BellHawk® Systems Corporation
Tracking Your Operations Like a Hawk
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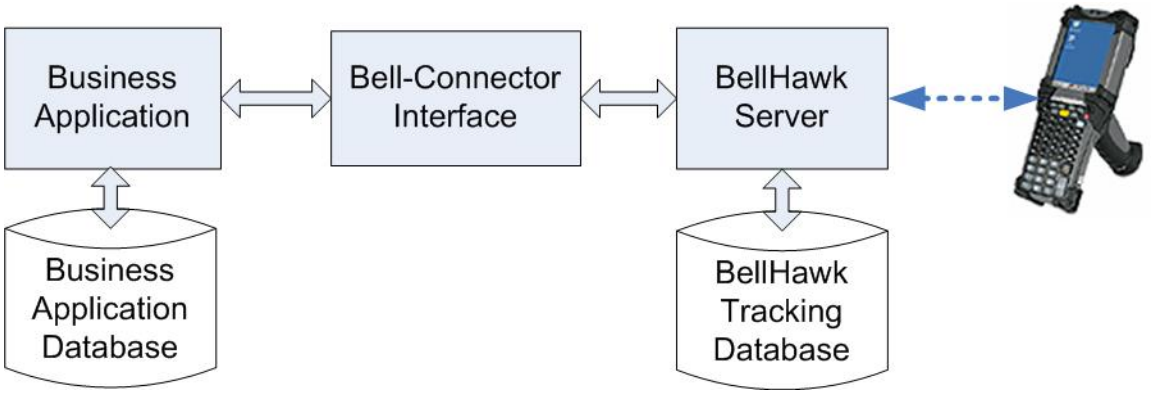
Bell-Connector™ Interface
Release 4

Introduction



Bell-Connector is a set of programs and interface development tools that enable the rapid development of interfaces between business applications, such as accounting, ERP and CRM systems and the BellHawk barcode tracking system.

The main concepts behind the Bell-Connector are:

1. Let interface developers work with high-level business data objects such as purchase orders and material receipt transactions rather than all the complex details of databases that have evolved over many years of changes. This speeds interface development and makes it much easier to modify interfaces as business needs evolve.

2. Have the Bell-Connector dynamically generate all the code for interfacing with the databases based on meta-data descriptions of all the tables, fields and stored procedures within the database. The Bell-Connector handles all the translation between each high-level business object and its storage as data in multiple tables within a database.

3. Use of formal XML based meta-data descriptions for each of the databases that are accessed by the Bell-Connector programs. This enables the Bell-Connector programs to work with many different databases using the formal XML meta-data for those databases. The XML is human readable but can be validated prior to use to ensure consistency.

4. Use Excel spreadsheets for maintaining and documenting the meta-data for the interfaces. This makes the interfaces self-documenting and also facilitates quick changes to an interface without having to wade through layers of complex SQL code.

5. Pre-build software components that can be used in implementing a wide-range of interfaces. This includes user interfaces and mechanisms for automating the exchange of data whenever an update occurs in a database. The reuse of these components again speeds interface development.

Bell-Connector Components

1. DEXEL – a computer program that enables business data objects to be exchanged in the form of Excel spreadsheets and comma delimited files. This is used by those organizations that want to manually examine and control the flow of data between their systems. It is also used to interface BellHawk to older legacy systems and to import initial setup data into BellHawk from business applications.

2. Bell-Connector Framework – a pre-built framework for automatically exchanging data between BellHawk and a wide range of ERP, accounting and other legacy systems. This framework is used by BellHawk Systems to implement interfaces to a wide range of ERP, accounting and other legacy systems.

3. Bell-Connector SDK – a .Net dynamic link library that enables .Net programs written in VB.Net or C# to manipulate BellHawk business data objects without needing to understand the underlying structure of the BellHawk database. This is primarily used for implementing interfaces to process control equipment and test stands. It can also be used to implement interfaces to external applications that themselves have a .Net SDK.

4. BCDEV – a computer program that enables developers to define business data objects in terms of the underlying tables, fields and stored procedures within a database using Excel spreadsheets. BCDEV then generates an XML meta-data file that provides a formal description for these relationships. These XML files are used by the other Bell-Connector products to define the interface to BellHawk. BCDEV can also be used to define interfaces to other ERP, accounting and legacy systems, thereby extending the use of the Bell-Connector tools to implement interfaces to these other systems.

5. BCMSG (coming in Q2, 2010) – a message-based interface between BellHawk and web-based applications that are able to exchange data objects in the form of industry standard SOAP message packets containing data objects in XML format.

BellHawk Systems will also continue to support the older DEX interface. DEX provides database programmers with a relatively safe way to read and write the underlying BellHawk database tables without being impacted by changes to the underlying database. With DEX, programmers use ODBC SQL calls to read and write interface tables and to use stored procedures to exchange data with their business applications.

DEXEL

DEXEL is a program that enables data objects to be imported into BellHawk from Excel spreadsheets and also exported from BellHawk in this same format. DEXEL also supports the use of comma delimited CSV format files for data exchange.

An example of the export and import data file format is shown below for item master parts. The user can supply just those data object parameters that are needed, by specifying the name of the parameter in the column header. Thus only the identifying parameters (in this case the item number) are required and all other parameters are optional, except those that are required for the use of the data object (such as the unit of measure).

Microsoft Excel - ITEM.xls

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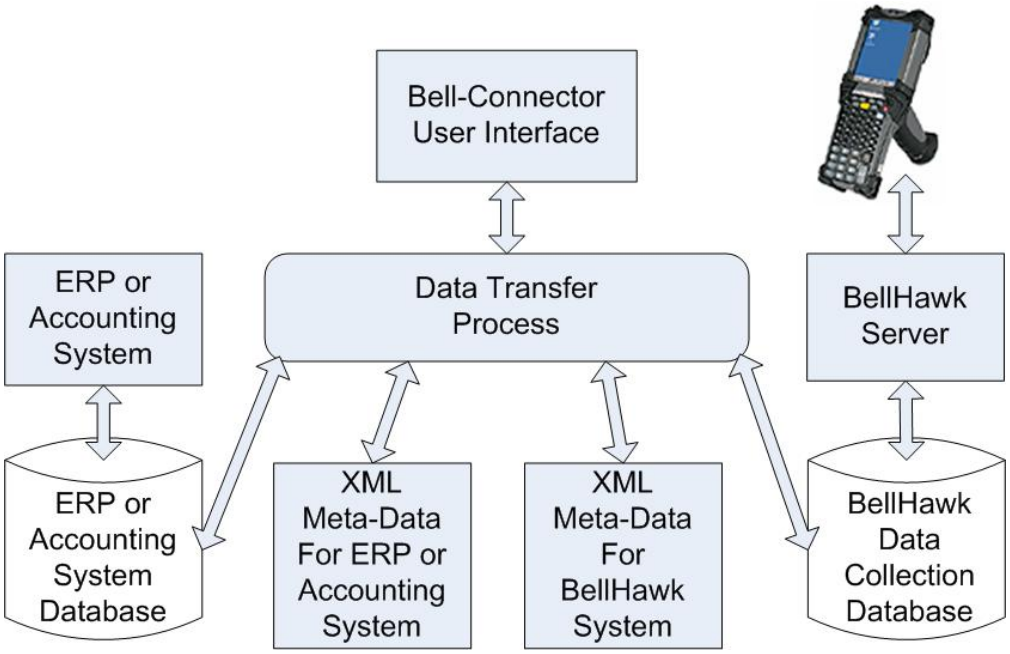
D14

	A	B	C	D	E	F	G	H	I	J
1	ITEM	ItemNumber	Make	Model	ItemDescription	UOM	Category	Material	UnitCost	UnitPrice
2		P101			12 inch paper roll	Pounds	Raw	PAPERROLL	$12.00	$0.00
3		P102			Coating Material	Gallons	Raw	COATMAT	$4.00	$0.00
4		P103			6 inch coated roll 100 foot long	Each	Finished	COATEDROLL	$0.00	$0.00
5		P104			6 inch core	Each	Raw	CORES	$0.10	$0.00
6										

On export, the user can specify which columns are to be exported and their order, as well as which objects to export using another Excel file to specify these exports. Of especial value is the ability to specify only the export of the latest updates to objects, such as inventory receipt transactions within BellHawk.

Bell-Connector Framework



Bell-Connector provides a pre-built framework for implementing real-time data exchange interfaces with ERP, accounting and other systems.

To implement an interface, BellHawk Systems' staff works with experts who are knowledgeable about the database of the business system to encode the meta-data about the relevant tables and fields and stored procedures in the business application database into an XML meta-data description file.

This XML metadata is then used by the Bell-Connector to automatically generate the code needed to read and write data objects in the business application's database. These data objects are then translated to and from BellHawk data objects by means of decision rules encoded in Visual Basic in the data transfer process.

The framework includes a user interface by means of which the data transfers can be scheduled, monitored and controlled. It also includes mechanisms for automatically monitoring changes to both databases and initiating the appropriate set of data transfer rules.

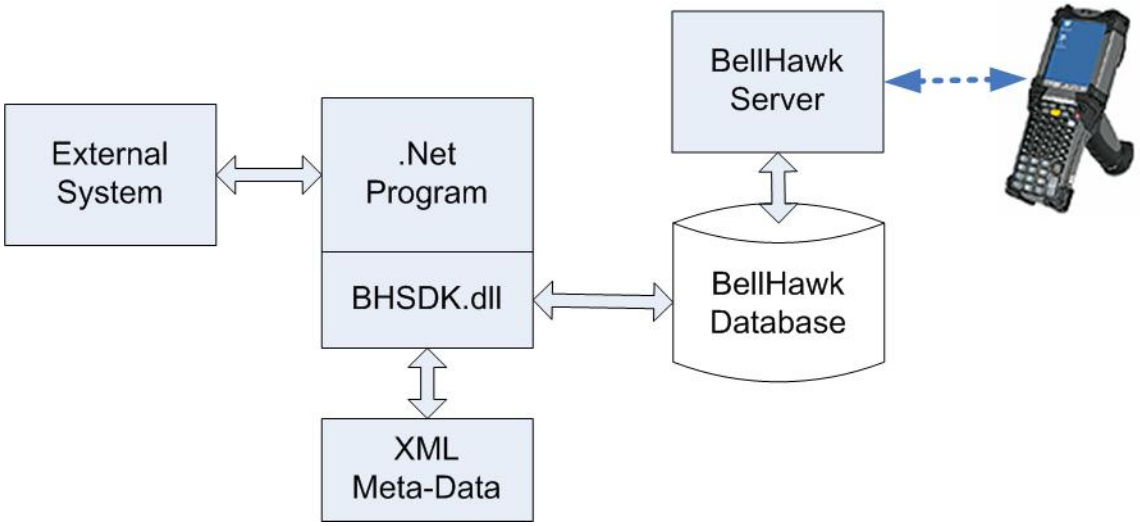
Through the use of automated code generation and reuse of pre-existing code, this technology enables BellHawk Systems to implement automated interfaces much more quickly than starting from “scratch” each time.

Even more important this approach separates the business logic rules from the interfaces to the databases. As such, the business logic in the data transfer process can be changed without needing to understand the database interfaces. Also the business logic is isolated from version to version changes in the underlying databases.

This enables these interfaces to be maintained over a period of many years and with many changes and upgrades to the two systems with minimal effort.

While the Bell-Connector Framework is normally used to interface between a business application and BellHawk, it can be uses to automatically exchange data between an arbitrary number of systems, which may or may-not include a BellHawk tracking system.

Bell-Connector SDK



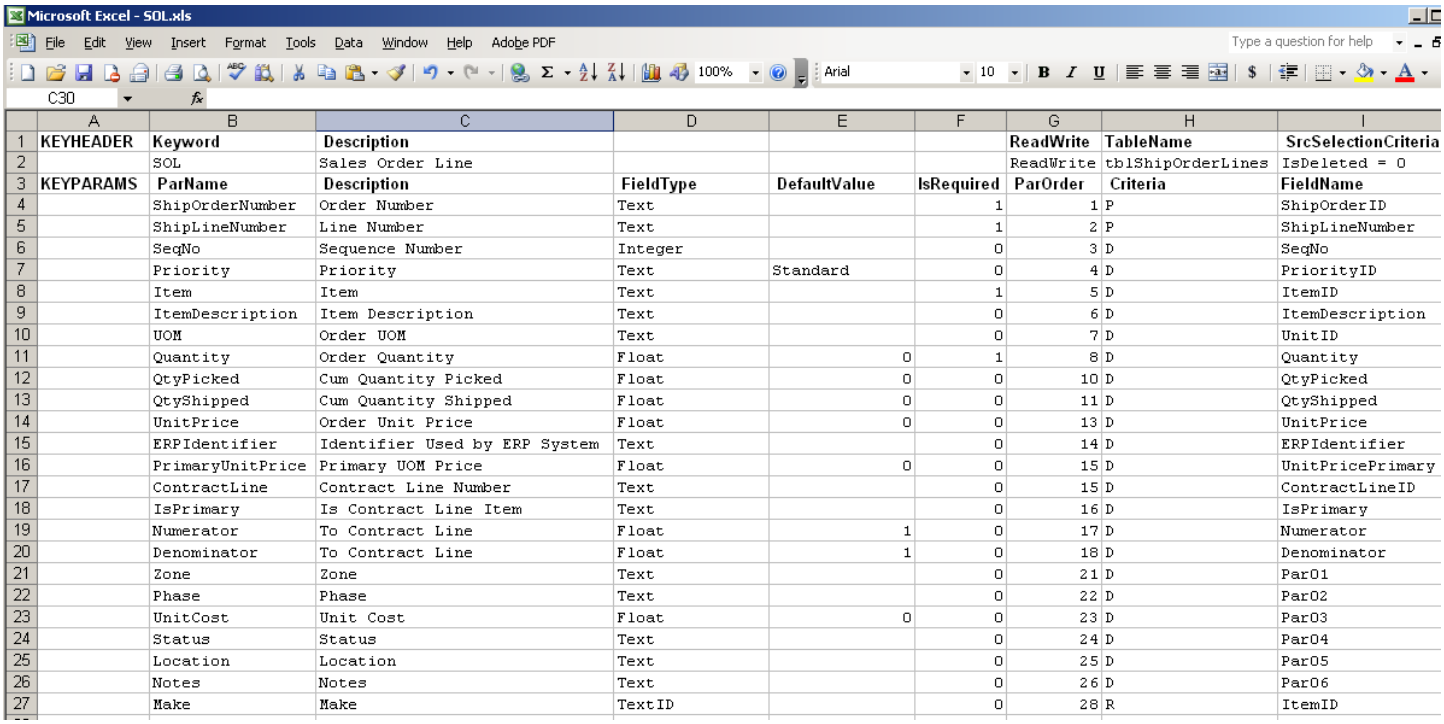
The Bell-Connector SDK is provided as a .Net DLL code library plus an XML file containing the Meta-Data for the BellHawk tracking database.

This enables programs to be written in VB.Net and in C# that can manipulate BellHawk data objects and exchange date with an external system, such as a process control system or a test stand, without needing to understand the structure of the underlying database or to write any SQL Code.

BCDEV

BCDEV is a program that takes in descriptions of data objects in the form of Excel spreadsheets and uses these to add to or edit the object meta-data used by the Bell-Connector programs to access the BellHawk or business application database.

An example of the Excel spreadsheet defining a data object is shown below, in this case for a customer sales order line object.



Microsoft Excel - SOL.xls

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C30

	A	B	C	D	E	F	G	H	I
1	KEYHEADER	Keyword	Description				ReadWrite	TableName	SrcSelectionCriteria
2		SOL	Sales Order Line				ReadWrite	tblShipOrderLines	IsDeleted = 0
3	KEYPARAMS	ParName	Description	FieldType	DefaultValue	IsRequired	ParOrder	Criteria	FieldName
4		ShipOrderNumber	Order Number	Text		1	1	P	ShipOrderID
5		ShipLineNumber	Line Number	Text		1	2	P	ShipLineNumber
6		SeqNo	Sequence Number	Integer		0	3	D	SeqNo
7		Priority	Priority	Text	Standard	0	4	D	PriorityID
8		Item	Item	Text		1	5	D	ItemID
9		ItemDescription	Item Description	Text		0	6	D	ItemDescription
10		UOM	Order UOM	Text		0	7	D	UnitID
11		Quantity	Order Quantity	Float	0	1	8	D	Quantity
12		QtyPicked	Cum Quantity Picked	Float	0	0	10	D	QtyPicked
13		QtyShipped	Cum Quantity Shipped	Float	0	0	11	D	QtyShipped
14		UnitPrice	Order Unit Price	Float	0	0	13	D	UnitPrice
15		ERPIdentifier	Identifier Used by ERP System	Text		0	14	D	ERPIdentifier
16		PrimaryUnitPrice	Primary UOM Price	Float	0	0	15	D	UnitPricePrimary
17		ContractLine	Contract Line Number	Text		0	15	D	ContractLineID
18		IsPrimary	Is Contract Line Item	Text		0	16	D	IsPrimary
19		Numerator	To Contract Line	Float	1	0	17	D	Numerator
20		Denominator	To Contract Line	Float	1	0	18	D	Denominator
21		Zone	Zone	Text		0	21	D	Par01
22		Phase	Phase	Text		0	22	D	Par02
23		UnitCost	Unit Cost	Float	0	0	23	D	Par03
24		Status	Status	Text		0	24	D	Par04
25		Location	Location	Text		0	25	D	Par05
26		Notes	Notes	Text		0	26	D	Par06
27		Make	Make	TextID		0	28	R	ItemID

BCDEV can export the definitions for a specific data object in the form of an Excel spread sheet, given the XML meta-data file for a database. It can then import this file, after editing, and use it to update the XML meta-data description file for a specific database.

The big benefit of this is that the interface documentation, in the form of an Excel spreadsheet, is always maintained consistently with the interface definition in the XML meta-data file. This XML file is then used as the basis of all the other Bell-Connector programs in accessing the database to which the XML file applies.

BCMSG

This latest initiative in the Bell-Connector interface family is designed to incorporate:

1. Interfaces to Web based business applications, including those that are running as part “Cloud” computing initiatives.

2. Interfaces to systems that need to securely interface with a BellHawk tracking system that is running using a server in a geographically remote facility over the internet.

BCMSG will use SOAP standard message protocols to securely exchange XML based business data objects between the remote systems and BellHawk over the internet.

BCMSG will use the same object definitions and definition mechanisms as are currently used by the Bell-Connector but with BCMSG the data exchange will be by means of messages instead of direct access to client-server databases.

