Database Audit Trail

Basic Operation

Content

1 What is "Audit Trail"

This manual describes what "Audit Trail" means and who it is implemented in the BatchXpert databases. An audit Trail refers to the recording of all changes made to any data stored in the BatchXpert databases. This system provides the ability to answer a variety of questions such as:

- "Who exactly changed any configuration of the System?"
- "Who and when was a Recipe Value changed?"
- "What was the recipe value before and after the modification?"

The system basically records the Time, User and data that was changed in the database. It always records the previous and new values of any modification. This allows the User to review any change that was done to any of the Configuration, with the exact Time, user credentials and values that where changed. It even allows the user to restore the "Batch Configuration" to any point in time and view the configuration at that point in time.

2 What data is being Recorded

The system is implemented in such a way that all data to all relevant Configuration data of the "Batch Configuration" and the "Material" databases are being recorded. Basically, it records all changes that can be made by the "Batch Configurator" or the "Material Configurator".

The Auditing is implemented such that the data is recorded even when a user modifies the data without the use of the provided "BatchXpert" tools. For example, if the user manipulates the data directly in the database. **It is not possible to circumvent the recording of Auditing Data, once it is activated.** Not even when data is changed by using direct database access with database tools such as "Microsoft SQL Management Studio" or any other SQL scripting mechanism.

3 When is data being Recorded?

The Auditing data is always recorded at the moment when the data is being changed in the databases. It does not matter what tools are being used to change the data. When the data is changed by one of the BatchXpert configuration tools, the user that was logged in at the moment is also recorded. If the data is being changed by any other application, that is not logged in, the currently connected windows user is recorded (Usually "BatchXpert Station" on standard installations).

4 How to Activate the Audit Trail
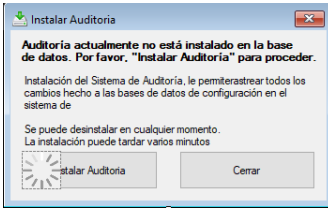
Since the Auditing increases the database size and it is not required by all installation, by default the Auditing is not activated. However, it can easily be activated by starting the "BatchXpert Audit Viewer". When the Auditing is not Activated yet, it prompts a dialog which allows the Activation of the Auditing.

By clicking "Install" the auditing is being installed in the system. This process may take several minutes and cannot be interrupted. The system can be uninstalled at any time; however, the recorded data is then lost.

After it was installed, all future modification of data is being tracked.
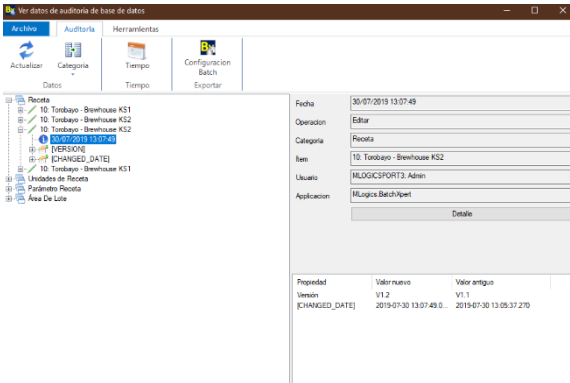
5 How to View the Audit Trail data

Figure 1 "BatchXpert Audit Viewer"

The "BatchXpert" system provides an application that allows for the visual review of the recorded auditing data. The "BatchXpert Audit Viewer" allows for the query of each one of the Modifications made, and provides information about the data that has changed and who made these changes.

It also allows for the data of any "Point in Time"

to be exported and viewed in the "BatchXpert Configurator".

6 Uninstallation

It is possible to uninstall the Auditing Mechanism at any time from within the "BatchXpert Audit Viewer". To do this open the "Tools" tab and select Uninstall. This action requires Administrator Privileges.

When the Auditing is uninstalled, this removes all recorded auditing data from the database. This means that all "Historical" change data is lost. **However, this action does NOT affect any current Configuration in the BatchConfig Database.**

7 Considerations

7.1 Performance

Every time a change is made to a data table in the database, an auditing record is created that holds the appropriate metadata. This means that for each data modification, and historical record has to be written. This means that the time required to save data to the Database approximately doubles. However, since the data modification are very fast (approx. 10 MS) this usually is negligible. Only when many configuration data are changed at the same time such as when "Copying Recipes" or during Engineering, the performance may be lower.

However, it just takes more time for the Save operation to complete.

7.2 Data size

Every time a change is made to a data table in the database, an auditing record is created that holds the appropriate metadata. This means that for each data modification about 100 bytes of metadata is recorded, which increases the database size over time.

However, in typical applications the Audit data rarely exceeds 100 MB.

7.3 Archiving

To improve performance, there is the option to send older Auditing data into "Archive" tables. This allows the "Current Audit Data" to be accessible faster, since the table size decreases. However, this only matters, on very big audit data sets.

7.4 Engineering

While engineering, many data changes are made to the Database. To avoid cluttering up the database, it is recommended to "Uninstall" the Auditing System while engineering. Since the system does not provide a mechanism to "Pause" audit recording, one should manually export the audit data and after reinstallation manually import the data again. This can be easily done by using the "Microsoft SQL Server Management Studio". Please contact Mlogics for more information about this.

8 Internal Working Principle

The Auditing data is being recorded by using "Data Triggers" in the corresponding databases. These Triggers fire every time any data is added, deleted or modified in the corresponding Table. This means that the Auditing is being recorded by the database itself, without help from any further application. This is the reason why all data modifications are recorded, even changes made directly in the database.

When The auditing is installed, the triggers are automatically added to each one of the data tables. They are added to all Data tables, so changes in all of the tables are being tracked. The recorded data is stored in "Auditing" tables, where they are available to be queried. Also, during Installation, the "Auditing Data" is initialized once with the current database data to provide a baseline for further Auditing operations. This means that during installation, the database size approximately doubles.

The Auditing System also provides various database "Views" which can be queried to gain access to "Point in Time" states of every table in the database. This mechanism can be used to restore the full database to every point in time, and is used by the "Exporting" Functionality of the Audit Viewer.

Since the Auditing adds triggers to each Table, this increases the System load for each data Update in the database and essentially increases the time needed to save changes to the database. Since very change is being recorded, this also increases the size of the database, the more changes are made. However, since it is intended for configuration data, not runtime data, this size increase is usually negligible and in the order of 100 byte per change in any column.

9 Debugging Errors during Installation

If you encounter errors during Installation, first one should review the log files created during installation. The installation is not actually run by the "BatchXpert Audit viewer", but rather delegated to the "BatchXpert DB Administration Tool". For this reason one should review the log files created by this applicaton.

To access the log files, please open the "Log File Viewer" from the windows start menu, and select the "BatchXpert DB Administration.exe.log" file, that was created by the Database administration tool.