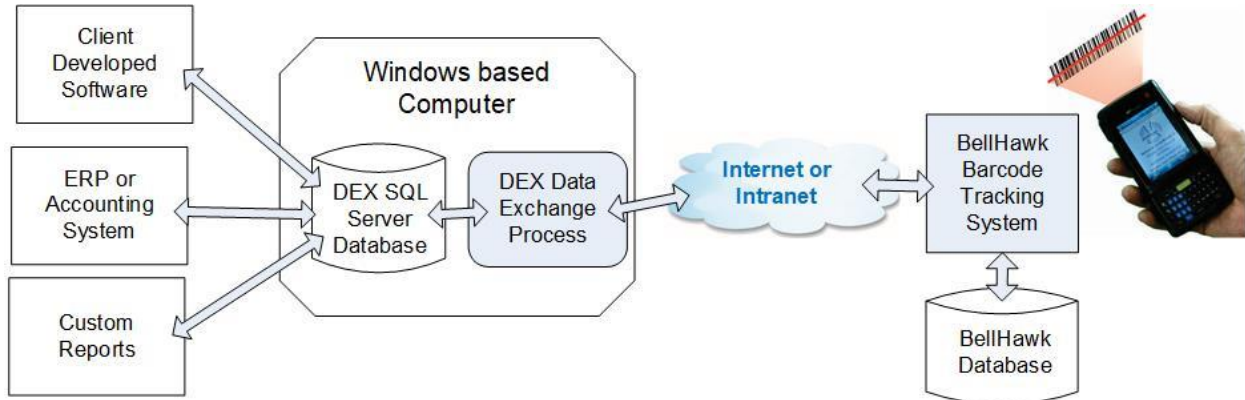


BellHawk Data Sheet DEX Data Exchange Interface

Introduction



The DEX interface provides a simple to use interface for exchanging data with BellHawk. DEX consists of a SQL Server database and a DEX data exchange process.

Data written into tables in the DEX database are automatically transferred to the corresponding tables in the BellHawk database by the DEX data exchange process. Similarly, data entered into BellHawk is automatically transferred to corresponding tables in the DEX database.

The tables in the DEX database are structured in a well-documented tabular format (think Excel spreadsheet), with a set of self-contained records and no indirect references. This makes it easy for users to develop their own custom reports, using the contents of the DEX database. It also makes the development of interfaces to exchange data with ERP, accounting, CAD, and other systems very straightforward.

This is in contrast to the BellHawk database itself, which is designed for rapid transactional processing of barcode scanning data from a large number of mobile computers. This requires a complex database organization with many indirect references, which makes using the BellHawk database itself for reporting or data exchange interfaces much more complex than using the DEX interface.

DEX comes in two versions:

1. A computer program (DEX2) which can be installed by end users on their Windows PCs, along with a copy of the Microsoft SQL Server Express database. This enables users to extract data from BellHawk and send data to BellHawk under user control
2. A version of DEX (MDEX) which uses the MilramX automated data exchange platform. This runs as a service on a Windows Server or Workstation and is designed to run unattended and reliably exchange data 24x7 for long periods of time. It has a web-browser interface for remote monitoring and control.

Users can start out using DEX2 to develop custom reports and/or interfaces and then transition to using MDEX for operational use. This is especially valuable when implementing shared reports using software such as SSRS (SQL Server Reporting Service) which require the DEX database to be continuously updated without human intervention. It is also essential when implementing automated data exchange interfaces with ERP, accounting, CAD and other systems.

Both versions of DEX can communicate with BellHawk over the Internet, using the BellHawk web-services interface. This enables the DEX database to be located in a manufacturing plant or warehouse that can be thousands of miles away from the data center in which the BellHawk software and database is running.

MDEX can also be run on a Windows Server in the same data center as BellHawk along with the ERP or other system with which BellHawk will automatically exchange data. In this case MDEX will exchange data directly with the BellHawk database, which is more efficient than communication over the Internet.

Multiple versions of MDEX and DEX2 can be in operation at the same time. This enables data exchange and reporting to be taking place simultaneously with a single version of BellHawk at multiple different geographic locations.

One major advantage of the DEX interface is that it isolates and protects the BellHawk database from possible damage from reporting and data exchange software which would be possible if they directly interacted with the BellHawk database. This also helps ensure compliance with requirements such as CFR 21 Part 11, which require that users not be able to modify data once it is captured without an audit trail being present.

Some Uses of DEX

Some uses of the DEX interface include:

1. Automatically exchanging data with an ERP or accounting system.
2. Generating custom reports using software such as Access, Excel, Crystal Reports, or SSRS based on data from the BellHawk database.
3. Exchanging data with EDI and shipping systems.
4. Transferring data from CAD or other engineering design systems into BellHawk.
5. Interfacing BellHawk with process control equipment and machines.
6. Generating large screen shop-floor displays showing performance dashboards.

There can be multiple copies of the DEX interface communicating with BellHawk from different plants, warehouses, and data centers. This enables BellHawk to be interfaced to a variety of systems and used by people doing custom reporting from multiple geographically separated locations.

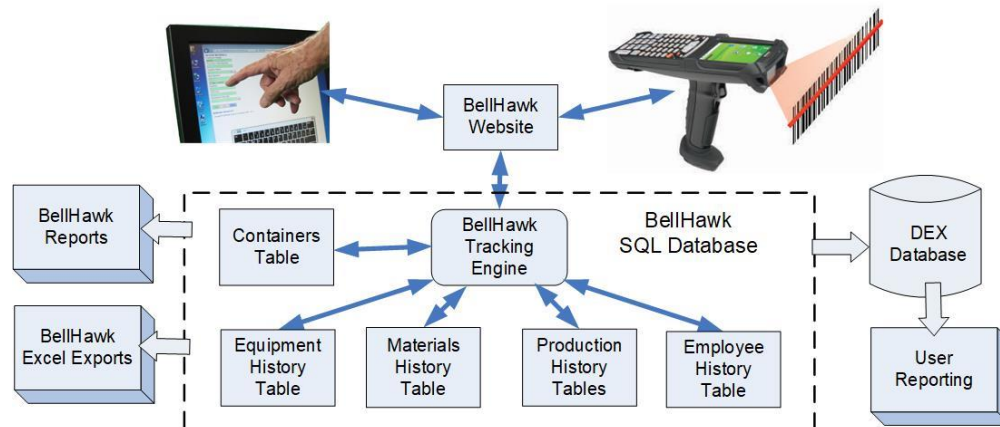
Data Exchange Overview

The data that can be exchanged consists of the following groups:

- Current status data. This includes the status of work orders and the contents of the containers table. These DEX tables are updated as changes occur in the BellHawk database.
- Data for transfer to ERP and accounting systems. These include aggregated shipments and receipts, as well as nightly inventory snapshots. These are periodically transferred from BellHawk at intervals set by the DEX user.
- Transaction history data. This DEX data includes containers of material received and picked, material moved, material consumed and produced on work orders, containers of material shipped, labor and machine time consumed against work orders, and the change in quality control status of containers of material. New records are added whenever a transaction is recorded in BellHawk.
- Setup data for BellHawk - this is the same data as that which can be imported in HLDO (High Level Data Object) format through the Excel Setup data interface into BellHawk. The primary function of these transfers is to enable setup data to be transferred from ERP and accounting systems into BellHawk but this can also be a convenient way of manually transferring setup data into BellHawk.
- Setup Data from BellHawk. This includes the same set of data objects as can be transferred to BellHawk but they are transferred from BellHawk into a separate set of DEX tables, which are updated automatically as changes are made in BellHawk. These are useful for including in reports, especially when the setup data is imported directly into BellHawk or is automatically updated in BellHawk from another system.
- Orders for BellHawk. These are the same Purchase Orders, Pick Orders, Work Orders, and Ship Orders, which can be directly entered into BellHawk. They enable orders to be automatically sent to BellHawk directly from ERP and other systems.
- Orders from BellHawk. These are copies of the Purchase Orders, Pick Orders, Work Orders, and Ship Orders directly entered into BellHawk or imported into BellHawk from another system. These are written into a separate set of tables from the DEX tables used for sending orders to BellHawk and are automatically updated whenever changes are made in the BellHawk database. These are intended for reporting but are also useful for transferring order data to other systems, such as operational parameters for process control systems.

Please note that the data which can be exchanged depends on the BellHawk options in use.

Producing Custom Reports using DEX



BellHawk maintains the status of all active materials in its containers table. It also captures the transaction history in a set of tables relating to materials receipt, movement, usage, production and shipment as well as the equipment and labor times used in production operations.

From these tables BellHawk produces a set of standard reports that cover most standard operations and materials tracking requirements. Also "reports" such as barcoded receiving and picking sheets, as well as purchase, work, and ship orders can be customized in a limited way, such as by using the client's logo instead of the BellHawk logo, and by adding fields to the header and lines on these "reports".

These standard reports, along with related Excel exports, usually meet the requirements of most organizations for reporting real-time operational status. Users can then create their own reports using report generation software such as Access, Crystal Reports and Excel using the contents of the DEX database, which contains copies of the data in all of these BellHawk tables.

The PC based version of DEX makes it easy for users to run DEX2 to transfer the data they need from BellHawk into the DEX database. They can then run the reports they need by linking software such as Access, Excel and Crystal reports to the appropriate tables in the DEX database.

BellHawk has the capability to integrate external web-based reporting into its standard reports. To do this, users will create need to create their custom reports using SSRS (SQL Server Reporting Services), or equivalent, and install these under IIS on a Windows Server so that they are accessible through a remote URL.

These custom reports can then be integrated into BellHawk through setup data imported into BellHawk, using Excel files, by the BellHawk Systems Administrator. This same feature can be used to replace existing BellHawk reports but not Excel exports.

Technology Notes

Users of DEX can link Microsoft Access to the DEX database and simply treat it as an Access database or link Excel to tables within the DEX database. Users can also link report generation programs, such as Crystal reports, to this database in order to generate custom reports. More sophisticated users, can integrate this database into an SSRS reporting scheme.

There is no need to setup any special "holes" in the network firewall of the plant or warehouse in which DEX is installed, as DEX uses a standard "outbound" Internet connection, just like any other PC on the network. This avoids a major security risk and a need to involve IT in the installation of DEX2.

MDEX, on the other hand, will typically require the involvement of the organizations IT staff to install the MilramX based version of DEX on a Windows Server computer.

DEX transfers take place in the background to data collection and user interaction in BellHawk. These transfers are deliberately throttled so as not to interfere with BellHawk user interactions which require quick response. As such, transfers do not take place instantaneously but typically occur with a several minute or more delay.

When BellHawk is run on a shared server, these delays may become quite lengthy due to many DEX sessions for multiple clients running at the same time. If the delays become unacceptable then clients can switch to running BellHawk on a dedicated server.

Commentary

The concept behind DEX is to make exchanging data with BellHawk and producing custom reports as simple as if BellHawk were running locally in each plant or warehouse or other facility. This method retains all the benefits of running BellHawk at a secure data center, on computers managed and maintained by IT professionals, where BellHawk can be accessed by many different users at many different locations over the Internet.

Please see the DEX Interface Manual for details of the tables through which data can be exchanged with BellHawk and details of how to use the DEX2 user interface.