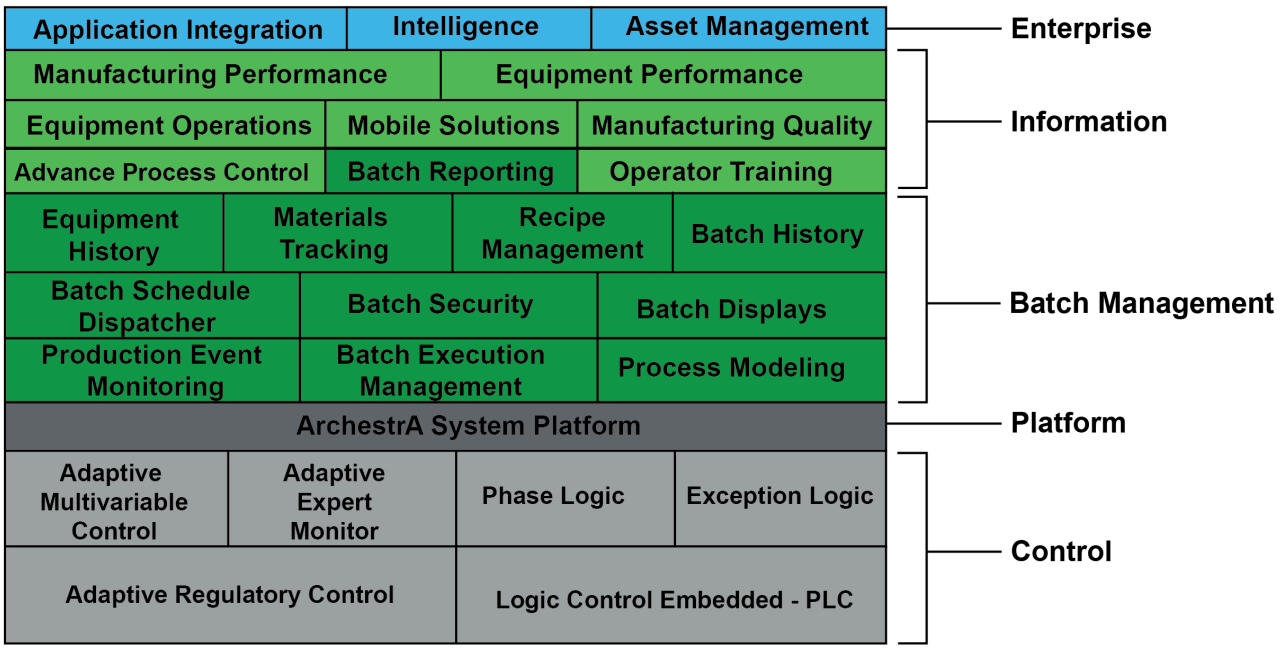
# Foxboro™ DCS

## Batch Management 2023 (v13.0)

## PSS 41S-4BATCH

**Product Specification**

**March 2025**



# Legal Information

The information provided in this document contains general descriptions, technical characteristics and/or recommendations related to products/solutions.

This document is not intended as a substitute for a detailed study or operational and site-specific development or schematic plan. It is not to be used for determining suitability or reliability of the products/solutions for specific user applications. It is the duty of any such user to perform or have any professional expert of its choice (integrator, specifier or the like) perform the appropriate and comprehensive risk analysis, evaluation and testing of the products/solutions with respect to the relevant specific application or use thereof.

# Features

Batch Management software is a flexible batch management system that automates batch processes and provides a complete production history. Consistent with the Instrumentation, Systems, and Automation Society of America ANSI/ISA 88.01 - 1995 standard, Batch Management software allows you to quickly and easily create recipes and simulate their execution against a model of the process - all before writing one line of control code. Batch Management software also provides a complete material genealogy.

Batch Management software features include:

- Field-proven batch engine
- Redundant Batch Server option
- Material genealogy
- Integrated Batch human interface (Batch View) when installed to work with Foxboro DCS™ software
- Integration with FoxView™ software, FoxAlert™ software, Sequential Function Chart and Structured Text (SFC/ST) Display Manager, and AIM*AT® software when installed to work with Foxboro DCS software
- Integration with AVEVA™ System Platform, Galaxy Repository, AVEVA InTouch® software and AVEVA Historian software when installed to work with the Foxboro DCS Control Software
- Batch History data stored in Microsoft SQL Server
- Web-based reporting leveraging Microsoft® Reporting Services
- FoxBatch™, RBATCH, I/A Series Batch, and InBatch Application Migration
- With the purchase of AVEVA Enterprise Integrator and additional services, comprehensive Enterprise Application Integration (EAI) solutions can be implemented for Batch Management software using World Batch Forum Business to Manufacturing (B2MML) schema, based on the ISA-95 standard
- Aids compliance with FDA 21 CFR Part 11 on Electronic Records and Electronic Signatures

# Benefits

- Reduces the life-cycle engineering effort and facilitates recipe development and updating
- Reduces dependence on system experts (recipe configuration can be done by process engineers or chemists)
- Speeds batch processing for greater production capability
- Produces more consistent batches that meet tighter tolerances
- Provides flexibility for manufacturing different products, grades of products, and quick switchover between products
- Offers extensive data collection and batch production reports that help in production tuning and in meeting FDA requirements
- Provides expandability from entry level system to large installations while maintaining full functionality

# Overview

**NOTE:** With the release of v12.1 of this software, the name of this batch software has changed from *InBatch* to *Batch Management*. Unless specifically stated, the references to InBatch in this PSS also relate to Batch Management.

Batch Management software enables comprehensive batch control solutions to process industries, such as food, beverage, life sciences, and fine chemicals.

Batch Management software is an easy-to-use graphical control package that requires no programming. A model of the process is created interactively on workstation display screens with icons and selections from pull-down menus. Recipes are configured by specifying unit and phase data interactively. The recipes are represented graphically in IEC 61131-3 based sequential function charts.

Batch Management software provides recipe management, production information management functions, and an appropriate environment for hierarchical structuring of batch process control.

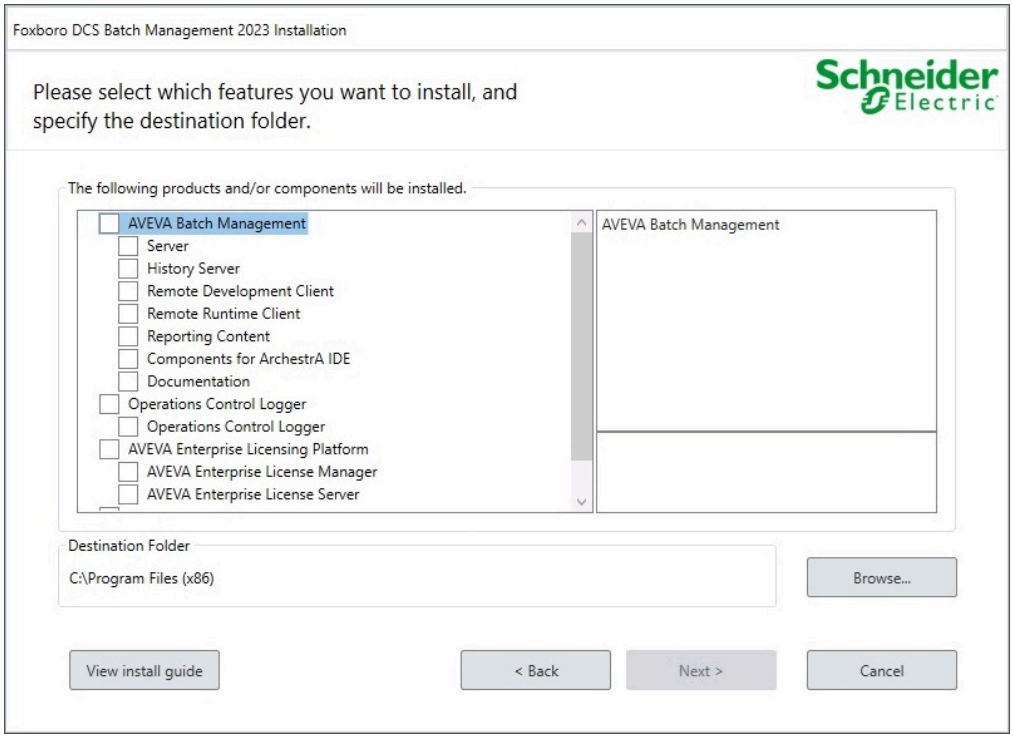
Batch Management software has a hierarchical management and control structure that allows plant engineers to maintain the system easily. By splitting the logic into real-time process control (the phases running in sequence blocks) and supervisory (Batch) control, a top-down/bottom-up approach allows a structured and efficient implementation of batch projects. All configuration data, recipes, and batch records are kept in relational databases.

Integration of the Batch system with enterprise and Manufacturing Execution Systems (MES) modules enables a more complete batch management solution including equipment and production performance and optimization.

# Installation Options

You can install and configure Batch Management software with or without I/A Components that enable tighter integration to the Foxboro DCS distributed control system. The I/A Components include the Foxboro DCS driver communication software via AIMAPI, Foxboro DCS IA Linker, as well as the Foxboro DCS extensions to the runtime batch scheduling and display interfaces and batch reporting.

Installing and configuring Batch Management software without the I/A Components enables a tighter integration to the AVEVA System Platform, security, Galaxy Repository, and use of the Foxboro DCS Device Integration Object (IADI) and/or the Foxboro DCS Data Access Server (IADAS) for communication to the Foxboro DCS as typically delivered in a Foxboro DCS Control Software solution.



# Process Modeling

A batch processing plant is made up of units, process classes, connections, transfer classes, process phases, and transfer phases.

- A unit is a group of equipment that processes materials such as reactors, mixers, blenders, trains and retorts. A unit can also simply hold materials. Examples of units are reactors, holding tanks, bulk storage vessels, filling stations, and manual addition stations.
- Process classes are groups of units. Each unit in the class has the same processing capabilities and/or performs the same function.
- Connections define a group of equipment that transfers material from a source unit to a destination unit.
- Transfer classes define a group of connections where all source units are in the same process class and all destination units are in the same process class.
- Process phases with their parameters define the capability of process classes.
- Transfer phases with their parameters define the capabilities of transfer classes.

An integral part of process modeling involves defining specific data points, called tags, for units, processes, connections, and transfers. Tags allow the mapping of data between Batch Management software and the controllers.

# Model Import/Export

The Batch Management Import Export Utility can be used to export a portion of a model from one model database and then import it into a new model database. This utility is useful when you have a corporate master database and want to use it to create new plant level model databases, which are a subset of the master.

The Batch Management Import Export Utility can also be used to copy phases from one process/transfer class to other process/transfer classes, either in the same model or a different model.

# Materials Tracking

Materials tracking defines materials as ingredients, intermediates, finished goods, by-products and others, and includes the characteristics of each material. The batch materials database is used to automatically track the location of materials stored in different units.

The batch management function uses the ingredients' location data to get ingredients during the manufacture of a batch. This capability allows ingredient locations to be independent of recipes and control programs and permits ingredients to change location with no effect on recipe execution provided that a comprehensive process model is used.

The unit location can be entered in the materials database by plant personnel when new ingredients are received. A lot identification can also be assigned to a material, and multiple lots of the same ingredient can be stored in the same vessel.

The batch management system updates the database when ingredients are used and when intermediates and finished goods are produced. The materials database provides easy access to work-in-process (WIP) information and can be used to update higher level management and Material Resource Planning (MRP) systems with ingredient usage, work-in-process, and finished goods production information. Materials tracking can be used to complement an existing inventory system.

# Process Management

## Batch Scheduling

A batch is scheduled by entering the campaign, lot, batch, and recipe name. A formula can also be assigned to a scheduled batch. The formula can be modified outside of Batch Management, and then used to change the formula values for the active batch. This allows the use of the same generic recipe procedure with different formula values and/or materials during run time. The train also needs to be selected with the batch size and the mode. The mode can be automatic, semi-automatic, or manual.

The batch scheduling function maintains a list of batches to be produced and allows priority based execution of batches, where the priorities can be manually specified or modified.

## Batch Management

The Batch Manager directs and supervises the execution of the batches. Based on the recipe procedure, phases are executed in sequential and parallel fashions after checking that the appropriate transition conditions are satisfied.

The Batch Manager also interfaces with batch display modules and provides operators with information on the batches running in the system. The Batch Manager coordinates the usage of process units for each batch and allocates units as they are available, within the specified train. Unit selection can also be done manually. The Batch Manager captures all batch execution events and operator activities during the execution of a batch and sends this information to the Batch History database.

## Simulating Batches

Batch Management software allows batches to be run in a simulation mode, where batches are created and run without actually starting the phases in a control processor. You specify a global phase duration time to permit operator interaction during the simulated execution.

## Recipe Procedure Jumps

The Batch View allows you, as the operator, to jump forward or backward in the recipe procedure and edit phase parameters (formula). To enter the jump mode, the batch must be in the Held state.

After exiting the jump mode, you can restart the batch at the selected procedure. All events are logged by the Batch Historian.

## Save Control Recipe as Master Recipe

At batch completion, as an operator, you may save 1) all phase parameter edits, and/or 2) the equipment used (creating an equipment-dependent recipe), as a master recipe. You have the option to overwrite the existing master recipe increasing the version level, or to save it as a new master recipe. You are required to enter a user

name and, if desired, may enter a comment. You must have an appropriate security role for a save to occur.

# Recipe Management

The recipe management function provides the environment to configure, copy, and modify master recipes in an IEC 61131-3 graphical environment. The recipe structures follow the ANSI/ISA 88.01 - 1995 standard and support all three levels of the standard: unit procedure, operation, and phase.

Batch Management software provides the environment for maintaining version history of a master recipe with date and time stamp, author name, and optional comments. Up to five levels of recipe approvals can be implemented.

A master recipe is scalable to the batch size specified manually or by production schedule. All formula quantities for ingredients, intermediates, by-products, and finished goods are scalable and can be entered either as actual quantities or as a percent of the total batch size.

The Recipe Editor features a BatchML standards- based XML file import and export that allows you to move or share recipe and formula information between multiple Batch Management or third party systems. The Batch Markup Language (BatchML) is courtesy of the World Batch Forum, and consists of a set of XML schemata. In addition to XML, recipe formulas can be imported and exported in CSV format. This allows a formula to be modified outside of Batch Management.

## Recipe Types

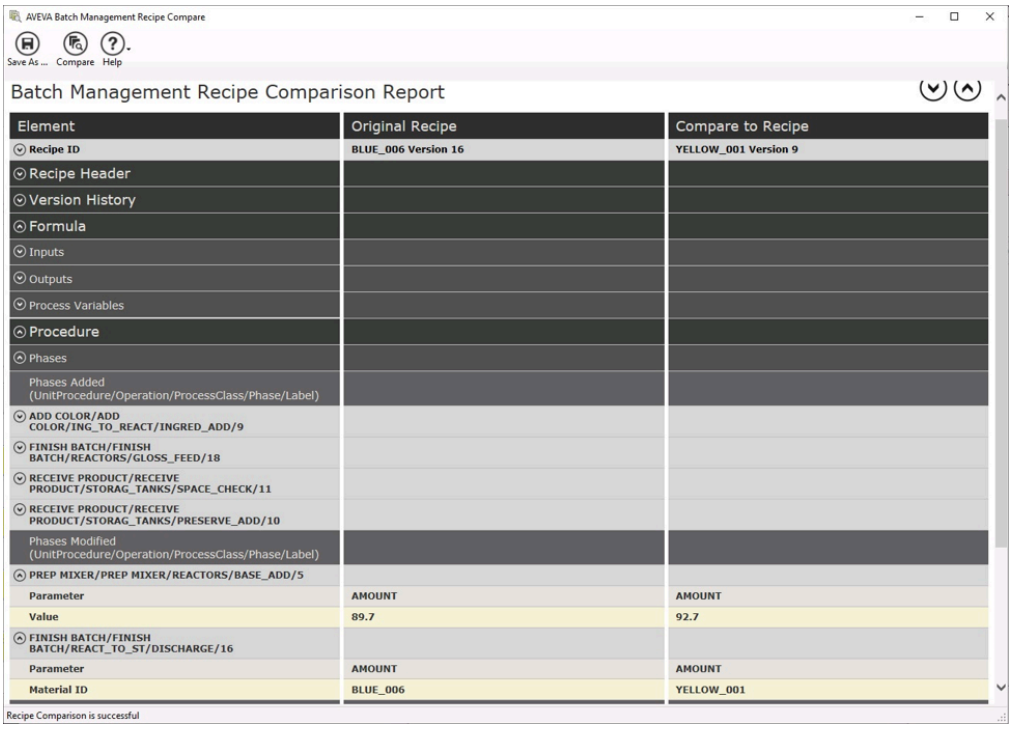
You have the ability to define recipe types. This allows you to group recipes for easy retrieval and scheduling. Examples of recipe types include clean-in-process, barbecue sauce, salad dressing.

## Recipe States

You have the ability to define recipe states. Examples of these states include Development, Production, Test, Review, Archive, and so forth. This allows you to group recipes for easy retrieval for editing.

## Recipe Comparison

A Recipe Compare utility is available to compare (either different versions of the same recipe or two different recipes) and then view and save a generated report showing the differences between them. The recipes to compare must have been previously exported from RecipeEdit in XML format. This can be done automatically when recipes are saved and/or approved. The Recipe Compare report provides color-coded details about additions, deletions and modifications to the recipe configuration (for example, process variables added to a phase, changes to the equipment requirements, and so on).


AVEVA Batch Management Recipe Compare
Save As ...
Compare
Help
Batch Management Recipe Comparison Report
Element
Original Recipe
Compare to Recipe
Recipe ID
BLUE_006 Version 16
YELLOW_001 Version 9
Recipe Header
Version History
Formula
Inputs
Outputs
Process Variables
Procedure
Phases
Phases Added (UnitProcedure/Operation/ProcessClass/Phase/Label)
ADD COLOR/ADD COLOR/ING_TO_REACT/INGRED_ADD/9
FINISH BATCH/FINISH BATCH/REACTORS/GLOSS_FEED/18
RECEIVE PRODUCT/RECEIVE PRODUCT/STORAG_TANKS/SPACE_CHECK/11
RECEIVE PRODUCT/RECEIVE PRODUCT/STORAG_TANKS/PRESERVE_ADD/10
Phases Modified (UnitProcedure/Operation/ProcessClass/Phase/Label)
PREP MIXER/PREP MIXER/REACTORS/BASE_ADD/5
Parameter
AMOUNT
AMOUNT
Value
89.7
92.7
FINISH BATCH/FINISH BATCH/REACT_TO_ST/DISCHARGE/16
Parameter
AMOUNT
AMOUNT
Material ID
BLUE_006
YELLOW_001
Recipe Comparison is successful

# Production Information Management

Production information management comprises:

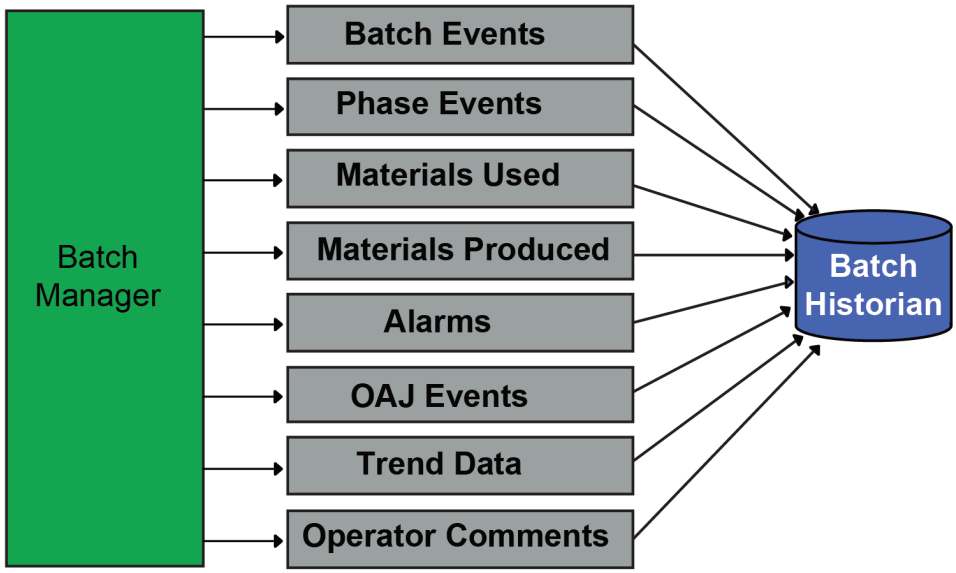
- Batch History Server for Batch History and Reporting functions
- Historian
- Batch, Equipment, and Security History
- Historian Archive Function
- Process Logger
- Reporting System

## Batch Historian

Comprehensive batch, equipment, and security history and flexible real-time reporting are hallmarks of Batch Management software. The Batch Historian uses Microsoft SQL Server to store batch history information.

The Batch Manager captures and logs events to the Batch Historian when batches are executing (refer to the figure below). All these events are stored with time, date, and batch ID for easy retrieval.

**Figure 1 - Batch History (EBR)**




## History Archive Function

The History Archive function allows you to create, edit, and execute archiving tasks that are registered by SQL Server. You identify the starting point and the ending point for archiving history data. The dates are inclusive, that is, all batches completed on or after the starting date and all batches completed on or before the ending date are archived. A batch is considered completed when it has obtained a status of Done or Aborted, and is closed (removed from the batch schedule). After an archive has been created, it can be deleted, restored or purged.

# Process Logger

The Process Logging system is an additional historical data capture feature aside from the standard Batch History. You can configure it to retrieve any existing Batch-tag data value, periodic time intervals, or based on the occurrence of events, and then logs the data to a printer or to the history database for storage.

A Process Log configuration consists of one or more groups of tags, with each group having its own logging criteria. The criteria control how the groups of tags and their respective values are sampled and logged at run time by the Process Log Manager.

# Reporting System

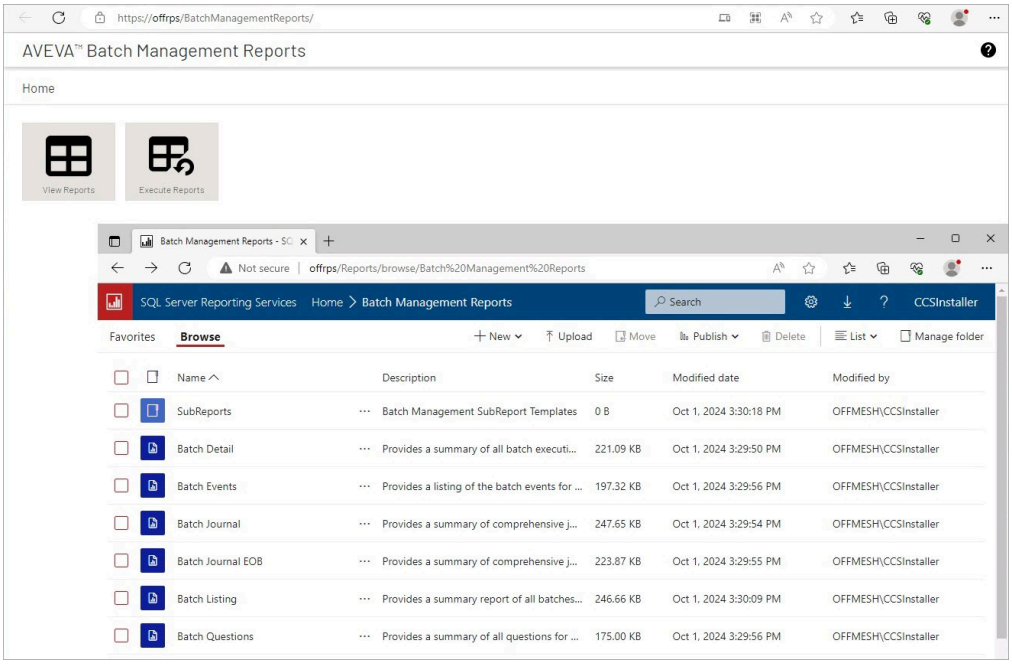
With Batch Management software, real-time reporting capabilities are available using Microsoft Reporting Services (SSRS) capabilities for configuring and viewing reports.

Client access licenses are required for viewing published reports on workstations in a network.

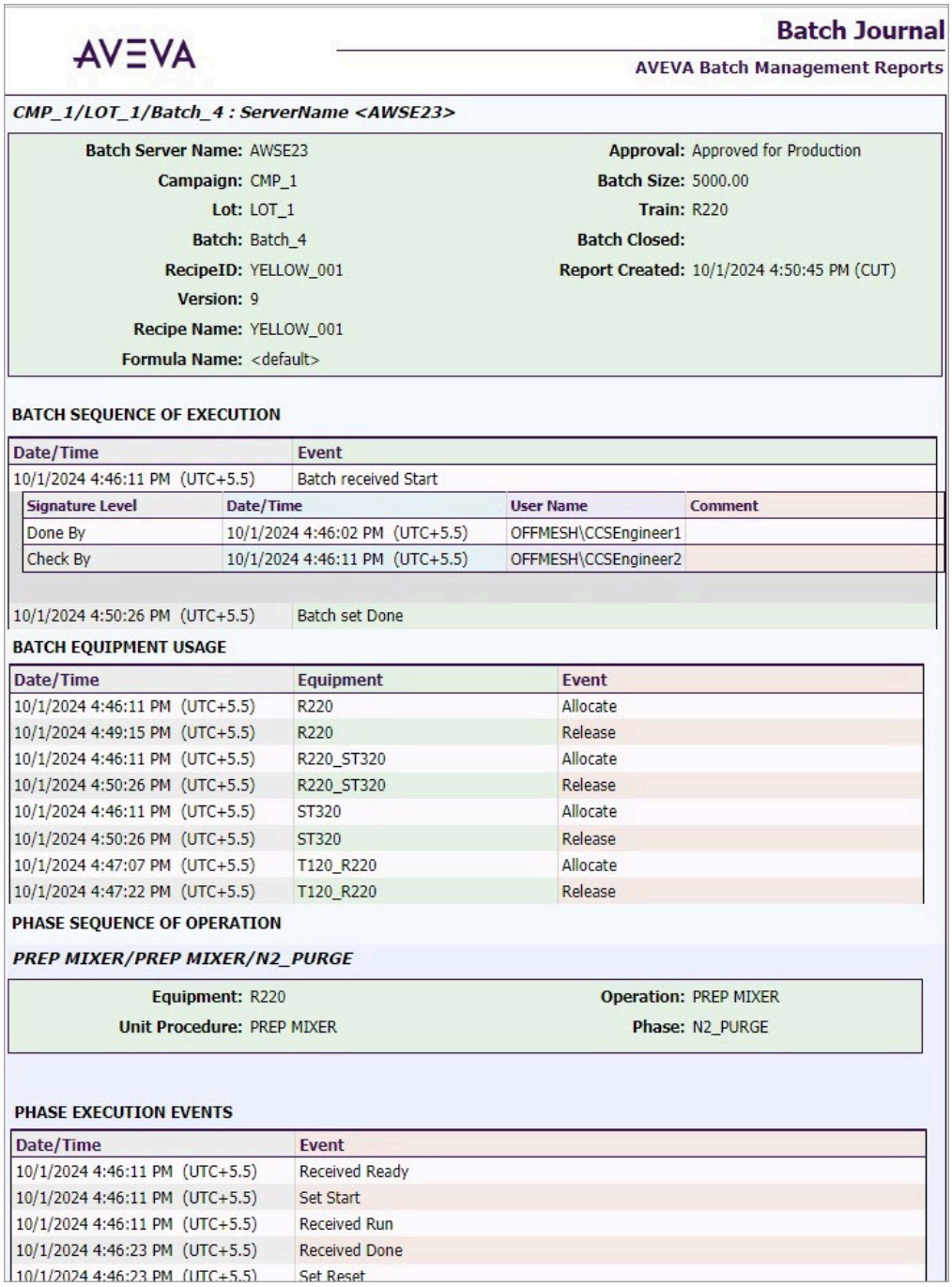
Reports are available to any workstation equipped with a network connection to the batch reporting server, a valid license, and an Internet browser. The reporting system offers end-of-batch reports and time triggers, such as time of day. Both batch and continuous data can be combined in one report.

Batch Management software provides more than 20 report templates as examples for your use. You can run and view reports using the Reporting Services interface as shown in this figure.

**Figure 2 - Batch Reports Interface via Reporting Services**




Reports can retrieve any piece of information stored in the Batch Historian and can be used in a real-time or off-line mode. This image below is a sample batch journal report:



AVEVA

**Batch Journal**

AVEVA Batch Management Reports

***CMP_1/LOT_1/Batch_4 : ServerName <AWSE23>***

| | | | |
|---|---|---|---|
| **Batch Server Name:** | AWSE23 | **Approval:** | Approved for Production |
| **Campaign:** | CMP_1 | **Batch Size:** | 5000.00 |
| **Lot:** | LOT_1 | **Train:** | R220 |
| **Batch:** | Batch_4 | **Batch Closed:** | |
| **RecipeID:** | YELLOW_001 | **Report Created:** | 10/1/2024 4:50:45 PM (CUT) |
| **Version:** | 9 | | |
| **Recipe Name:** | YELLOW_001 | | |
| **Formula Name:** | <default> | | |

**BATCH SEQUENCE OF EXECUTION**

| Date/Time | Event |
|---|---|
| 10/1/2024 4:46:11 PM (UTC+5.5) | Batch received Start |

| Signature Level | Date/Time | User Name | Comment |
|---|---|---|---|
| Done By | 10/1/2024 4:46:02 PM (UTC+5.5) | OFFMESH\CCSEngineer1 | |
| Check By | 10/1/2024 4:46:11 PM (UTC+5.5) | OFFMESH\CCSEngineer2 | |

| | |
|---|---|
| 10/1/2024 4:50:26 PM (UTC+5.5) | Batch set Done |

**BATCH EQUIPMENT USAGE**

| Date/Time | Equipment | Event |
|---|---|---|
| 10/1/2024 4:46:11 PM (UTC+5.5) | R220 | Allocate |
| 10/1/2024 4:49:15 PM (UTC+5.5) | R220 | Release |
| 10/1/2024 4:46:11 PM (UTC+5.5) | R220_ST320 | Allocate |
| 10/1/2024 4:50:26 PM (UTC+5.5) | R220_ST320 | Release |
| 10/1/2024 4:46:11 PM (UTC+5.5) | ST320 | Allocate |
| 10/1/2024 4:50:26 PM (UTC+5.5) | ST320 | Release |
| 10/1/2024 4:47:07 PM (UTC+5.5) | T120_R220 | Allocate |
| 10/1/2024 4:47:22 PM (UTC+5.5) | T120_R220 | Release |

**PHASE SEQUENCE OF OPERATION**

***PREP MIXER/PREP MIXER/N2_PURGE***

| | | | |
|---|---|---|---|
| **Equipment:** | R220 | **Operation:** | PREP MIXER |
| **Unit Procedure:** | PREP MIXER | **Phase:** | N2_PURGE |

**PHASE EXECUTION EVENTS**

| Date/Time | Event |
|---|---|
| 10/1/2024 4:46:11 PM (UTC+5.5) | Received Ready |
| 10/1/2024 4:46:11 PM (UTC+5.5) | Set Start |
| 10/1/2024 4:46:11 PM (UTC+5.5) | Received Run |
| 10/1/2024 4:46:23 PM (UTC+5.5) | Received Done |
| 10/1/2024 4:46:23 PM (UTC+5.5) | Set Reset |

# Enhanced Security Options

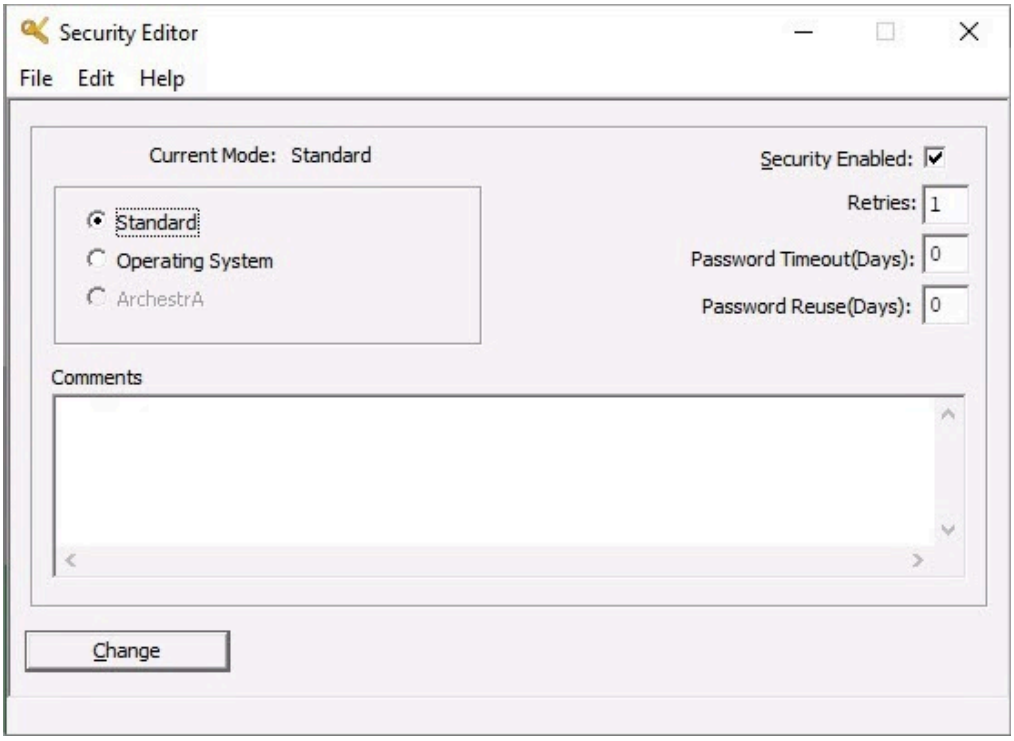
## Standard Batch Security

Batch Management software provides a standard security mode which may be used to control the access and manipulation capability of users. A security role is assigned to users based on their job functions such as operators, supervisors, engineers, and so forth. Only one security role can be assigned to a given user. New security roles can be added to the security system at any time, and there is no limit to the number of roles that can be defined.

Batch Management applications and their associated functions can be assigned security roles defining which groups of users can access an application and which groups can execute and verify the various functions available within that application. The Batch applications include Batch Display, Batch Scheduler, Process Model Editor, Recipe Editor, and so forth. Each application can be assigned one or more security access roles permitting groups of users to access the application. Applications can be added to the security system at any time.

The Batch software supports security for execution and verification of the functions available within an application. As an example, the Batch Display application includes functions such as Abort Batch, Allocate Equipment, Start Batch, Unit Hold, and so forth. Each function can be assigned one or more Done By and Check By security roles. More than one role can be permitted to perform or verify a function, for example, both operators and supervisors could be permitted to perform a function, but only supervisors could verify the function.

Recipe assignments protect against operators working on products for which they have not been trained.



# Support for Electronic Records and Electronic Signatures Regulations

Batch Management software has been designed for use in validated processes that must comply with the FDA 21 CFR Part 11 on Electronic Records and Electronic Signatures and EudraLex Annex 11. A white paper describing the regulation and how the Batch Management software helps users comply with the regulation is available. Refer to the AVEVA documentation portal for more information.

# Batch Software Deployment

## Localization and Regional Settings

Batch Management is designed to facilitate localization. Batch Management's default language is US-English.

There are three different repositories for localization in Batch Management:

- BatchServer
- Admin Web
- Report Web

You can localize the user interface, messages, and all features of Batch Management with the exception of several applications and interfaces as described in the user documentation.

## Upgrading to Batch Management Software

Information about migration of Model, Recipe, Material, Link, Logger, and Security databases to Batch Management 2023 (v13.0) from previous versions of RBATCH, I/A Series Batch, InBatch, and Batch Management software is available upon request. For additional information, contact Global Client Support (GCS).

## Foxboro DCS Integration

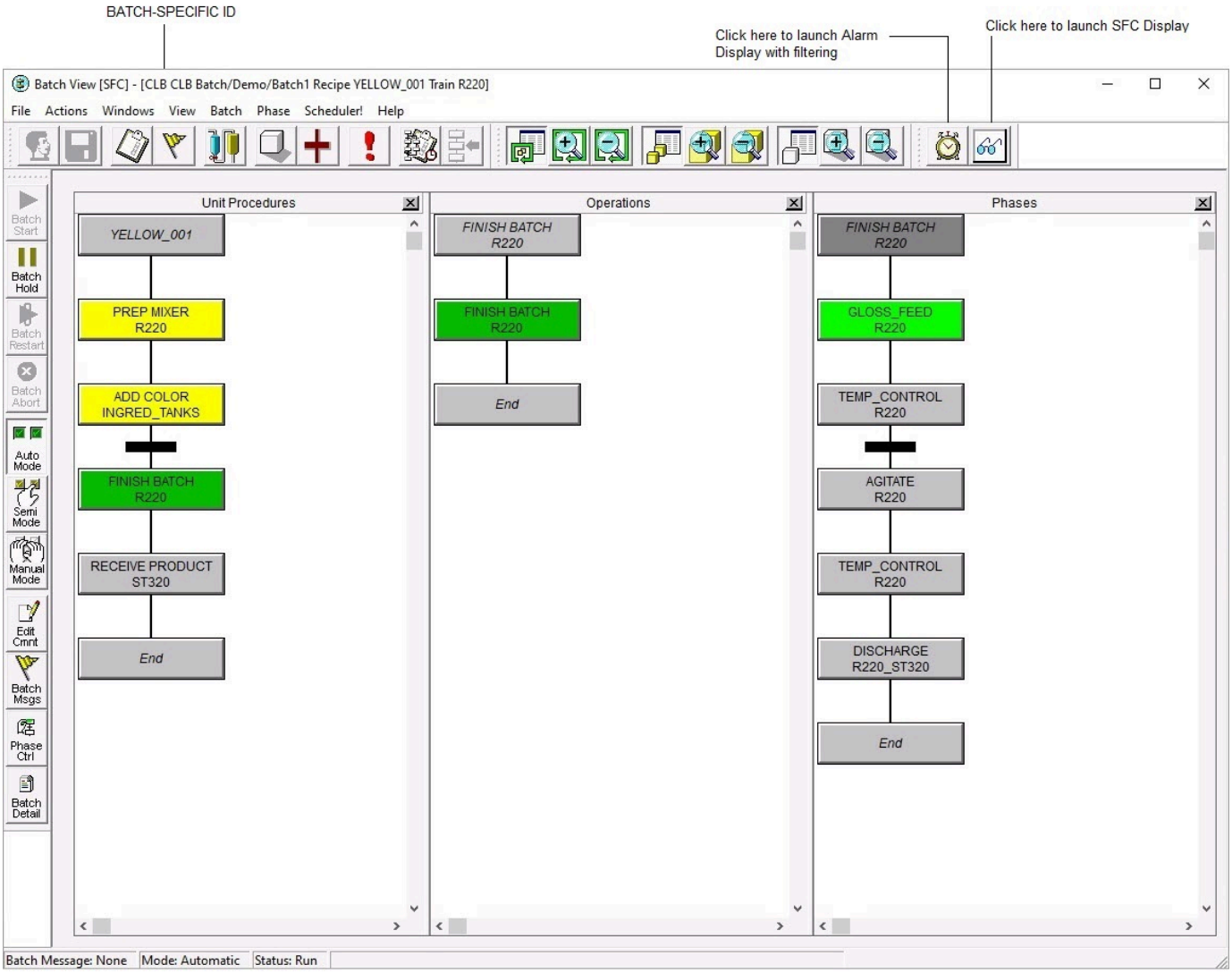
I/A Components are required for systems without Control Software or systems that upgraded to Control Software, but need to keep backwards compatibility as their application was built this way. For example, systems with AIMAPI or BatchView.

When using I/A Components, associations between equipment and a batch are dynamically made in the control package so that any batch related alarm messages contain the Batch ID. This ensures data integrity when queries are made later on the Batch Historian and obviates the need to infer associations between equipment and a batch based on time.

Using the Batch display for a given batch, you can launch FoxAlert software with match filtering automatically set to the Batch ID of that batch. This ensures that only those alarms that pertain to that batch are displayed in this view (refer to the figure below). Phase and formula parameter descriptions are available from the Batch display.

Phase logic is implemented using Foxboro DCS sequence blocks and can be configured and displayed in a graphical format that follows the IEC 61131-3 standard. When viewing a phase from the Batch display, you can launch the SFC/ST display for that phase (if it was configured using the SFC/ST Configurator) to quickly and easily determine, via highlighting, where you are in that phase and to view the live, updating evaluation of any active transitions (refer to the figure below). This greatly reduces the time to debug and commission phase logic as well as provides a handy tool to operations people for ongoing support.

**Figure 3 - Integration with FoxAlert and SFC/ST Display Manager**




When installed without the I/A Components, Batch Management software is still well integrated with the rest of the Foxboro DCS platform, but the integration is done using Foxboro Control Software and standard Batch Management features rather than the integration options described above. Communication to the Foxboro DCS control system is done using the Foxboro DCS Device Integration Object (IADI) and/or the Foxboro DCS Data Access Server (IADAS).

# System Platform Integration

When installed without the I/A Components, Batch Management software includes several features for tightly integrating the software to the rest of the System Platform infrastructure including Foxboro DCS software. Batch tags can be linked to the galaxy repository and a communication software module (IBMX) is available to communicate with System Platform rather than directly to the control system. Application objects and attributes can be browsed and assigned within the batch tag linker application. Standard batch security can be enhanced to support operating system or System Platform security. In addition, the ActiveX controls can be used to develop a tightly integrated human machine interface if using AVEVA InTouch software or Industrial graphics with .NET components.

# Batch System Configuration

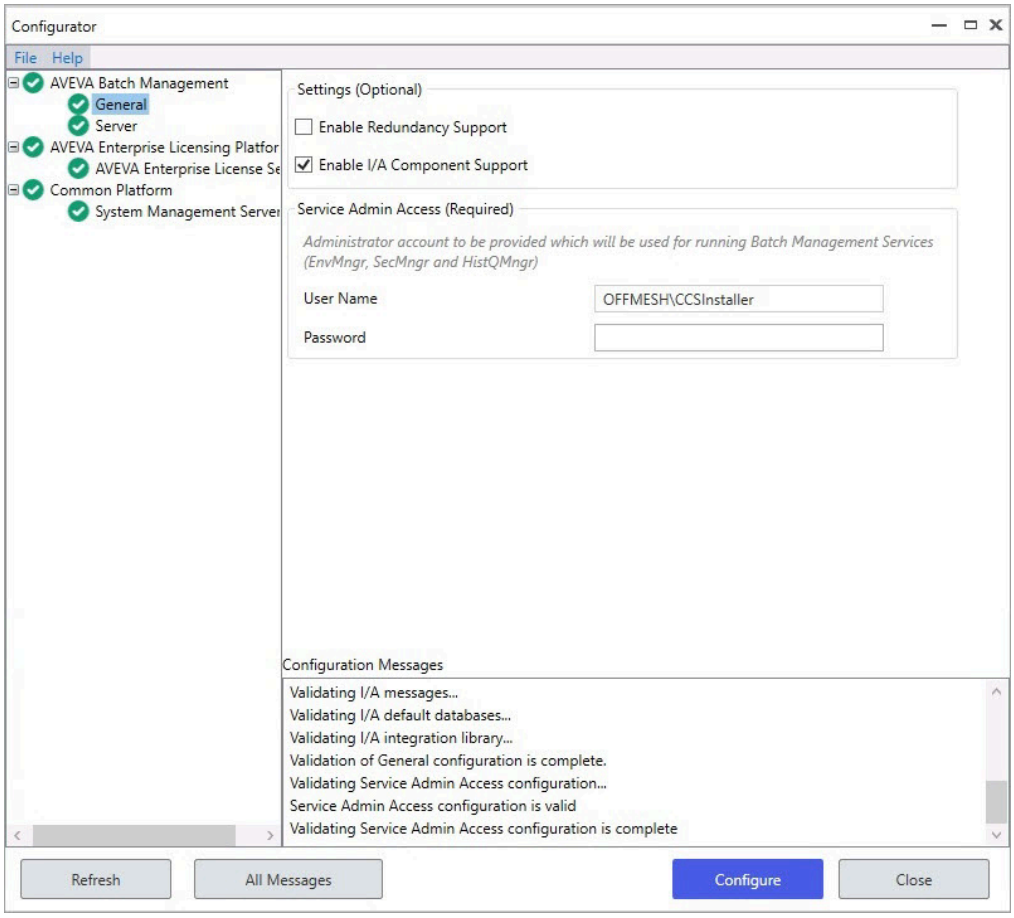
The Batch Management system is comprised of several components including Batch Server, Runtime Client, Development Client, History Server, Reporting Content. A utility is used to configure each component. See the figure below.

The Batch Management server is scalable and available in three sizes: large, medium, and small. The number of runtime and development stations is selectable.

The Batch Server license includes the Runtime Client and the Development Client functionality, giving access to all product capabilities from the Batch Server workstation. Additional Runtime and Development clients may be installed on other workstations as required.

The History Server and Reporting Content can be installed on one workstation or split onto two different workstations. The Batch Management server as well as the batch history and reporting server must be server class computers.

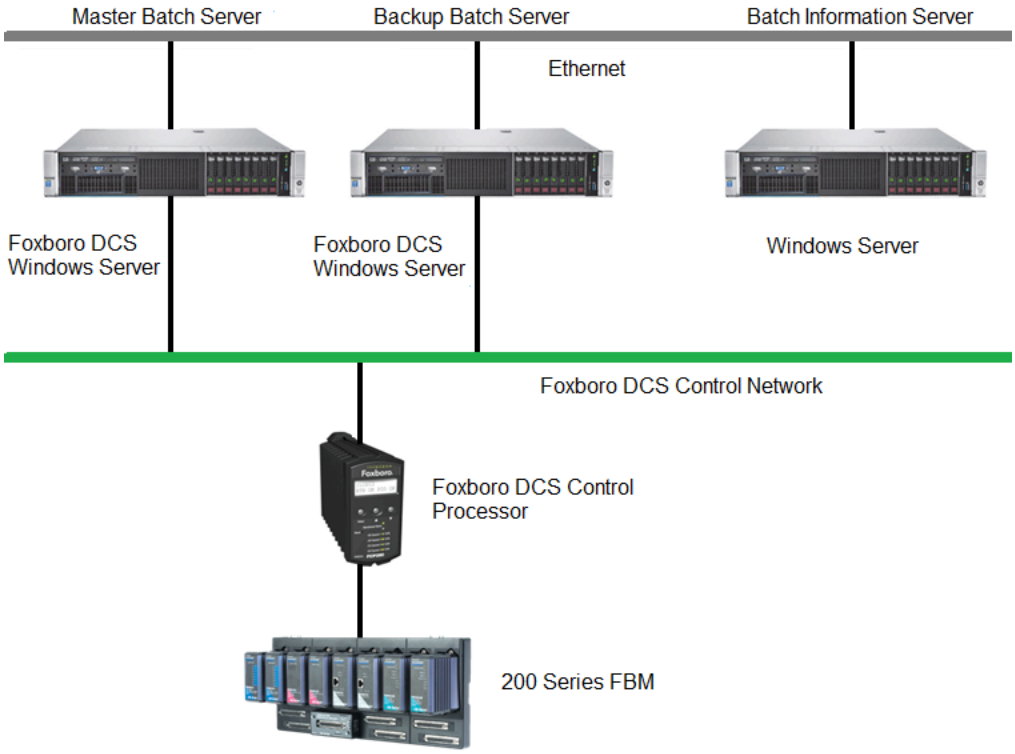
Virtualization is supported with Batch Management for the batch servers, batch history and reporting server, as well as the batch clients. Hyper-V and VMware are the supported hypervisors. Hyper-V is the only qualified hypervisor when Batch Management is used with the Foxboro DCS.



## Redundant Batch Server Option

Batch Server redundancy capabilities allow the server to automatically switch batch control to a backup server in the event of a primary server shutdown due to a hardware failure or power loss. Two identical servers or a virtual machine are required to configure a redundant system. This figure shows a redundant configuration using two servers.

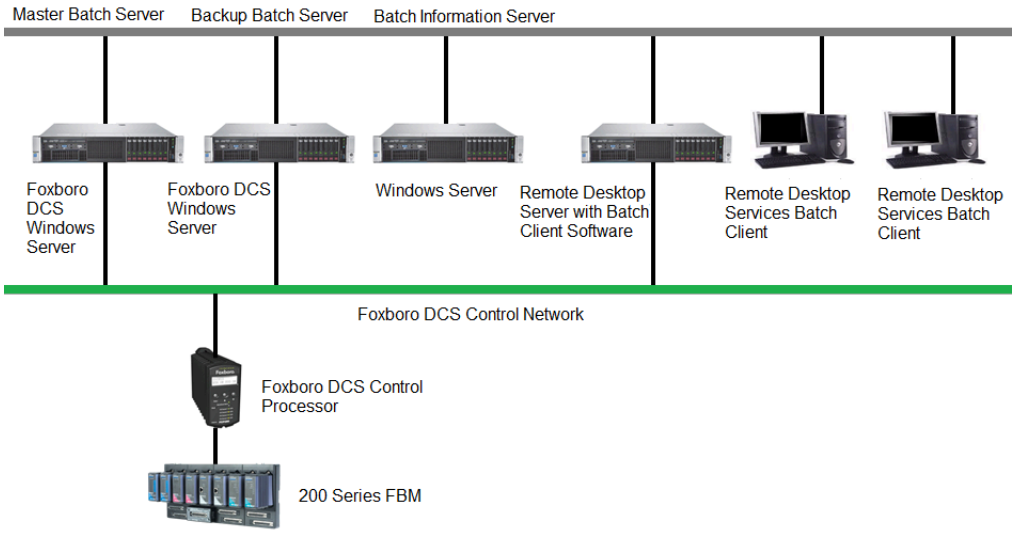
**Figure 4 - Batch Server Redundancy**




## Batch Management Software and Remote Desktop Services

Batch Management software supports remote desktop services for batch Runtime and Development clients. The batch client remote desktop services software is recommended to be installed and licensed on a server other than the Batch server. See the figure below.

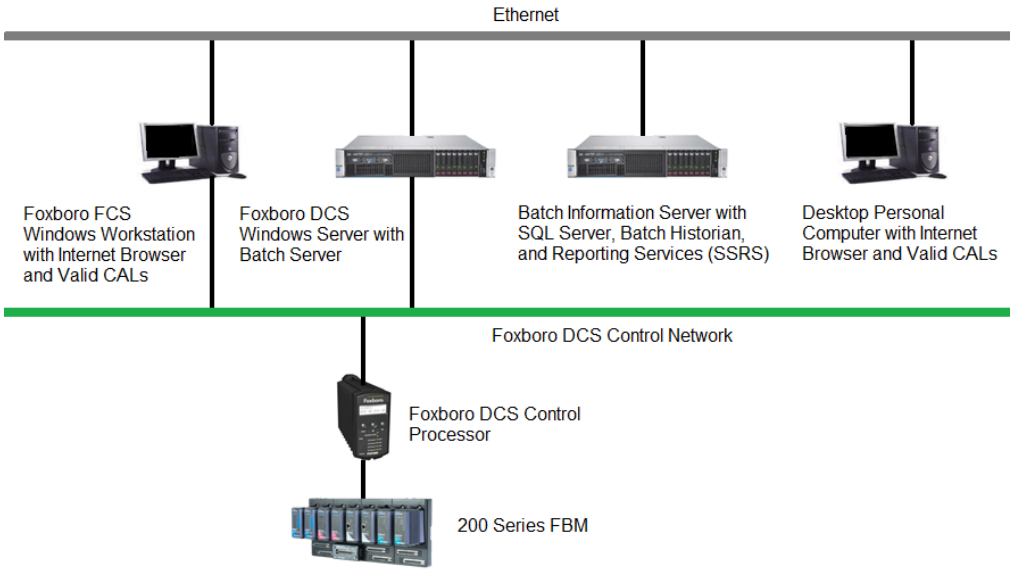
**Figure 5 - Batch Management Software and Remote Desktop Services**




# Batch History Server

The Server for Batch History and Reporting functions rely heavily on resource-intensive SQL Server, Internet Information Server, and Reporting Services (SSRS). This requires a powerful computer.

**Figure 6 - Batch Reporting System Configuration**



# Software Specifications

## Batch Software Functional Specifications

| | |
|---|---|
| Process Model | There are no absolute limits on the number of process units or connections. The only limitation is hard disk space in the host processor. |
| Maximum Number of Formula Variables per Phase when Downloading to a Foxboro DCS Sequence Block | 24 booleans, 8 integers, 15 reals and 10 strings {Note: These limitations do not apply when downloading to multiple blocks.} |
| Maximum Number of Recipes | Unlimited. The only limitation is hard disk space in the host processor. |
| Maximum Number of Serial Steps (Operations) in a Recipe | 510 |
| Maximum Number of Serial Steps (Phases) in an Operation | 510 |
| Maximum Number of Phases for Operator Selection of Parallel Execution | 20 |

## Recommended Minimum Hardware Requirements

The following hardware is recommended to support Batch Management 2023 (v13.0):

- Processor: 2.1 gigahertz (GHz) or faster processor with 4 processor cores
- RAM: 8 gigabytes (GB) of memory
- Hard disk: At least 500 GB of available disk space
- Video adapter and monitor with super VGA (1024 × 768) resolution or higher
- CD-ROM or DVD drive for installation
- Keyboard
- Mouse or compatible pointing device

For further hardware requirements, see your specific Microsoft operating system hardware requirements.

## Foxboro DCS Software Compatibility

Batch Management 2023 (v13.0) is only compatible with Control Core Services v9.8 and Control Software v8.0.1 and later.

Batch Management also supports the Foxboro DCS Microsoft Hyper-V hypervisor solution.

For the current qualification, see the *Batch Management Compatibility Matrix with Foxboro DCS* document on the Global Client Support (GCS) website.

# Microsoft SQL Server Software Compatibility

**Table 1 - Batch Management 2023 (v13.0) Software Microsoft SQL Server Database Requirements**

| Version | Type | Service Pack Level |
|---|---|---|
| Microsoft SQL Server 2019 | Standard or Enterprise Edition | — |

For the current qualification, see the *Batch Management Compatibility Matrix with Foxboro DCS* document on the Global Client Support (GCS) website.

# Proposition 65

**WARNING:** This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

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As standards, specifications, and design change from time to time,
please ask for confirmation of the information given in this publication.



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