

# **CRC Event Suite for BusinessObjects Enterprise Database Events From CRC Business Solutions, Inc. Product Data Sheet**

## **About CRC's Enterprise Database Events**

Enterprise Database Events, a component of the CRC Event Suite for BusinessObjects Enterprise from CRC Business Solutions, Inc., introduces a new "Database Events" feature for BusinessObjects Enterprise. Similar to the standard Business Objects Enterprise "File Events", CRC's "Database Events" use the Enterprise event trigger architecture to process scheduled reports and programs when "events" occur outside the BusinessObjects Enterprise system. Typically, external systems signal a change in their state to the Enterprise system through events. For example, a data mart system may signal that nightly update processing is complete and that reports scheduled within the Enterprise system can now process the updated data.

## **Enterprise Events**

The Event feature of BusinessObjects Enterprise allows reports and programs to be scheduled based on activities outside the Enterprise system.

### ***Business Objects File Events***

Business Objects "File Events" provide a way for report processing to begin when a file is copied to a particular directory and with a particular file name. The Enterprise system administrator configures a "File Event" to "trigger" when the file appears. As a rudimentary mechanism, File Events are simple to implement. For example, a batch process on an external system can copy an event file to a monitored directory via a Windows Networking Shared Directory or via an FTP server that can write the event file to the monitored location.

### ***Database Events in the CRC Event Suite for BusinessObjects Enterprise***

"Database Events" in the CRC Event Suite BusinessObjects Enterprise provides a similar mechanism for triggering events defined in Enterprise. The Enterprise system administrator configures a "Database Event" to "trigger" when the external database changes. Instead of using the appearance of a file to trigger an event, the CRC Event Monitor reads a pair of fields stored in a table within a database that's external to the Enterprise system. When the "trigger" field's value changes, the CRC Event Monitor triggers the event within the BusinessObjects Enterprise system. Thus, a Database Event is functionally equivalent to a File Event, but uses a database table as the interface to external systems.

## **Event Security and Administration Issues**

The simplicity of File Events introduces security and system administration problems.

### ***Event Security Issues***

Security issues relate to system access and protection within the computing environment. Many companies no longer allow FTP servers on operational production systems, even within a corporate firewall. The ability of an external system to access a secured system such as BusinessObjects Enterprise in any way is viewed by such companies as a security vulnerability. Similarly, a Windows Networking Shared Directory with write access for external processes is also viewed as a security vulnerability. In contrast, a Database Event uses a database table for inter-machine communication. As such, Database Events are inherently secured by database access network protocols, database account table access, and access permissions.

File Events allow external systems to alter Enterprise reporting systems. In contrast, the CRC Event Monitor requires only read-only access to the event table monitored. As a result, Database Events allow the Enterprise system to monitor but not to alter specific internal states of external systems, no different than report processing itself.

### **Event Administration Issues**

The Enterprise File Event mechanism relies on the appearance of the event file as a new file. To trigger an event, the “old” event file must be deleted for a period of time (a few seconds) and then the “new” event file of the same name must appear. Altering the creation, modification, or access date for a file will not trigger a File Event. As a result, File Events require clean-up processes to run at the correct time.

In contrast, Database Events are triggered by a change in the state of the corresponding event record in the External Database Event table. This approach eliminates any event maintenance. A change to the Database Event’s timestamp (or other value) triggers the Enterprise event. The state change approach requires no maintenance by the Enterprise system administrator – only configuration.

Another administrative issue for File Events is that system administrators have no visibility to system-wide event triggers date and time, and no event history is provided with the standard Enterprise system. The CRC Event Monitor creates a database table with processing details for each Database Event and process summaries for each time events are checked for changed trigger values. Each monitoring batch creates a processing output file that documents the configuration and processing results of that run. All Database Event history can be accessed through web pages so system administrators can view system performance in detail and in aggregate over time.

## **File Event Conversion Issues**

Sites that might consider replacing File Events with Database Events will want a method to replace File Events with Database Events. Internally, Enterprise maps report and program schedules to File Events using the internal Enterprise Object ID. This implies that each schedule needs to be recreated using the new Database Event IDs, even if a File Event is deleted and replaced with a of the same name (a new object will have a new ID). Such a potentially burdensome administrative task is unnecessary. CRC provides a web interface to Enterprise Events that allow an Event Object’s event type to be changed. An event can be changed among the File Event, User Event, Schedule Event, and Database Event types – and in doing so, the Enterprise internal ID remains unchanged. Consequently, report and program schedules require no change to use Database Events.

Similarly, File Events can be migrated from one system to another. The Enterprise Import Wizard re-maps “source” File Event IDs to “target” File Event IDs during the import process (like-named events for the “source” and “target” system must be the same Event Type for this to occur). After the import of File Events and schedules based on File Events, the event type can be changed to a Database Event.

## **Database Event Intervention**

In every system’s lifetime, processing exceptions will occur. For example, an event update process may fail to occur on time, or may fail altogether. Typically, selected reports must be run as soon as the reporting source database becomes available during a recovery. Enterprise File Events require manually creating a file in the Event File directory – and deleting the file after the Enterprise system has triggered the corresponding File Event. Database Events can be triggered manually by system administrators, independent of the external system’s state. And because Database Events work based on state transitions no follow-up “reset” action is required.

## Database Event System Security and Qualities

### **Enterprise Class Security**

CRC's Database Events are fully implemented using the built-in security of Enterprise.

Database Events are implemented as add-on properties to standard Enterprise Custom (User) Events. Access to the web-based configuration and monitoring is based on Enterprise access rights to the Event objects and to the web administration pages.

The CRC Event Monitor program is stored, scheduled, and managed within the Enterprise system. Access to scheduling the monitor, and viewing its output, is the same as scheduling and viewing reports within the Enterprise system. The Monitor program itself and its output instances are stored within the Enterprise File Repository, using the same Enterprise access security as report design files and report processing instances.

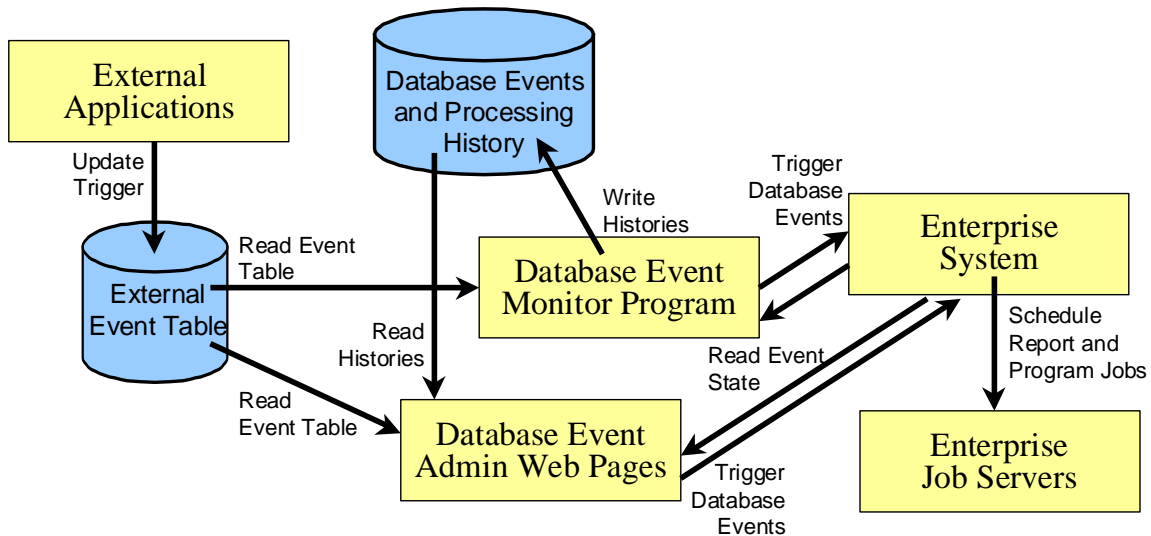
### **Enterprise Class Quality**

As an independently managed interface to the BusinessObjects Enterprise system, Database Events have these "Enterprise Class" qualities:

Simple Interface	A database interface is the most accessible inter-process communication within a networked enterprise.
High Availability	The CRC Event Monitor runs within the Enterprise system and inherits its data center reliability, availability, and robustness.
Processing Queue	Database Events are managed by the CRC Event Monitor as a processing queue.
Timely Event Processing	The CRC Event Monitor runs at a configured time interval, typically every 2 to 10 minutes.
Event/Run-time Independence	An application's event trigger is recorded within a database; the event is processed when the Enterprise system is available, so the Event Database and Enterprise event triggers operate independently.
Cross Platform Support	The database interface approach requires only that an external application be capable of writing to an SQL compliant database.
State Status	Database Events operate through state changes and not a sequence of file creation, deletion, and subsequent creation.
Result Status	Each Database Event processing results in a "Triggered" or "Failed" status stored in the Database Event History table.
Error Messages	Any error messages resulting from a failed Database Event Trigger or from configuration errors are available for administrators to view in the CRC Event Monitor's output file. The error count for each processing run is stored in the Processing History table.
Error Recovery	Administrators can trigger Database Events directly to correct processing or timing errors.
Diagnose at Interface Point	Each Database Event can be examined through the web administration tools to diagnose problems.
Server Friendly	The CRC Event Monitor is run by the Enterprise Program Job Server, so no new services are required and processing is secured.
Fault Tolerance	External applications can update the External Database Event table when the Enterprise system is unavailable. When a previously unavailable Enterprise system becomes available, the CRC Event Monitor resumes its scheduled processing.
Web Based Administration and Monitoring	Web based administration, secured through Enterprise access control, provides authorized access from any web browser within the enterprise at any time.

## Database Event Processing Architecture

Database Event processing integrates external applications with the Enterprise system as shown below:



Any enterprise application that is capable of writing to the “External Event” table can trigger a Database Event. The application updates a “trigger” field within an event record in the table. Typically, the “trigger” field is a date/time type, although any data type and any value change will trigger a Database Event. Changing the value does not trigger the corresponding Database Event in the Enterprise system directly – the value change sets the stage for the actual event triggering. The CRC Event Monitor triggers Enterprise events based on the trigger field changes, and is scheduled to run periodically, for example, every 10 minutes. The Monitor program finds each Database Event configured in the Enterprise system. For each Database Event, the program looks up the current “trigger” field value in the External Event Table and compares the value read to the “previous” value stored within the Database Event object in the Enterprise system. When the values differ, the Enterprise Database Event is triggered. From a scheduling perspective, a report or program scheduled based on a Database Event is no different than a schedule based on a File Event or a Custom Event. When the event is triggered, the Enterprise Central Management System schedules the corresponding jobs (multiple event requirements are supported).

As the CRC Event Monitor triggers each Database Event, a Database Event History record is added to the Database Event History table. At the conclusion of processing, a summary record is written to the Database Event Processing History table. Both history tables can be viewed within the Database Event Administration web pages. The Administration web pages also support directly reading the External Event Table to manually process External Events, and each Database Event can be manually triggered in the Enterprise system for testing or manual intervention in report scheduling.

Because both the CRC Event Monitor program and the CRC Event Administration web pages have read-only access to the External Event Table, the security of both external systems and the Enterprise system cannot be compromised.

The CRC Event Monitor is managed through the CRC Event Administration web pages – the most recent run time and next scheduled run time can be viewed, and output from recent runs can be viewed. The CRC Event Monitor can be run directly from the Administration web pages.

## The Database Event Processing Interface

### *The Database Event Process*

The Database Event processing cycle involves an interplay of the External Application, the CRC Event Monitor, and Enterprise System as follows:

External Application	CRC Event Monitor	Enterprise System
Change "Trigger_DateTime" in External Events Table		
	Compare current "Trigger_DateTime" value to "DB_Trigger_DateTime"	
	If changed, update "DB_Trigger_DateTime" and trigger the event	
	Write CRC Event History record	
		Process reports and programs scheduled using the Database Event*
	Write CRC Event Processing History record and script output file	

- Report and program schedules can be configured within BusinessObjects Enterprise to run when an event (or combination of events) occurs, or at a time / event combination. The event type changes the event trigger mechanism only – Enterprise scheduling is the same for all event types. Note that Enterprise uses "then" logic for time / event schedules – that is, the time must occur, then the event must occur. Event triggers that precede the processing time scheduled will not start job processing until the event triggers again within the Enterprise scheduling time span. CRC offers a variety of alternative event and time scheduling solutions.
- As a component of the CRC Event Suite for BusinessObjects Enterprise, Database Events also support "Event Report Groups" – an event attribute that identifies an event with reports within the Enterprise system that are mapped to the same group. Event Report Groups provide real-time report scheduling: when a Database Event associated with an Event Report Group is triggered, a scheduling process locates all reports within the Event Report Group and schedules them to "Run Now". No recurring schedules are required and report processing has no time component.

### **The External Database Event Table**

Database Events are implemented in a table or view outside the Enterprise system using a record format similar to the one below:

<b>Field</b>	<b>Data Type</b>	<b>Contents</b>
Event_Name	Text ((50)	Event Name in the external system (Indexed)
Trigger_DateTime	Date/Time	Date / time of the activity

### **The Database Event History Table**

The history of each Database Event is stored using the record format below:

<b>Field</b>	<b>Data Type</b>	<b>Contents</b>
HistoryID	Number	Auto-generated primary key for record uniqueness
CE_Event_ID	Text (10)	Enterprise System ID for the Database Event
CE_Event_Name	Text (50)	Name of Event Object in the Enterprise system
DB_Event_Name	Text (50)	Name of Event in the External Database
DB_Trigger_DateTime	Date/Time	Date / time the event was triggered in DB
CE_Trigger_DateTime	Date/Time	Date / time the event was triggered in Enterprise
Prev_CE_Trigger_DateTime	Date/Time	Date / time the event was previously triggered in Enterprise
MinutesElapsed	Number	Minutes since last trigger in Enterprise
Status	Text (9)	'Triggered' or 'Failed'
CMS_Name	Text (50)	CMS_Name that processed the event
Monitor_Script_ID	Text (10)	SI_ID of the program run that created this record

### **The CRC Event Processing History Table**

The history of each run of the CRC Event Monitor is stored using the record format below:

<b>Field</b>	<b>Data Type</b>	<b>Contents</b>
SequenceID	Number	Auto-generated primary key for record uniqueness (Indexed)
Activity_DateTime	Date/Time	Date / time of the activity (Indexed)
CMS_Name	Text ((20)	Name of CMS used for event processing
nEventsProcessed	Number	Number of Database Events processed
nEventsUpdated	Number	Number of Database Events updated for the DB Event Timestamp
nEventsTriggered	Number	Number of Database Events successfully triggered
nFailedEvents	Number	Number of Database Event triggers that failed
nEventsNotFound	Number	Number of Database Events not found
nErrors	Number	Number of processing errors
MinutesElapsed	Number	Minutes since last run
HourGroup	Number	Tag for hourly summaries
DayGroup	Number	Tag for daily summaries
MonthGroup	Number	Tag for monthly summaries
HasActivity	Text (1)	'Y' for records with activity (triggers set or failed)
Monitor_Script_ID	Text (10)	SI_ID of the program run that created this record

History tables are managed within the CRC Event Administration web pages to review record counts by status and age, and to purge aged records by "Inactive" or "All" status.

## Database Event Administration

### ***CRC Event Monitor Administration***

Database Events are monitored by a recurring Enterprise script program: the “CRC Event Monitor”. The program is stored within the Enterprise system and scheduled by the system administrator to run on a recurring schedule, similar to a report schedule. Output from each processing run is securely stored within the Enterprise system and can be viewed through the Central Management Console, InfoViewer, and other standard web applications that can access program output stored within the Enterprise system. Because the monitor runs frequently, the program is configured to limit the number of instances stored within the Enterprise system; program output is used primarily to verify system configuration and for short term system monitoring. The results of each run are stored in an SQL compliant database such as SQL Server or Oracle. The most recent program output and all retained history can be viewed through the web based CRC Event administration tools provided by CRC.

### ***Web Based Administration***

Administrator tools, similar to the Central Management Console, are provided to monitor processing and to view database processing results by process run, individual event processing history, and Database Event details. The tools are implemented for secured access from any web browser. Tool users must be a member of an administration group authorized in the Enterprise system.

The CRC Event administration tools also provide for changing event types within the Enterprise system and for configuring each Database Event for its corresponding event name and trigger “watch field” within the external database table used to drive Database Event processing.

## Database Event Configuration

Each Database Event is configured using the supplied web administration tools. Within the tools, a Database Event is created by changing an existing User Event or File Event within the Enterprise system to a “Database Event” event type. Internally, a Database Event is a User Event with custom properties that identify the event as a Database Event and that configure the event to map to the external database table. As such, Database Event properties are stored within the Event Object within the CMS database.

The web administration tools and the CRC Event Monitor script are configured for the CRC Event History table, the CRC Event Processing History table, and the External Database Event table during system installation.

## Server Technology

### **Server Executable**

The “CRC Event Monitor” is a Windows script file written in VB Script stored within the Enterprise system’s Input File Repository. The script runs as a script program object within the Enterprise system and may be run on any Program Job Server. It runs on a recurring schedule defined by the Enterprise system administrator using the Central Management Console. Script program output is stored within the Enterprise system’s Output File Repository. The number of output instances retained is limited as configured by the Enterprise system administrator using the Central Management Console.

### **Supporting Components**

Database Events are defined and configured using web pages provided by CRC. Database Event processing by the CRC Event Monitor is monitored and administered using web pages provided by CRC. The External Event Table is created and updated by system administrators.

### **Enterprise Framework**

All communication with the Enterprise system uses the Enterprise Framework using the interface supported by Business Objects.

Communication with the External Database Event table and with the Database Event History tables is through ODBC.

### **Enterprise Version Compatibility**

Database Events are compatible with Crystal Enterprise versions 9.0 and 10.0 and with BusinessObjects Enterprise versions 11.0 and 11.5 (XI and XI R2).

### **Database Connectivity**

The CRC Event Monitor and web administration tools connect to any enterprise database system supporting ODBC and Active Data Objects. Implemented databases include MS Access, SQL Server, Oracle 10g, and UDB. Separate connections are defined for the External Event Table and the history tables, so that all tables need not reside in the same database. For example, the External Event Table can be implemented on an Oracle database and the history tables can be implemented on a SQL Server database.

## Licensing

The CRC Suite for BusinessObjects Enterprise is licensed per BusinessObjects Enterprise CMS Cluster. The CRC Suite for BusinessObjects Enterprise is owned and copyrighted © 2006 by CRC Business Solutions, Inc.; source code is provided to licensees.

Use of the CRC Suite for BusinessObjects Enterprise is subject to BusinessObjects Enterprise licensing from Business Objects.

## Contact Information

The CRC Suite for BusinessObjects Enterprise is available from CRC Business Solutions, Inc., a Business Objects Professional Services Partner. For additional information about the CRC Event Suite for BusinessObjects Enterprise and our other Enterprise services and products, visit <http://www.crcsolutions.com>.

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