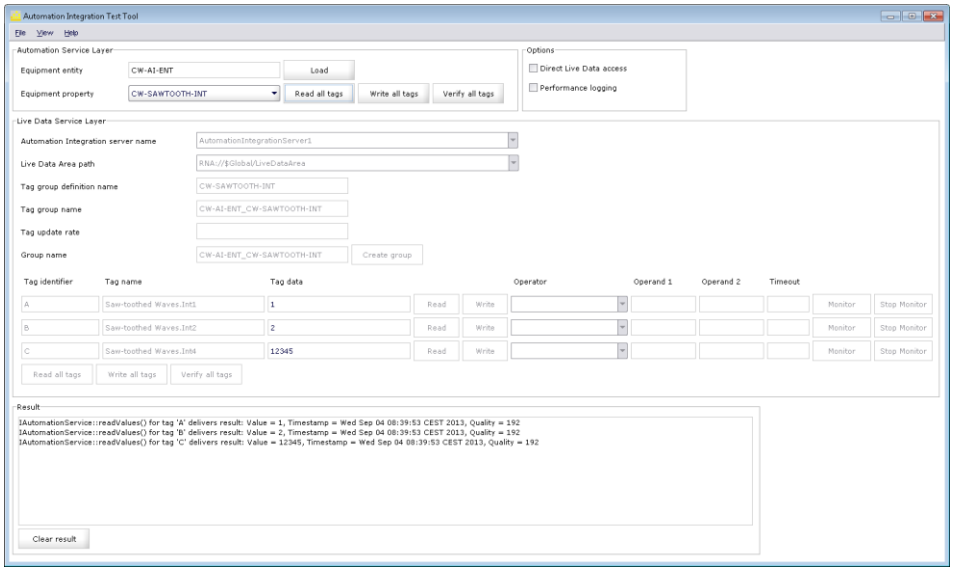

Figure 7: Verify access to Automation Integration server

TIP

Even though the **FlexibleTagDefinition** data type may have more than three tag definitions, the tool only supports the first three tag definitions.

To use the tool, run the **mes_AutomationIntegrationTestTool** form to start the **Automation Integration Access Verification** tool.

High Level Functions

The following high level API functions are available using the Automation service layer:

- Optional: Show profiling information
  Enable the **Performance logging** option to display how much time is used for the corresponding API call in the **Result** panel.
- Load an equipment entity
  Type an entity identifier and click **Load**. The tool displays the available data of the equipment entity and the associated Live Data-related data as read-only (except for the tag data, which is always editable).
- Properties of a loaded equipment entity
  The option list provides all of the entity's properties of the **Automation** usage type sorted by name. The first entry is selected automatically, others can be selected manually.
  The tool updates the display of the property type-related data and of the associated Live Data-related data.
- Read all tags
  To read all of the tags of the selected property, click the **Read all tags** button in the **Automation Service Layer** panel.
  The system displays the tag data in the corresponding text boxes and the API call in the **Result** panel.
- Write all tags
  To write all of the tags of the selected property, type the data in the corresponding text box and click the **Write all tags** button in the **Automation Service Layer** panel.
  The system displays the API call in the **Result** panel.
- Verify all tags
  To verify all of the tags of the selected property, click the **Verify all tags** button in the **Automation Service Layer** panel.
  The system displays the API call in the **Result** panel.

Low Level Functions

The following low level API functions are available using the Live Data service layer:

- Optional: Show profiling information
  Enable the **Performance logging** option to display how much time is used for the corresponding API call in the **Result** panel.

- Optional: Load an equipment entity
  Type an entity identifier and click **Load**. The tool displays the available data of the equipment entity and the associated Live Data-related data as read-only (except for the tag data, which is always editable).
- Optional: Properties of a loaded equipment entity
  The option list provides all of the entity's properties of the **Automation** usage type sorted by name. The first entry is selected automatically, others can be selected manually.
  The tool updates the display of the property type-related data and of the associated Live Data-related data.
- Write access to Live Data-related data
  Enable the **Direct Live Data access** option to make all text boxes in the **Live Data Service Layer** panel editable.
- Automation Integration server name
  The default value is read from the **Default configuration** application (see **Equipment/DefaultAutomationIntegrationServerName** configuration key, chapter "Configuration Keys of PharmaSuite" in Volume 4 of the "Technical Manual Configuration and Extension" [A6] (page 53).)
  The option list provides other available Automation Integration servers.
  - *LiveDataAccessFileMock* is useful for local testing without a real FactoryTalk Services Platform LiveData connection. The corresponding mock file of a Live Data group has a unique name and is located in *c:\Users\<user>\AppData\Local\Temp*. The file is created, unless it already exists.
  - *LocalLiveDataAccess* is useful when FactoryTalk Services Platform is installed and the **Automation Integration Test** tool is running on the same computer (see section "Automation Integration Configuration Scenarios" (page 40)).

  You can also type a server name in the text box.
- Live Data Area path
  The default value is read from the **Default configuration** application (see **Equipment/DefaultLiveDataAreaPath** configuration key, chapter "Configuration Keys of PharmaSuite" in Volume 4 of the "Technical Manual Configuration and Extension" [A6] (page 53).)
  You can also type a server path in the text box.
- Tag group definition name
  Type the name of an existing tag group definition. By default, the name corresponds to the identifier of the equipment property.

- Tag group name
  Type the name of an existing tag group. By default, the name is specified as follows: **<equipment entity identifier>_<equipment property identifier>**.
- Tag update rate
  Type the tag update rate for the group, otherwise the default tag update rate is used.
- Group name
  Type the name of a group to be used during its creation. The group is used when accessing tags and is created on the server. By default, the name is the same as the tag group name (**<equipment entity identifier>_<equipment property identifier>**).
- Create a Live Data group
  Load an equipment entity or type a tag set definition name, tag set name, and group name, then click the **Create group** button.
  This is only necessary **once** for any given tag group definition.
- Tag identifier 1..3
  Identifiers of the tags of the current tag group.
- Tag name 1..3
  Tag names of the related tag identifier. The name is read-only.
- Tag data 1..3
  Data of the related tag identifier.
- Only for monitoring: Operator
  The option list provides comparison operators to be used when tag data is monitored.
- Only for monitoring: Operand 1
  First operand of the comparison operation.
- Only for monitoring: Operand 2
  Second operand of the comparison operation.
- Only for monitoring: Timeout
  Timeout in milliseconds to be used when tag data is monitored.
- Read tags
  To read one or all tags, click the **Read** or **Read all tags** button in the **Live Data Service Layer** panel.
  The system displays the tag data in the corresponding text boxes and the API call in the **Result** panel.

- Write tags
  To write one or all tags, type the data in the corresponding text box and click the **Write** or **Write all tags** button in the **Live Data Service Layer** panel.
  The system displays the API call in the **Result** panel.
- Only for monitoring: Monitor tags
  To monitor the change of tag data for a given condition, click the **Monitor** button in the **Live Data Service Layer** panel. The condition is defined with the **Operator**, **Operand 1**, **Operand 2**, and **Timeout** parameters.
  An API call for monitoring is scheduled in a separate thread, so monitoring of multiple tags is possible.
- Only for monitoring: Stop monitoring tags
  To stop monitoring of tag data, click the **Stop monitor** button in the **Live Data Service Layer** panel.
  An API call to stop monitoring is executed immediately.
- Verify tags
  To verify all of the tags, click the **Verify all tags** button in the **Live Data Service Layer** panel.
  The system displays the API call in the **Result** panel.

TIP

The "all" buttons only apply to tags for which a name has been defined.

A typical use case for the low level functions is to load an equipment entity and an equipment property first to get suitable default values for some low level parameters based on the loaded equipment data. Then, switch on the **Direct Live Data access** option to enable editing of the parameters.

Step 10: Optional: Redundant PharmaSuite Automation Integration Servers for High Availability

This section applies to the Live Data and the Historian infrastructure (page 45).

The high availability scenario requires at least several computers:

1. The **first** Automation Integration server computer where the primary Automation Integration server is running.
2. The **second** Automation Integration server computer where the secondary Automation Integration server is running.
3. Only for Live Data infrastructure:
   The **third** one is the one where the LiveData directory is hosted. This is the recommended setup.

4. (Optional) The computer(s) where
   - the data servers configured in the above LiveData directory or
   - the Historian access servers and the Historian servers

   are running.
   This can be the same computer as above.

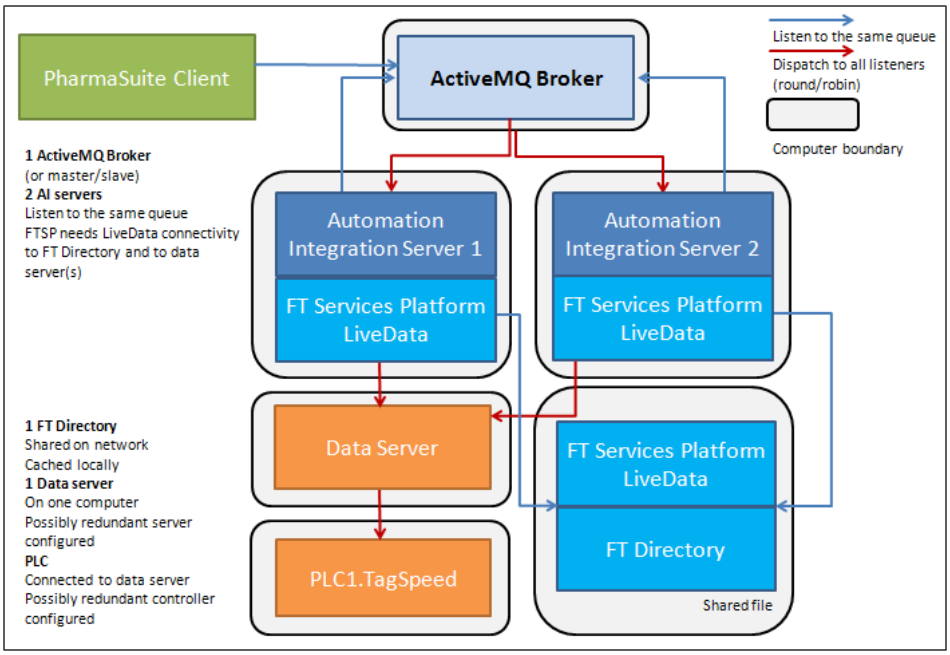

Figure 8: Example: High availability (with redundant hardware for Automation Integration servers)

An alternative setup uses only one server computer running two Automation Integration servers. This provides protection from software failures of these servers only, not from hardware or system failures of the computer.

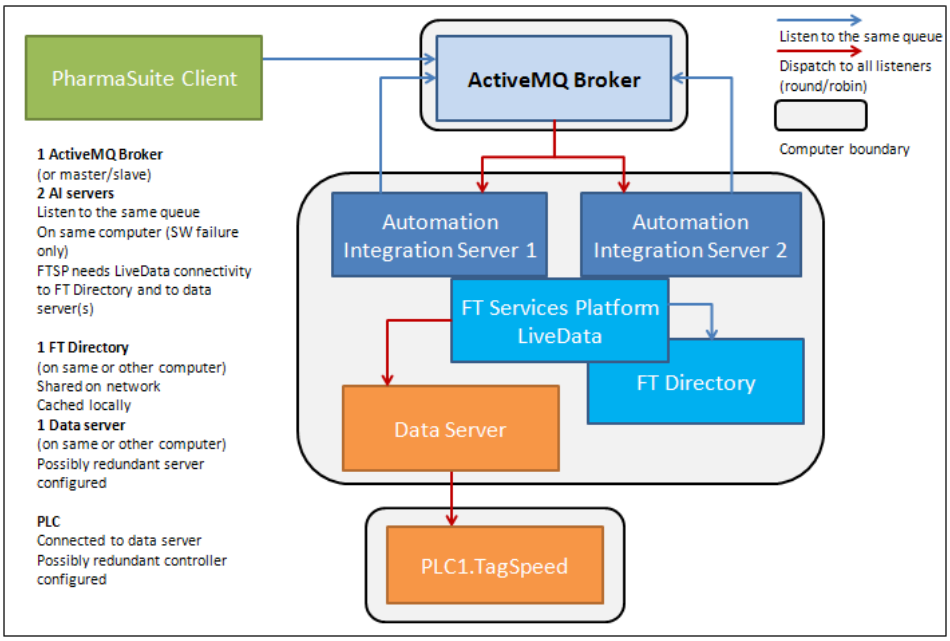

Figure 9: Example: High availability (with redundant software for Automation Integration servers)

Only for Live Data infrastructure:

- On all the computers, FactoryTalk Services Platform has to be installed and set up in a way that on both Automation Integration server computers, the tags from the configured data servers can be accessed.
- FactoryTalk Services Platform is responsible for the high availability of the LiveData directory (in case the third computer fails or is not accessible). Additionally, FactoryTalk Services Platform can configure redundancy for the data servers itself. For details, see FactoryTalk Help [B2] (page 53).

Only for Historian infrastructure:

- On all the computers, the PI JBDC driver has to be installed (page 46).

Installing a Redundant PharmaSuite Automation Integration Server

This section applies to the Live Data and the Historian infrastructure (page 45).

To install a redundant Automation Integration server to support the high availability scenario, perform the following steps:

1. Make sure that the first Automation Integration server has been installed (see "Step 8: Installing the PharmaSuite Automation Integration Server for Live Data" (page 29) or "Step 6: Installing the PharmaSuite Automation Integration Server for Historian" (page 48)).
2. On the second Automation Integration server computer
   - Only for Live Data infrastructure:
     Repeat "Step 3: FactoryTalk Services Platform Installation" (page 26) and "Step 6: FactoryTalk Services Platform Configuration" (page 27).
     - Step 6: FactoryTalk Services Platform Configuration
       Make sure to use the same FactoryTalk directory as for the first computer.
   - Only for Historian infrastructure:
     Repeat "Step 3: PI JDBC Driver Installation" (page 46) and "Step 4: FactoryTalk ProductionCentre Configuration" (page 47).
3. The Shop Operations Server for the second Automation Integration server uses the same **Application** object as the first Automation Integration server and refers to the same configuration key (e.g. **Equipment/DefaultAutomationIntegrationServerName = AutomationIntegrationServer1**, **Equipment/DefaultHistorianAIServerName = AutomationIntegrationServer1**).
   Only for Live Data infrastructure:
   The Shop Operations Server runs under the same user.
4. In the following, *<path_to_service>* is used as a placeholder for the location of the *PharmaSuite_EBR_Server* server (e.g. *C:\Rockwell\PharmaSuite\installation\services*).
   If you install the redundant Automation Integration server on a computer where the PharmaSuite Enterprise Edition Installer has not been run, copy the *<path_to_service>\PharmaSuite_AI_Server* directory from the computer where PharmaSuite and the first Automation Integration server has been installed to the same path on the computer for the second Automation Integration server.
   Open *<path_to_service>\PharmaSuite_AI_Server3\conf\wrapper.conf* and replace each uncommented occurrence of `.../j2sdk/...` with the path where the required Java SDK version has been installed.
   If JBoss and ActiveMQ are not running on the server, remove the corresponding dependency (`wrapper.ntservice.dependency.*`).

5. Set up the Shop Operations Server authentication.
   In *{SOSInstallDir}\bin\ShopOperationsServer.xml* enter the user name and password of the user.
   Navigate to *<path_to_service>\PharmaSuite_AI_Server\bin* and run *InstallApp-NT.bat* as administrator.
   Open **Services**, navigate to the **PharmaSuite AI server** service, and start the service.
   Open *<path_to_service>\PharmaSuite_AI_Server\logs\wrapper.log* and review the last message. It should be similar to the sample log shown below.

```
[WrapperSimpleAppMain]  WARN
AutomationIntegrationServerActivity:35 - Started
AutomationIntegrationServer with name
AutomationIntegrationServer1 with messaging address
failover:(tcp://<activeMQServer>:61646)?randomize=false&time
out=1000
```

(Optional) Only required for the scenario with two Automation Integration servers on the same computer:

- Choose a different target directory for the copy e.g. *<path_to_service>\PharmaSuite_AI_Server2*
- In *wrapper.conf*, replace each occurrence of `AutomationIntegrationServer1` with, for example, `AutomationIntegrationServer2`.
- In *{SOSInstallDir}\bin\ShopOperationsServer.xml*, specify a free port number, for example, replace `jetty-port="8086"` with `jetty-port="8087"` (or another free port).

Step 11: Optional: Installing an Additional PharmaSuite Automation Integration Server

This section applies to the Live Data and the Historian infrastructure (page 45).

The figure below illustrates the scenario where an additional Automation Integration server is required since different Automation Integration servers are addressed by different equipment properties.

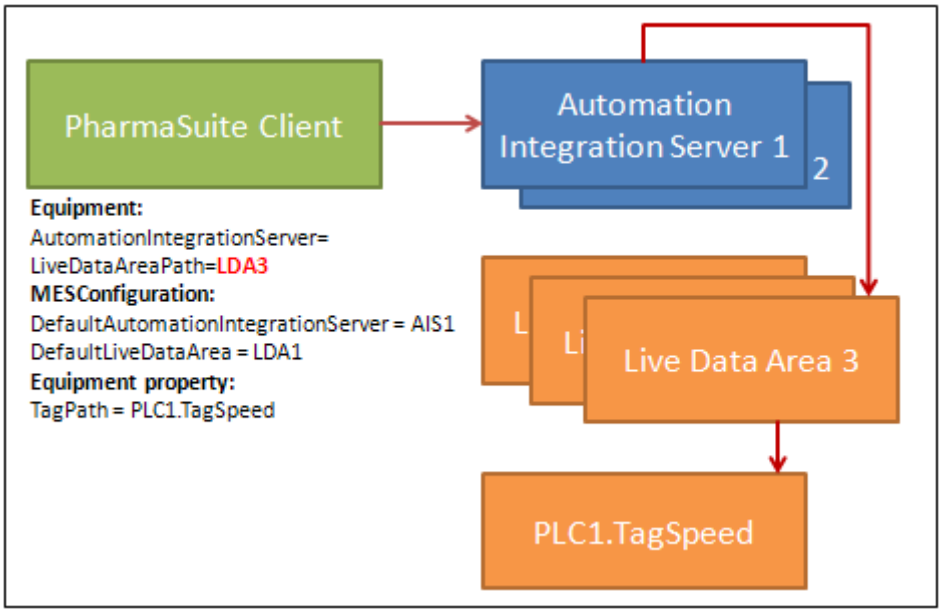

Figure 10: Example: Specific Live Data Area per equipment

To set up your configuration according to the scenario, perform the following steps:

1. In Process Designer, create a new **Application** object for the new Automation Integration server configuration, based on the **DefaultConfiguration**.
   For more information, please refer to chapter "Managing Configurations" in Volume 4 of the "Technical Manual Configuration and Extension" [A6] (page 53).
   Example: **AIServer2Config**
2. For Live Data infrastructure:
   Set the value of the **Equipment/DefaultAutomationIntegrationServerName** configuration key as follows: **AutomationIntegrationServer2**
3. For Historian infrastructure:
   Set the value of the **Equipment/DefaultHistorianAIServerName** configuration key as follows: **AutomationIntegrationServer2**
4. Create a new user with **AIServer2User** as name, for example.
5. Bind **AIServer2Config** to the **AIServer2User** user.
   In the **User** object, set the **BootstrapApp** parameter to the **AIServer2Config** application.
6. Install the new Automation Integration server according to the instructions in section "Setting up Shop Operations Servers" (page 16) and assign the **PharmaSuite_AI_Server** event sheet.
7. Make the Shop Operations Server authenticate as **AIServer2User** user.
   - In *{SOSInstallDir}\bin\ShopOperationsServer.xml* enter the user name and password of the **AIServer2User** user.

Configuration Keys

The following configuration keys are available for setting up a Live Data infrastructure:

- Equipment/AIServerMessagingTimeoutInSeconds
- Equipment/DefaultAutomationIntegrationServerName
- Equipment/DefaultLiveDataAreaPath
- Equipment/DefaultTagUpdateRateInMilliseconds
- Equipment/LiveDataPassword
- Equipment/LiveDataUsername
- Equipment/TagQualityGoodList

For details, chapter "Configuration Keys of PharmaSuite" in Volume 4 of the "Technical Manual Configuration and Extension" [A6] (page 53).

Automation Integration Configuration Scenarios

The following configuration scenarios illustrate specific use cases:

TIP

To improve legibility, the Automation Integration server name and path to the Live Data Area are abbreviated.

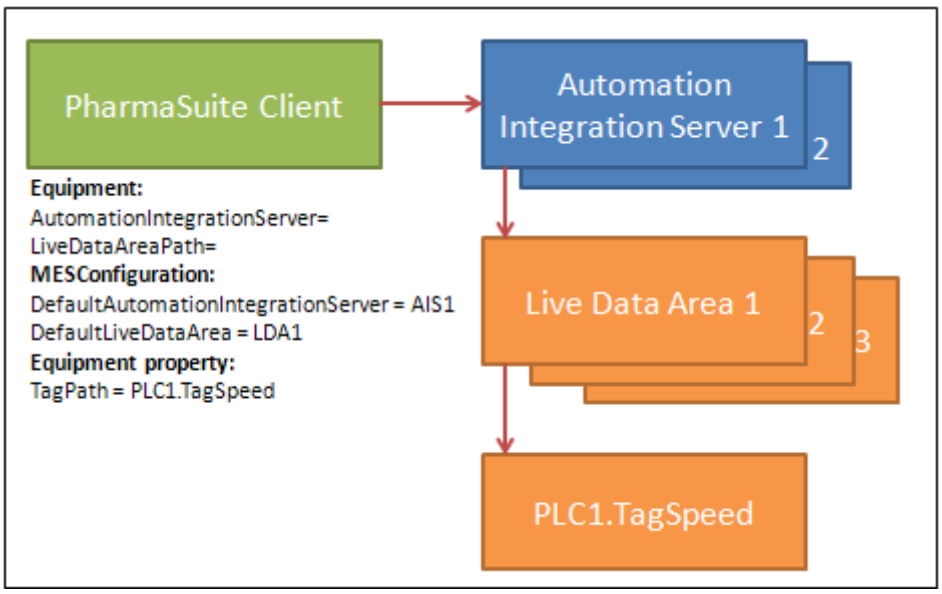

Figure 11: Example: Normal access

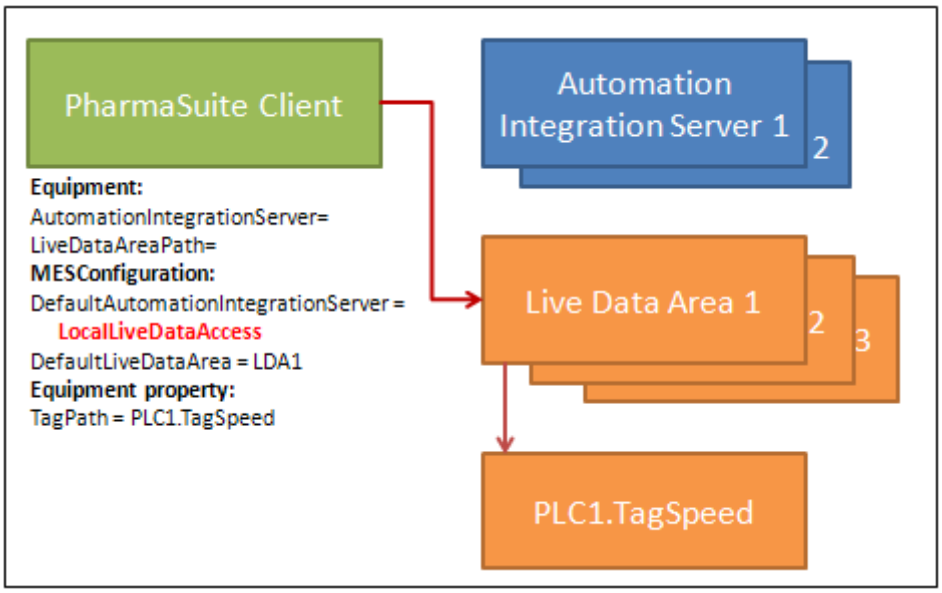

Figure 12: Example: Direct access for performance reasons

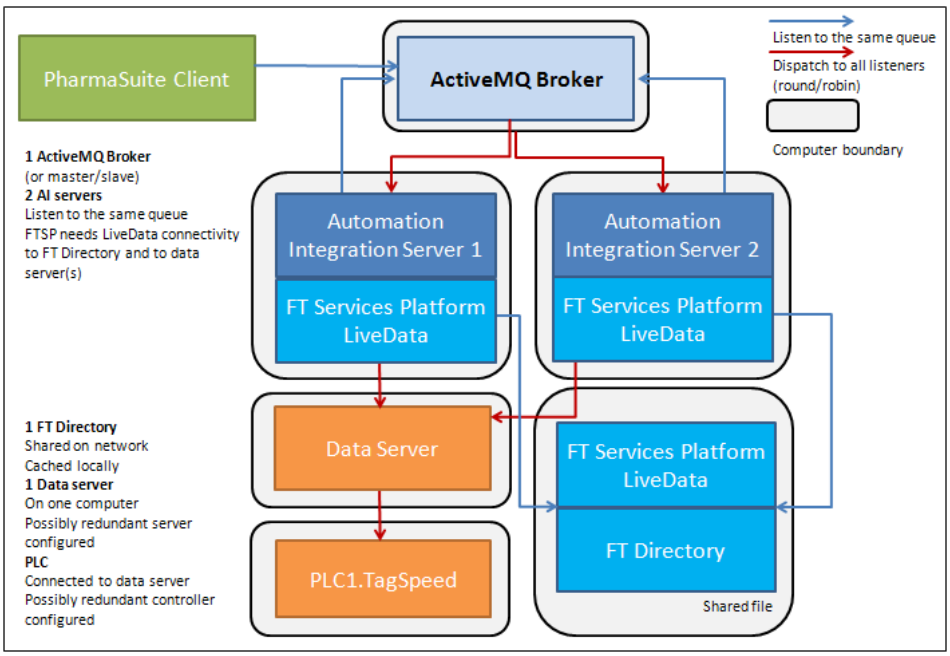

Figure 13: Example: High availability (with redundant hardware for Automation Integration servers)

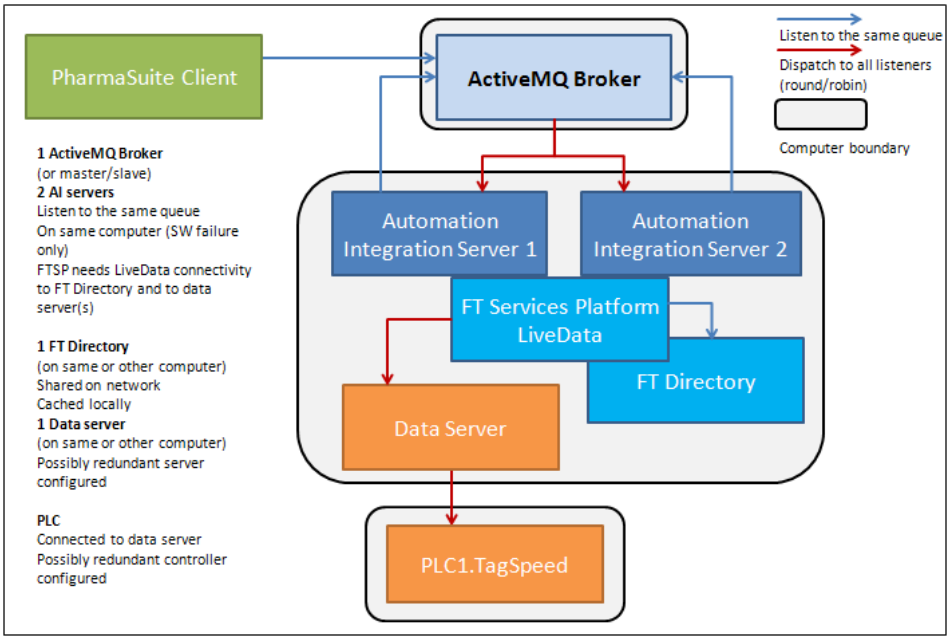

Figure 14: Example: High availability (with redundant software for Automation Integration servers)

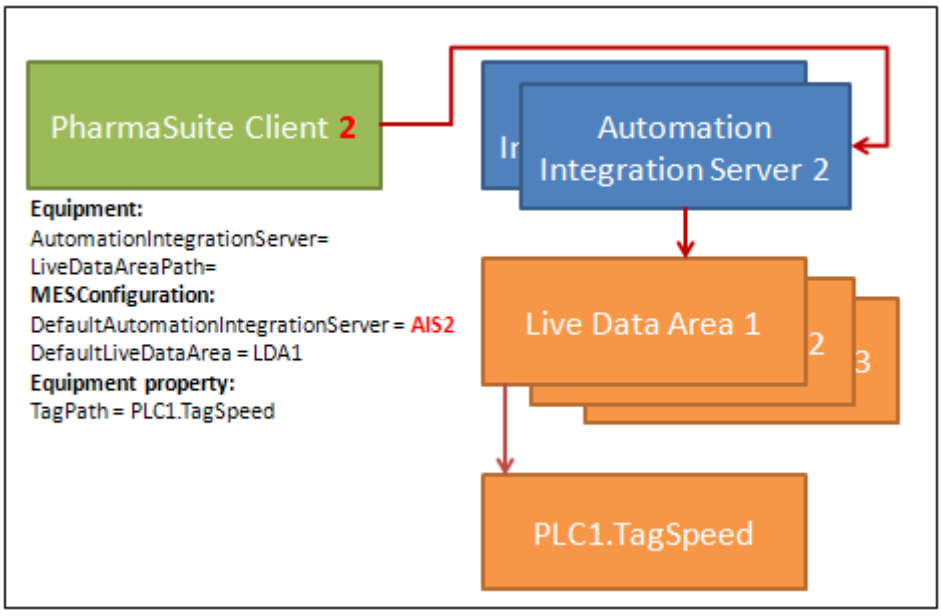

Figure 15: Example: Load balancing by different client configurations

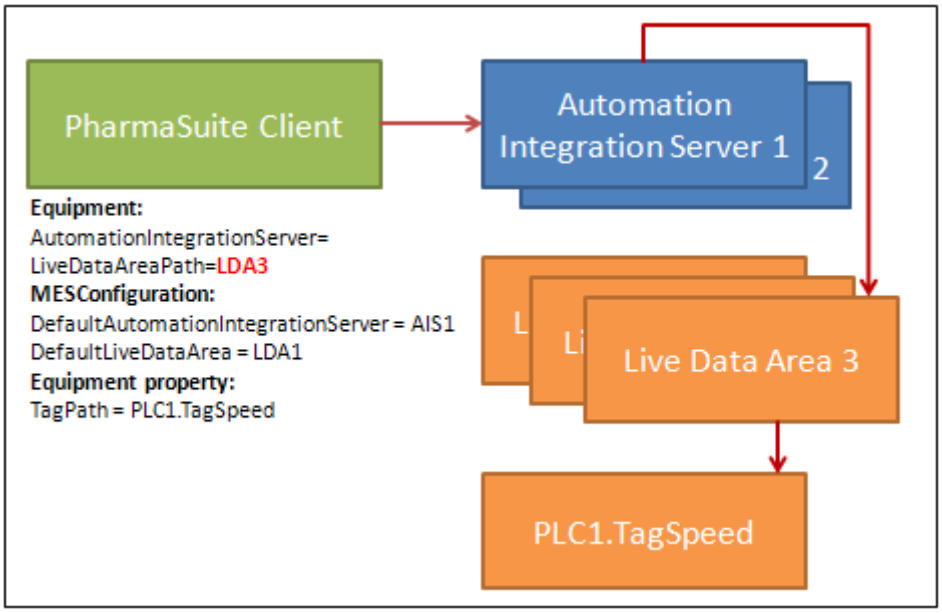

Figure 16: Example: Specific Live Data Area per equipment

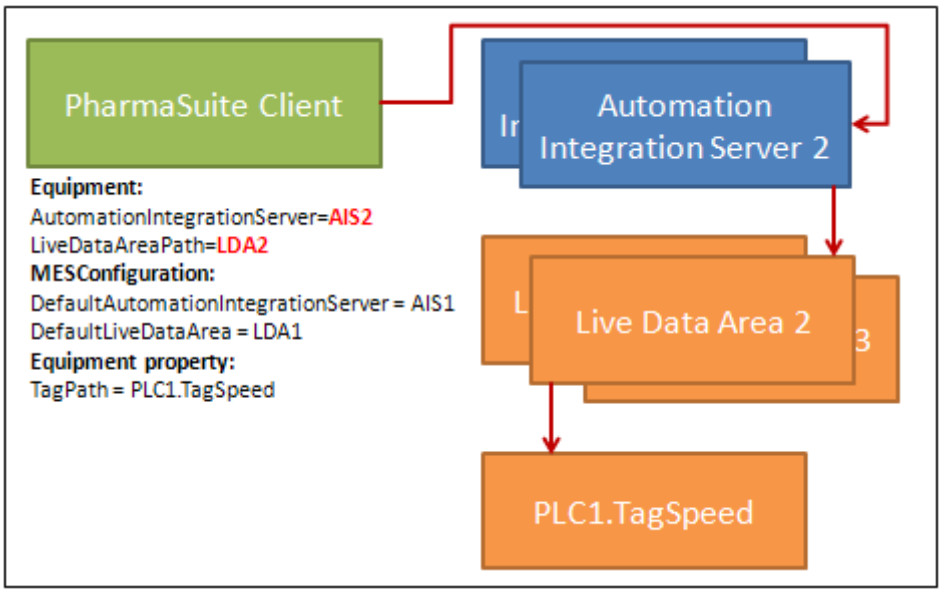

Figure 17: Example: Segmented automation networks

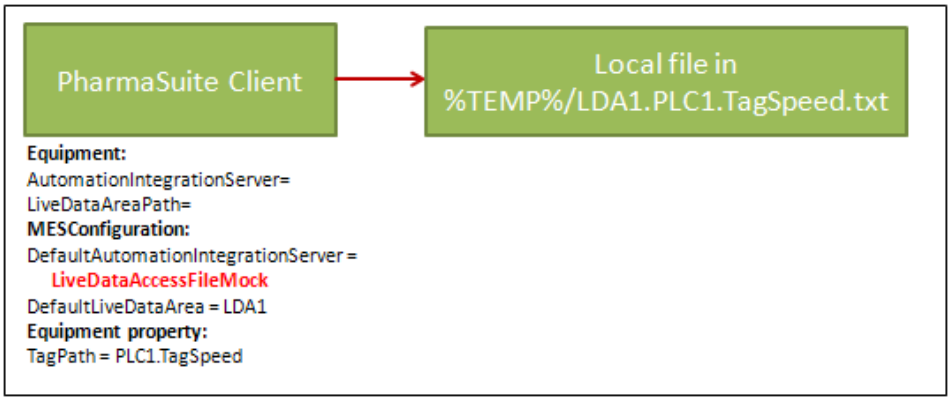

Figure 18: Example: Development-focused test

Chapter 5

Setting up the Historian Infrastructure for PharmaSuite

This section contains general information about the system setup when PharmaSuite reads and browses historical data values from a Historian server on a factory floor network by means of FactoryTalk Historian SE from Rockwell Automation.
Typically, the Historian environment is accessed indirectly by the PharmaSuite Historian Integration server (i.e. the Automation Integration server).

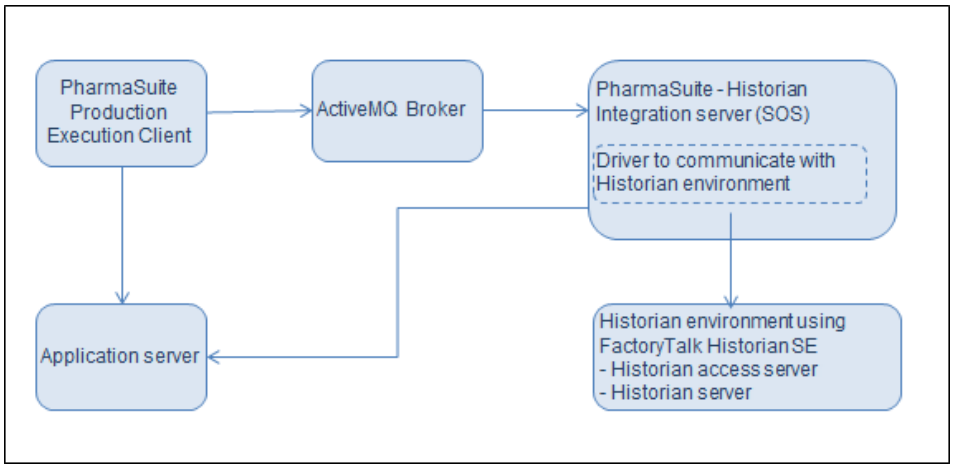

Figure 19: Overview of applied components

TIP

The instructions assume that FactoryTalk Historian SE (Historian server, Historian access server = PI SQL Data Access Server) is already installed, set up, and running. The Historian access server hosts interfaces for the communication with the Historian server. The Historian server is a collection of modules responsible for processing events for each configured data point, configuring them, and archiving the collected data.

Step 1: Network Considerations

Define a network node to be used by the Windows-based PharmaSuite Automation Integration server with access to all of the following systems:

- FactoryTalk ProductionCentre with JBoss as application server
- PharmaSuite Production Execution Clients
  For the ports used by the ActiveMQ JMS message broker, see "Setting up the ActiveMQ JMS Message Broker" (page 14).

- Historian access server (e.g. Data Access Server for PI SQL Clients)
  Direct access to the Historian server is not needed since it is only used indirectly via the Historian access server.

Step 2: Topology Considerations

You may consider the following alternatives for various reasons:

- Performance, install PI JDBC 2010 R3 on the same computer as the Production Execution Client of PharmaSuite for direct access between Production Execution Client and the Historian access server (without JMS via the Automation Integration server).
- Scalability, install several Automation Integration servers to achieve load balancing (see "Step 11: Optional: Installing an Additional PharmaSuite Automation Integration Server" (page 38) of the Live Data infrastructure).
- High availability, install several redundant Automation Integration servers to provide failover support (see "Step 10: Optional: Redundant PharmaSuite Automation Integration Servers for High Availability" (page 34) of the Live Data infrastructure).
- Network segmentation, allow access to separated Historian networks.
  Example: Each of your n different production lines is configured as a separate network and each production line has its own set of Historian access servers. As a consequence you may need N Automation Integration servers.

For other configuration scenarios, see section "Historian Integration Configuration Scenarios" (page 51).

Step 3: PI JBDC Driver Installation

Install the PI JDBC Driver to make the Historian SQL-based access available.

TIP

PI JDBC 2010 R3 is compatible with the current version of PharmaSuite.
The driver is available as part of FactoryTalk Historian Site Edition V3.0.1.

All machines accessing the Historian access server via JDBC need a local installation of the PI JDBC driver. This includes:

- the machine hosting the Automation Integration server used for central PI access and
- the machines running PharmaSuite Data Manager or Production Execution Client on an equipment instance whose Automation Integration server name is set to **LocalHistorianAccess**.

To install the PI JDBC driver, proceed as follows:

1. From the installation media of FactoryTalk Historian SE locate and run *\9518-FTHISTSITE-3.01.00\Redist\Advanced Server Options\PIDASSetup\JDBC\Setup.exe*
2. If Microsoft .NET 4.0 Framework is missing, the installer displays a message that lists the missing components.
   To install the component with the OSI-Soft Prerequisite KIT, locate and run *\9518-FTHISTSITE-3.01.00\Redist\dotNet40\dotNetFx40_Full_x86_x64.exe*

   Then repeat step 1.

The *PIJDBCDriver.jar* driver .JAR file is installed in the *c:\Program Files\PIPC\JDBC* directory.

For details, see OSIsoft PI JDBC 2010 R3 Administrator Guide, page 14, [D3] (page 54).

Step 4: FactoryTalk ProductionCentre Configuration

Before you can use the *PIJDBCDriver.jar* driver .JAR file, you have to deploy the driver to PharmaSuite as a Process Designer **Library** object. This has to be done only once.

In Process Designer, proceed as follows:

1. Create a new **Library** object with the following properties:
   - **Name**: PIJDBCDriver.jar
   - **Library Jar Path**: c:\Program Files\PIPC\JDBC\PIJDBCDriver.jar
2. For each Historian server, configure the credentials in the **Application** object of Process Designer.

Example:

The Historian server name is **FT-H-SE** and the following configuration keys are used in the **Equipment** class of the **Application** object.

Name	Value	Type
HistorianAccessPassword.FT-H-SE	-14,91,49,-34,-114,-117,79,-94,...	String
HistorianAccessUser.FT-H-SE	FT-H-SE\Administrator	String

You can store the password as clear text or encrypted. To encrypt the password, use the **mes_PasswordEncryptionForm** utility.

The names of the Historian access server (=PI Data Access server) and the actual Historian server (=PI server) are configured in PharmaSuite Data Manager as equipment entity attributes.

If the Automation Integration server name is set to **LocalHistorianAccess** instead of e.g. **AutomationIntegrationServer1**, the communication to the Historian access server will be performed directly from the PharmaSuite client using a local PI JDBC driver installation.

Step 5: Installation Verification (Part 1: JDBC Access)

To verify that the JDBC access is working, proceed as follows:

1. Make sure that local Java JRE is available on the machine where PI JDBC has been installed.
2. Open a command prompt, navigate to *c:\Program Files\PIPC\JDBC\Samples\getSnap\bin*
3. Type

```
java getSnap FT-H-SE FT-H-SE sin%
```

where the three parameters are PI SQL DAS name, PI Server name, and PI tag name or tag name wildcard (SQL syntax).

4. The console output will be similar to:

```
com.osisoft.jdbc.Driver 1.2.2.0243
PI SQL DataAccessServer using PIOLEDB
PIOLEDB: 3.3.1.2

SINUSOID 30.510075
SINUSOIDU 0.08331537
```

For details, see OSIsoft PI JDBC 2010 R3 Administrator Guide, page 15, [D3] (page 54).

Step 6: Installing the PharmaSuite Automation Integration Server for Historian

PharmaSuite offers an interface for synchronous service calls to read or verify tags from a Historian server. For this purpose, it internally uses JMS (ActiveMQ) for the communication between the PharmaSuite Automation Integration server and PharmaSuite clients. The requests are performed using JDBC against the PI Data Access server to return the result to the client.

To install the Automation Integration server observe the instructions in section "Setting up Shop Operations Servers" (page 16) and assign the **PharmaSuite_AI_Server** event sheet.

(Optional) In order to control the connection pool used for the OSI PI JDBC communication, a *c3po.properties* file can be included within the Automation Integration server. For this purpose, add the file to the AI server deployment directory and to the classpath of the AI server:

1. Add the *c3po.properties* file to *<path_to_service>\conf*.

2. Extend the classpath in *<path_to_service>\conf\wrapper.conf* to include the properties file.
3. Restart the AI server to apply the changes.

For further information, see "c3p0 - JDBC3 Connection and Statement Pooling" [D4] (page 54).

The user rights to access FactoryTalk Historian SE can be configured as follows:

- The JDBC connection is configured to use Integrated Security (SSPI) configuration for the PI Server login. For details, see OSIsoft, Configuring PI Server Security, [D3] (page 54).
- Configure PharmaSuite to use a specific user and password to login to each Historian access server. For this purpose, for each Historian data access server, add the **Equipment/HistorianAccessUser.<Historian access server name>** and **Equipment/HistorianAccessPassword.<Historian access server name>** configuration keys.
  See chapter "Configuration Keys of PharmaSuite" in Volume 4 of the "Technical Manual Configuration and Extension" [A6] (page 53).
  We recommend to use password encryption.

IMPORTANT

Make sure that the date and time settings are synchronized between the machines that are running the PharmaSuite clients, the ActiveMQ JMS message broker, and the Automation Integration server.
We recommend to

- use the Active Directory mechanism for time synchronization (if available) or
- set up an automated task to frequently synchronize the times. For example, run `hourly:schtasks /create /TN HourlyTimeSync /SC HOURLY /RU SYSTEM /TR "W32tm.exe /resync"` as administrator.
  The **Windows Time** service must be started. Its **Startup Type** should be set to **Automatic**.
  All systems should be synchronized with the same NTP server.

Step 7: Installation Verification (Part 2: Library Object)

To verify the installed Process Designer **Library** object, proceed as follows:

1. In PharmaSuite Data Manager, create a property type of the **Historian** usage type and **BigDecimal** data type.
2. Create an equipment entity and assign the newly created property type as process property in the **Process** tab.
   The verification assumes that the Historian attributes in the **Basic** tab are valid.

3. In the **Process** tab of the entity, open the Historian BigDecimal editor for the property.
4. Type an existing tag name of a numeric Historian tag (valid on the configured server, e.g. SINUSOID), click the **OK** button, and save the entity.
5. Open the Historian BigDecimal editor for the property again and click the **Verify point** button.
   An information message lets you know that the verification was successful (Point name verification was performed successfully.).

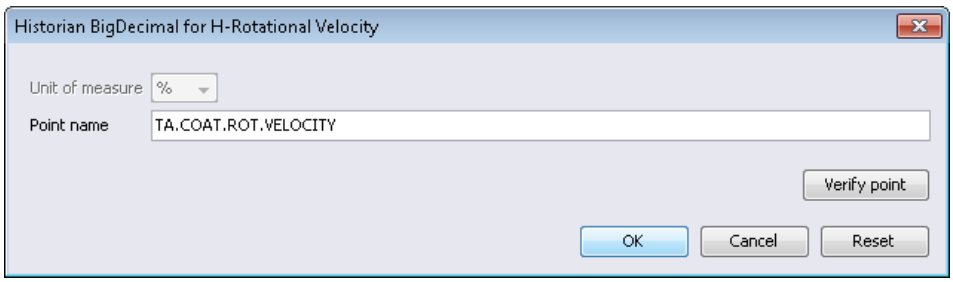

Figure 20: Verification of the Process Designer Library object

Configuration Keys

The following configuration keys are available for setting up a Historian infrastructure:

- Equipment/HistorianAccessUser.<HistorianAccessServerName>
- Equipment/HistorianAccessPassword.<HistorianAccessServerName>
- Equipment/DefaultHistorianServerName
- Equipment/DefaultHistorianAccessServerName
- Equipment/DefaultHistorianAIServerName
- Equipment/PI_JDBC_DCA_OPTION
- Equipment/PI_JDBC_Property_LogFile
- Equipment/PI_JDBC_Property_LogConsole
- Equipment/PI_JDBC_Property_LogLevel
- Equipment/PI_JDBC_URL

For details, chapter "Configuration Keys of PharmaSuite" in Volume 4 of the "Technical Manual Configuration and Extension" [A6] (page 53).

Historian Integration Configuration Scenarios

The following configuration scenarios illustrate specific use cases:

TIP

To improve legibility, the Automation Integration server name and others are abbreviated.

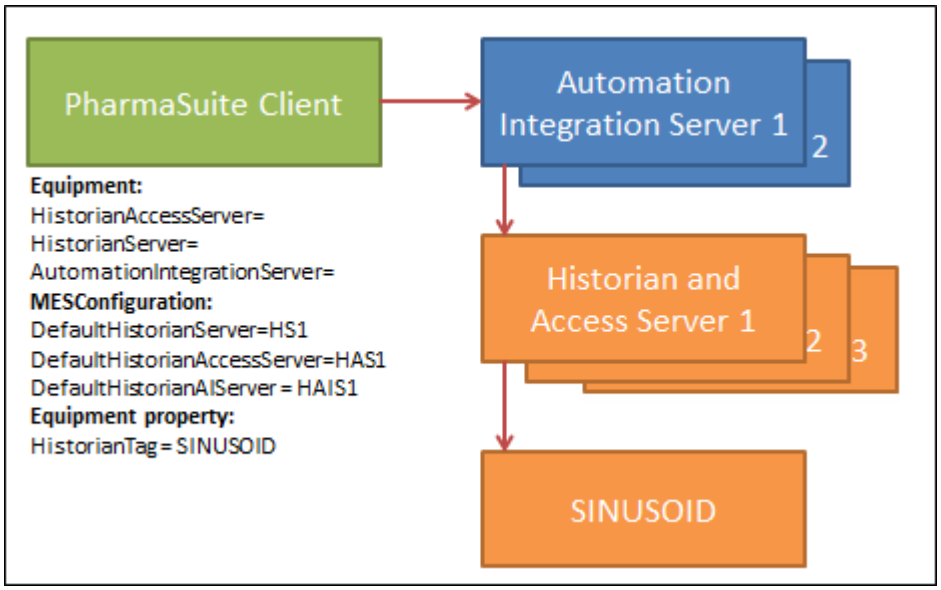

Figure 21: Example: Normal access

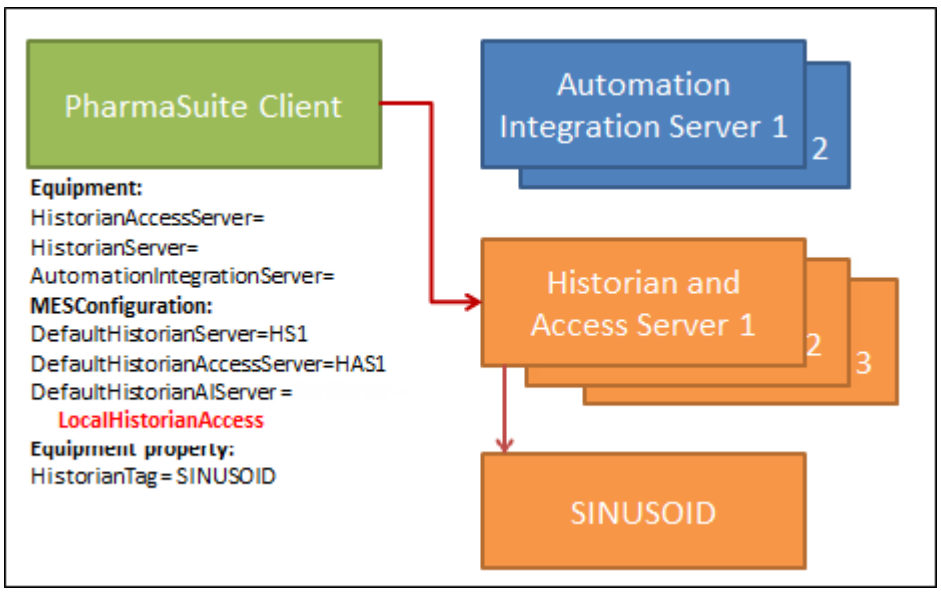

Figure 22: Example: Direct access for performance reasons

Chapter 6

Reference Documents

The following documents are available from the Rockwell Automation Download Site.

No.	Document Title	Part Number
A1	FactoryTalk ProductionCentre 10.4 Supported Platforms Guide	PRDCTR-RM104A-EN-E
A2	FactoryTalk ProductionCentre Release 10.4 Database Installation Guide	PRDCTR IN104A EN E
A3	FactoryTalk ProductionCentre Plant Operations Release 10.4 Server Installation Guide - JBoss Advanced	PCJBAD IN104A EN E
A4	PharmaSuite Supported Platforms Guide	PSPG-RM084A-EN-E
A5	FactoryTalk ProductionCentre Administrator Release 10.4 User's Guide	PCADM-IN104A-EN-E
A6	PharmaSuite Technical Manual Configuration & Extension - Volume 4	PSCEV4-GR008E-EN-E
A7	RSLinx (http://www.rockwellautomation.com/rockwellsoftware/design/rslinx/)	N/A
A8	PharmaSuite Technical Manual Developing System Building Blocks	PSBB-PM007E-EN-E
A9	PharmaSuite Technical Manual Administration	PSAD-RM008E-EN-E

TIP

To access the Rockwell Automation Download Site, you need to acquire a user account from Rockwell Automation Sales or Support.

The following documents are distributed with the FactoryTalk ProductionCentre and other FactoryTalk installations.

No.	Document Title / Section
B1	Process Designer Online Help
B2	FactoryTalk Help This is the FactoryTalk Administration Console Online Help and the FactoryTalk Directory Server Location Utility Online Help.
B3	Live Data Test Client Help
B4	FactoryTalk ProductionCentre Support Home Page (http://rockwellsoftware.custhelp.com/app/home)

TIP

To access the "Process Designer Online Help", use the following syntax: *http://<MES-PS-HOST>:8081/PlantOpsDownloads/docs/help/pd/index.htm*, where <MES-PS-HOST> is the name of your PharmaSuite server. To view the online help, the Apache Tomcat of the FactoryTalk ProductionCentre installation must be running.

The following documents are distributed with the PharmaSuite installation.

No.	Document Title / Section
C1	Production Execution User Documentation

TIP

To access the "Production Execution User Documentation", use the following syntax: *http://<MES-PS-HOST>:8080/PharmaSuite/documentationandhelp/index.htm*, where <MES-PS-HOST> is the name of your PharmaSuite server.

The following third-party documentation is available online as reference:

No.	Document Title / Web Site
D1	ActiveMQ, Tools - Java Service Wrapper (http://activemq.apache.org/java-service-wrapper.html)
D2	ActiveMQ - Features - Clustering - MasterSlave (http://activemq.apache.org/masterslave.html)
D3	OSIsoft (http://www.osisoft.com/) PI JDBC 2010 R3 Administrator Guide Configuring PI Server Security
D4	c3p0 - JDBC3 Connection and Statement Pooling (http://www.mchange.com/projects/c3p0/#c3p0_properties)

Appendix A

Revision History

The following table describes the history of this document.

Changes related to the document:

Object	Description	Document
---	---	---

Changes related to "Introduction" (page 1):

Object	Description	Document
Introduction (page 1)	FactoryTalk ProductionCentre version updated.	1.0

Changes related to "Installing PharmaSuite Enterprise Edition on FactoryTalk ProductionCentre with JBoss" (page 3):

Object	Description	Document
Information Checklist (page 4)	Java version updated to 1.8.0_144. ActiveMQ and the PharmaSuite upgrade engine runs with the 64-bit version of Java.	1.0
Executing the Installation Script (page 8)	Step 3: Java version updated to 1.8.0_144.	1.0
Setting up the ActiveMQ JMS Message Broker (page 14)	ActiveMQ version updated to 5.15.0. It runs with the 64-bit version of Java.	1.0
Setting up Shop Operations Servers (page 16)	Step 3: adaption of heap space added. Step 4: configuration of resource handling added. Step 6: log file name configuration updated.	1.1
Setting up Shop Operations Servers (page 16)	Step 3: configuration of the Java command (32-bit) for launching a JVM added.	1.2

Changes related to "Troubleshooting Installation Issues" (page 23):

Object	Description	Document
---	---	---

Changes related to "Setting up the Live Data Infrastructure for PharmaSuite" (page 25):

Object	Description	Document
---	---	---

Changes related to "Setting up the Historian Infrastructure for PharmaSuite" (page 45):

Object	Description	Document
Step 6: Installing the PharmaSuite Automation Integration Server for Historian (page 48)	The option to control the connection pool used for the OSI PI JDBC communication with c3p0 - JDBC3 Connection and Statement Pooling is no longer supported.	1.0
Step 6: Installing the PharmaSuite Automation Integration Server for Historian (page 48)	The option to control the connection pool used for the OSI PI JDBC communication with c3p0 - JDBC3 Connection and Statement Pooling is still supported.	1.1

Index

M

O

R

S

T