

LiveCode 4.5.1 Release Notes

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Overview

LiveCode 4.5 is a major new release containing a number of new features together with a streamlined install process and improved web-plugin.

This document describes all the changes that have been made – including bug fixes and new syntax.

At the time of writing, this information has yet to been integrated into the dictionary or User's Guide.

Known issues

- The installer will currently fail if you run it from a network share on Windows. Please copy the installer to a local disk before launching on this platform.
- The Oracle dbdriver for Mac (PowerPC) is not present in this build.

Platform support

The engine supports a variety of operating systems and versions. This section describes the platforms that we ensure the engine runs on without issue (although in some cases with reduced functionality).

Windows

The engine supports the following Windows OSes:

- Windows 2000 SP4
- Windows XP SP2 and above
- Windows Server 2003
- Windows Vista SP1 and above (both 32-bit and 64-bit)
- Windows 7 (both 32-bit and 64-bit)
- Windows Server 2008

Note: On 64-bit platforms the engine still runs as a 32-bit application through the WoW layer.

Linux

The linux engine requires the following:

- 32-bit installation, or a 64-bit linux distribution that has a 32-bit compatibility layer
- 2.4.x or later kernel
- X11R5 capable Xserver running locally on a 24-bit display
- glibc 2.3.2 or later
- gtk/gdk/glib (optional – required for native theme support)
- pango/xft (optional – required for pdf printing, anti-aliased text and unicode font support)
- lcms (optional – required for color profile support in JPEGs and PNGs)
- gksu (optional – required for elevate process support)

Note: The optional requirements (except for gksu and lcms) are also required by Firefox and Chrome, so if your linux distribution runs one of those, it will run the engine.

Note: If the optional requirements are not present then the engine will still run but the specified features will be disabled.

Note: LiveCode and standalones it builds may work on remote Xservers and in other bit-depths, however this mode of operation is not currently supported.

Mac OS X

The Mac OS X engine supports:

- 10.3.9 (Panther) on PowerPC
- 10.4.11 (Tiger) on Intel and PowerPC
- 10.5.8 and later (Leopard) on Intel and PowerPC
- 10.6.x (Snow Leopard) on Intel

Note: The engine runs as a 32-bit application regardless of the capabilities of the underlying processor.

Changes at version 5.0

The supported platforms that will be supported in 5.0 is currently being reviewed. However, it is likely that the following will be the case:

- The engine **will no longer support** Mac OS 10.3.9 (Panther)
- The engine **will require** gtk, gdk, glib, pango and xft on Linux

Improved installation

Layout

The structure of the IDE install has changed significantly in this release.

Each distinct version has its own complete folder – multiple versions will no longer install side-by-side: on Windows (and Linux), each distinct version will gain its own start menu (application menu) entry; on Mac OS X, each distinct version will have its own app bundle.

The default location for the install on the different platforms when installing for 'all users' are:

- Windows: <x86 program files folder>/RunRev/ LiveCode 4.5.1
- Linux: /opt/runrev/livecode-4.5.1
- Mac OS X: /Applications/ LiveCode 4.5.1.app

The default location for the install on the different platforms when installing for 'this user' are:

- Windows: <user roaming app data folder>/RunRev/Components/LiveCode 4.5.1
- Linux: ~/.runrev/components/livecode-4.5.1
- Mac OS X: ~/Applications/ LiveCode 4.5.1.app

Getting folder locations within the IDE

If you write plugins, or have code that relies on the location of IDE files then please ensure you use the following access functions to locate them:

| | |
|--|---|
| <i>revEnvironmentToolsPath()</i> | The location containing the main IDE files. |
| <i>revEnvironmentToolsetPath()</i> | The location of the main IDE stacks. |
| <i>revEnvironmentExternalsPath()</i> | The location of the externals that come with the IDE. |
| <i>revEnvironmentPluginsPath()</i> | The location of the plugins that come with the IDE. |
| <i>revEnvironmentRuntimePath()</i> | The location of the standalones that come with the IDE. |
| <i>revEnvironmentDocumentationPath()</i> | The location of the documentation files. |
| <i>revEnvironmentResourcesPath()</i> | The location of the resources that come with the IDE. |
| <i>revEnvironmentCustomizationPath()</i> | The location of the IDE customization folder. |
| <i>revEnvironmentUserCachePath()</i> | The location of the folder to use for caching files. |
| <i>revEnvironmentUserPreferencesPath()</i> | The location of the folder to use for preference files. |
| <i>revEnvironmentUserExternalsPath()</i> | The location of the folder to use for additional externals. |
| <i>revEnvironmentUserPluginsPath()</i> | The location of the folder to use for additional plugins. |
| <i>revEnvironmentUserResourcesPath()</i> | The location of the folder to use for additional resources. |

Important: Third-party IDE extensions must avoid placing any files inside the application

bundle or under `revEnvironmentToolsPath()` (not least because you will probably not have privileges to do so!). Instead, they should use the user-externals and user-plugins paths as provided. These paths are determined by the user's *customization path* setting, configurable in the preferences.

New installer

The installer has been entirely replaced in this version. It is (hopefully!) a vast improvement over the old installer, and now runs on Windows, Mac OS X and Linux.

At release the intention is that the installer will automatically detect whether authentication is required for the install and request it if needed.

***Note:** If your linux distribution does not have the necessary support for authentication (gksu) then the installer will run without admin privileges so you will have to manually run it from an admin account to install into a privileged location.*

Uninstallation

On Windows, the installer hooks into the standard Windows uninstall mechanism. This is accessible from the appropriate pane in the control panel.

On Mac OS X, simply drag the app bundle to the Trash.

On Linux, the situation is currently less than ideal:

- open a terminal
- `cd` to the folder containing your rev install. e.g.
`cd /opt/runrev/livecode-4.5.1`
- execute the `.setup.x86` file. i.e.
`./setup.x86`
- follow the on-screen instructions.

Reporting installer issues

If you find that the installer fails to work for you then please file a bug report in the RQCC or email support@runrev.com so we can look into the problem.

In the case of failed install it is vitally important that you include the following information:

- Your platform and operating system version
- The location of your home/user folder
- The type of user account you are using (guest, restricted, admin etc.)
- The installer log file located as follows:
 - **Windows 2000/XP:** <documents and settings folder>/<user>/Local Settings/
 - **Windows Vista/7:** <users folder>/<user>/AppData/Local/RunRev/Logs
 - **Linux:** <home>/runrev/logs

- **Mac OS X:** <home>/Library/Application Support/Logs/RunRev

Improved licensing

The license system has been replaced in this release.

The new system ties your product licenses to a customer account system, meaning that you no longer have to worry about finding a license key after installing a new copy of LiveCode. Instead, you simply have to enter your email address and password that has been registered with our customer account system and your license key will be retrieved automatically.

Alternatively it is possible to activate the product via the use of a specially encrypted license file. These will be available for download from the customer center after logging into your account. This method will allow the product to be installed on machines that do not have access to the internet.

Engine changes

Non-blocking DNS resolution

The **open socket** command no longer blocks on DNS resolution. Instead, if resolution is required the command will return immediately and the DNS lookup will happen in the background. If resolution fails, then a **socketError** message is sent in the same way as if connection fails.

For applications using **hostNameToAddress** directly, its syntax has been augmented:

```
hostNameToAddress(hostname, [ callback ])
```

If the *callback* parameter is specified then the call will return immediately and upon completion of the lookup, the callback will be invoked with the resolved address as a parameter.

Improved cursor support

Cursor support has been improved in several ways.

The engine will now automatically process any image to convert to a form suitable for display on the current platform and screen depth taking this burden off the developer. Specifically, the engine will scale the image down to the appropriate size, and reduce the number of colors to the appropriate number of colors.

Additionally, the engine has been updated to take advantage of support for larger and potentially alpha-blended cursors on platforms that support this. Specifically:

- Windows XP and above support full alpha-blended cursors up to 64x64
- More recent Linux distributions support alpha-blended cursors up to a size of 64x64
- Mac OS X supports alpha-blended cursors up to 256x256

The engine now picks up the GTK cursor theme on Linux. (4.5.1)

Note: It appears that alpha-blending support depends on the current screen depth on some platforms.

Improved image export

BMP Export

The export command can now produce Windows BMP format images in the same way as it previously did for gif and png:

export target as bmp

Palette reduction

The **export** command can now perform color reduction. To support this, the following new forms have been added:

export target as (gif | png | bmp) with palette colors

export target as (gif | png | bmp) with (standard | optimized) palette

export target as (gif | png | bmp) with count color optimized palette

The first form allows you to specify a list of up to 256 colors to use in the final palette.

The second form will use either the standard 'websafe' palette, or will compute an optimized palette with at most 256 colors.

The third form allows you to choose the size of the optimized palette to be generated. The number of colors can be at most 256.

If the image has any sort of transparency, then this will utilize one palette entry. (In particular if you ask for a 256 color palette with a transparent image, you may get only 255 colors).

In all cases, optional dithering will be performed as determined by its **dontDither** property.

Note: It is a (relatively) slow process to compute an optimized palette and then remap an image against it – it should not be considered a real-time operation except for very small images.

Note: There is no support for exporting a JPEG with a reduce palette as this format is for continuous-tone images and as such the notion of palette makes no sense.

Raw data export (experimental)

It is possible to export raw image data using the following forms:

export target as raw with palette colors

export target as raw with (standard | optimized) palette

export target as raw with count color optimized palette

export target as raw [argb | bgra | abgr | rgab]

The first three of these operate in the same way as for the other formats as described above except that instead of formatted image data you get the raw palette indices packed appropriately depending on the size of the palette:

<= 2 colors will be 1 bpp

<= 4 colors will be 2 bpp

<= 16 colors will be 4 bpp

<= 256 colors will be 8 bpp

The final form allows export of the full 32-bit data of the image with 8 bits per component. In this case, the components are not pre-multiplied with any alpha channel, and appear ordered in memory in increasing bytes.

e.g. The argb form will give you:

byte 0 = alpha

byte 1 = red

byte 2 = green

byte 3 = blue

Important: This feature is currently experimental. This means that it may not be complete, or may fail in some circumstances that you would expect it to work. Please do not be afraid to try it out as we need feedback to develop it further.

Color profile support

The engine will now attempt to use any embedded ICC color profile information that is present in JPEGs and PNGs.

If a JPEG contains a color profile then the engine will attempt to use it to translate the image's colors to the default screen color space before display.

When printing JPEGs, the original JPEG data will now be sent to the printer directly whenever possible. In particular, this means that any intermediate color matching for the screen that the engine performs does not affect the printed output.

As an additional side-effect of color profile support, the engine now also supports YCCK and CMYK JPEG images.

Note: *Support for color profiles depends on the OS - in particular Windows XP and earlier only support ICC v2 profiles, Vista onwards supports ICC v4.*

Print to pdf support

The engine printing system has been augmented with the ability to *print to pdf*. This feature uses the existing print-loop model and virtually no code changes are needed to make existing code use it.

Print loop integration

To start a print loop that outputs directly to a pdf rather than the currently configured printer, use the following form:

open printing to pdf *filename* [**with options** *optionArray*]

This should be performed *instead of* the usual **open printing** command.

Note: *It is not necessary (and unwise!) to set the **formatForPrinting** option on stacks which are being printed to PDF.*

Options

The options array which can be optionally specified when opening a print loop for pdf allows you to add entries to the resulting PDF's *Document Information Dictionary*.

The following keys are supported:

Title, Author, Subject, Keywords, Creator, Producer

Their values can be any string.

Hyperlink support

When inside a pdf print loop you can use additional commands to define hyperlinks and their targets.

To define a target for an internal hyperlink, use the following form:

print anchor *name* **at** *anchorPoint*

Here *name* is used to identify the anchor in related **print link** commands, and *anchorPoint* is the location on the current page to which any such link should jump to.

To define a hyperlink use the following form:

print link to *target* **with rect** *linkRectangle*

If *target* is a url, then the given rectangle will jump to that url when it is clicked. If *target* is not a url, it is assumed to be the name of an internal anchor as specified by the **print anchor** command and clicking in the given rectangle will jump there instead.

When printing fields, any text that has its **linkText** property set will be treated as if a **print link** command had been executed with the contents of the property as target, and the formattedRect of the text as rectangle.

Runtime dependency

The implementation of pdf printing resides in a dynamic library called *revpdfprinter*. The standalone builder will automatically include this in the appropriate place when building standalones.

Any custom code that deals with standalones which use this feature must make sure that the revpdfprinter library resides next to the engine executable (On Mac OS X, this is inside the Contents/MacOS folder, not next to the bundle).

Elevated process support (experimental)

Sometimes it is necessary to perform operations on the local machine as an administrator, and a typical pattern for a GUI application doing this is for it to prompt for authentication at certain points.

Modern operating systems do not permit a process to elevate itself, nor grant itself increased privilege. Instead, they only allow a running process to launch another process with increased privilege. Therefore, in order to support this, a new form of the **open process** command has been introduced that can launch a slave process with elevated permissions:

open elevated process *process* [**for** [**text** | **binary**] (**read** | **write** | **update** | **neither**)]

This form operates identically to the normal version, except that engine will ask the system to launch the given process with admin/root privileges.

The standard way for a GUI application that needs to perform privileged operations to be structured is to split the application into two parts: a GUI front-end that interacts with the user, and a command-line back-end that is run with elevated permissions. These two parts can then talk to each other using a standard master-slave approach, or some other form of IPC such as sockets.

Important: This feature is currently experimental. This means that it may not be complete, or may fail in some circumstances that you would expect it to work. Please do not be afraid to try it out as we need feedback to develop it further.

Slave process improvements

A number of issues with the *open process* command and the engine itself have, up until now, conspired to make it difficult (if not impossible!) to either run a slave process, or use the engine as slave on all platforms.

These issues have been resolved in this version, thus making it straightforward to run another process and poll for input and output over stdin/stdout.

The typical form for this is along the following lines (this example assumes the process being executed outputs whole lines):

```
command startSlave pProcess
    open process pProcess for text update
    send "monitorSlave pProcess" to me in 50 millisecs
end startSlave

command monitorSlave pProcess
    repeat forever
        # Loop until there are no more lines to read.
        read from process pProcess for 1 line in 0 millisecs
        if the result is empty then
            # The slave has sent us something, so process it and loop for
            # (potentially) more data.
        else if the result is "timeout" then
            # There is nothing waiting for us, so exit repeat
            exit repeat
        else if the result is "eof" then
            # The slave has terminated, so do any final processing and finish
            # monitoring.
            close process pProcess
            exit monitorSlave
        else
            # Some error has occurred!
            exit monitorSlave
        end if
    end repeat
    send "monitorSlave pProcess" to me in 50 millisecs
end monitorSlave
```

Videograbber improvements

Some work has been done on storing and fetching settings from the videograbber.

On Windows and Mac OS X, audio and video settings are now correctly retrieved and set using **revVideoGrabSettings** and **revSetVideoGrabSettings**.

On Windows (when using DirectShow), the 'Camara Control' settings are now saved and restored via the grab settings commands. Specifically: pan, tilt, roll, zoom, exposure, iris, focus and flash.

Status icon support (experimental)

Windows, Linux and Mac OS X all have an area where so-called 'status icons' can be displayed. On Windows this is the system tray on the bottom right of the start bar, on Linux this is typically the right of the panel at the top of the screen, and on Mac OS X this is on the menubar.

The engine has support for adding a single status icon, and it can be configured using **the `statusIcon`, the `statusIconTooltip` and the `statusIconMenu`**:

set the `statusIcon` to *imageId*

set the `statusIconMenu` to *iconMenuSpec*

set the `statusIconTooltip` to *toolTip*

Here *imageId* is the id of the image you wish to use as the icon. It will be scaled down automatically to the appropriate size for the platform and then set. The *toolTip* specifies what message appears when the user hovers over the status icon.

The *iconMenuSpec* allows you to configure a menu that will appear when the user does a 'menu' click on the icon. This string uses a subset of the standard engine menu specification:

```
[ <tab> * ] [ '(' <label> [ '|' <tag> ]
```

Here the number of tabs determines the depth of the menu (i.e. use this to create sub-menus). The optional tag is used when calling the **`statusIconMenuPick`** message.

Before the engine displays the status icon menu, it will send a **`statusIconMenuOpening`** menu to the current card of the defaultStack. You can use this opportunity to change the icon menu before it is displayed, this is an analog to handling *mouseDown* in a menu button.

When the user selects an item from the dock menu, the engine will send an **`statusIconMenuPick`** message to the current card of the default stack:

`iconMenuPick` which

Here *which* will be a list of labels or tags (if specified) separated by '|' which determines which item was selected.

In addition, the engine will send the following message in response to clicks on the icon:

`statusIconMenuClick` button

`statusIconMenuDoubleClick` button

You can use these to perform an appropriate action.

Note: If you wish to display a menu from the status icon you must use the `statusIconMenu` property, attempting to open a normal popup menu in response to one of the click messages is not guaranteed to work.

Note: This syntax is only implemented on Windows at the moment and replaces the previously unsupported use of **the `icon` and the `iconMenu`** for this purpose. The properties specified above will have no effect on Mac OS X and Linux at this time.

Important: This feature is currently experimental. This means that it may not be complete, or may fail in some circumstances that you would expect it to work. Please do not be afraid to try it out as we need feedback to develop it further.

Listing sub-keys in the registry (experimental)

To get a list of sub-keys in the Windows registry use the following function:

```
listRegistry(parentKey)
```

This will return a return-delimited list of sub-keys, i.e. those keys which are direct children of the given *parentKey*. The specified key should be in the same format as the other registry functions.

Important: This feature is currently experimental. This means that it may not be complete, or may fail in some circumstances that you would expect it to work. Please do not be afraid to try it out as we need feedback to develop it further.

Cryptographic-quality random data (experimental)

A **randomBytes()** function has been added to enable generation of arbitrary amounts of cryptographic-quality random data. To use this feature, the syntax is:

```
randomBytes(byteCount)
```

The function will return *byteCount* random bytes and uses the OpenSSL library's random data generator to do so.

Note that the random data is derived from non-predictable sources where possible, meaning that it can (for the most part) be considered truly random. This is contrast to the **random** function which uses a pseudo-random number generator and **randomSeed** value.

Important: This feature is currently experimental. This means that it may not be complete, or may fail in some circumstances that you would expect it to work. Please do not be afraid to try it out as we need feedback to develop it further.

SHA-1 digest support (experimental)

The SHA-1 digest of a block of data can now be computed by using the following form:

```
the sha1Digest of data
```

```
sha1Digest(data)
```

This function returns the sha-1 digest in the form of 20 (binary) bytes.

Important: This feature is currently experimental. This means that it may not be complete, or may fail in some circumstances that you would expect it to work. Please do not be afraid to try it out as we need feedback to develop it further.

Public key encryption support (experimental)

The **encrypt** and **decrypt** commands now support RSA public key encryption. The new forms supporting this are:

```
encrypt message using rsa with ( public | private ) key key [ and passphrase passphrase ]
```

```
decrypt message using rsa with ( public | private ) key key [ and passphrase passphrase ]
```

Here *key* should be in PEM format, optionally protected by *passphrase*.

The maximum length of a message that can be encrypted using RSA is the size of the key in bytes – 11. So, for a 512-bit key pair, the maximum encryptable message size is 53 bytes.

Generating key pairs

Public-private key pairs can be generated using the **OpenSSL** suite of command-line tools. For example:

```
openssl genrsa -out private_key.pem 512
openssl rsa -pubout -in private_key.pem -out public_key.pem
```

Will generate a key pair of size 512-bits, placing the private key in *private_key.pem* and the public key in *public_key.pem*.

For more information on these utilities see <http://www.openssl.org/docs/apps/rsa.html> and <http://www.openssl.org/docs/apps/genrsa.html>.

Command variants

Use encrypt with a public key to encode a message that you only want to be decoded the holder of the private key.

Use decrypt with a private key to decode a message that a sender has encrypted with its corresponding public key.

Use encrypt with a private key to encode a message that a receiver can then verify has come from one of the holders of the private key (this is a *signing* operation).

Use decrypt with a public key to verify that a message has been encoded with the corresponding private key, and there has come from one of its holders (this is a *verify* operation).

Encrypting longer messages

For signing, the maximum length of an encryptable message isn't really an issue since typically in that scenario it will be some sort of hash that would be being encrypted.

For the more traditional encrypting scenario, however, the standard approach is to use public key cryptography to encrypt a random password which is then used with a symmetric cipher to actually encrypt the payload.

Important: This feature is currently experimental. This means that it may not be complete, or may fail in some circumstances that you would expect it to work. Please do not be afraid to try it out as we need feedback to develop it further.

HTTPS – automatic root certificate discovery (experimental)

In previous versions it was necessary to set the *sslCertificates* property to the root certificates that HTTPS connections should be verified against. Support has now been added to locate and load the root certificates installed (and kept up to date) as part of the OS.

This uses the standard root certificate keychain on Mac OS X, the standard root certificate store on Windows and uses a number of heuristics to locate this information on Linux.

You can easily find out if the system-installed root certificates are being found by running the following command in the message box:

```
get url "https://www.google.com"
put the result & return & it
```

If this results in an error about verification failure then it is likely that root certificates have not been found. Please let us know (particularly on Linux) if you find this simple test fails, making sure you give us full details of your system (e.g. Linux distribution and version).

Important: This feature is currently experimental. This means that it may not be complete, or may fail in some circumstances that you would expect it to work. Please do not be afraid to try it out as we need feedback to develop it further.

Runtime execution stack configuration (4.5.1)

In order to be able to more reliably control the maximum level of recursion, a new global property **stackLimit** has been introduced.

This property allows a script to set (in bytes) the maximum size of the (runtime) stack the engine uses for recursive computation. A change in the setting will only take effect when all currently executing handlers complete, and at this time the stack size limit will be reconfigured to the given limit, or the nearest amount to it depending on available memory.

The stackLimit currently in effect can be fetched using **the effective stackLimit**.

The recursionLimit property is now bounded by the stackLimit – attempts to set the recursionLimit greater than the stackLimit will see it downwardly adjusted to the maximum current size allowed.

Note: The changes to the recursionLimit property and the new stackLimit property are only implemented on Windows at present.

Important: This feature is currently experimental. This means that it may not be complete, or may fail in some circumstances that you would expect it to work. Please do not be afraid to try it out as we need feedback to develop it further.

Keyboard layout syncing (4.5.1)

The field object will no longer attempt to sync the keyboard to the current text. This brings LiveCode (and applications built with it) inline with modern practice on both Windows and Mac (the Linux engine has never tried to do this syncing).

Standalone allowInterrupts default (4.5.1)

The default setting for the *allowInterrupts* property is now false in standalones. This change has been made to ensure that user's cannot inadvertently interrupt scripts in built applications.

MySQL driver improvements (4.5.1)

The MySQL client library has been updated to the latest version (6.0.0). In particular, this fixes a long standing issue with connection timeouts.

Additionally, SSL support now works correctly on all platforms (this requires the 'SSL & Encryption' support be included in the standalone settings when deploying).

XML Namespace support (4.5.1)

By default, revXML will process XML Namespace related tags and attributes in a way that is inaccessible to revXML. This can cause problems when a script needs to process the namespaces

itself.

To resolve this issue two additional functions mimicking the behavior of `revCreateXMLTree` and `revCreateXMLTreeFromFile` have been added to `revXML`. These functions are:

```
revCreateXMLTreeWithNamespaces
revCreateXMLTreeFromFileWithNamespaces
```

The difference between these and the originals is that these two functions ignore namespace tags and attributes, and instead return them as part of the tree without doing any processing.

For example, consider the following XML tree:

```
<db>
  <bb:record>
    <bb:firstname>Bugs</bb:firstname>
    <bb:lastname>Bunny</bb:lastname>
    <zz:zip>10101</zz:zip>
  </bb:record>
  <xx:record>
    <xx:firstname>Bugs</xx:firstname>
    <xx:lastname>Bunny</xx:lastname>
    <xx:zip>10101</xx:zip>
  </xx:record>
</db>
```

Will get interpreted as follows:

| <code>revCreateXMLTree</code> | <code>revCreateXMLTreeWithNamespaces</code> |
|---|---|
| <pre>db record[1] record[1]/firstname record[1]/lastname record[1]/zip record[2] record[2]/firstname record[2]/lastname record[2]/zip</pre> | <pre>db bb:record[1] bb:record[1]/bb:firstname bb:record[1]/bb:lastname bb:record[1]/zz:zip xx:record[2] xx:record[2]/xx:firstname xx:record[2]/xx:lastname xx:record[2]/xx:zip</pre> |

The latter form is more appropriate in the case that an application needs the namespace information to perform correctly.

***Note:** This is breaking change from 4.5 which (erroneously) changed the behavior of `revCreateXMLTree*` to be that of `revCreateXMLTree*WithNamespaces`.*

revBrowser improvements (4.5.1)

There is a long standing issue with `revBrowser` that causes browser instances to be lost whenever the stack it is attached to has its window re-created. Previously, cases where this would occur had to be avoided when a browser was present on a stack.

To resolve this problem a new property has been added to browser instances – `windowId`. The `windowId` property allows the stack to which a browser instance is attached to be changed after it has been created.

If the `windowId` is set to 0, the browser instance is temporary hidden. If the `windowId` is set to a

valid stack windowId, the browser instance will move to that stack.

For example, to toggle the resizable property of a stack hosting a browser use the following code:

```
revBrowserSet pBrowserId, "windowId", 0
set the resizable of stack pBrowserStack to pNewResizableValue
revBrowserSet pBrowserId, "windowId", the windowId of stack pBrowserStack
```

Important: This feature is currently experimental. This means that it may not be complete, or may fail in some circumstances that you would expect it to work. Please do not be afraid to try it out as we need feedback to develop it further.

Linux – font support improvements

The font support in the Linux engine has been completely overhauled.

The engine now uses the *pango* library for all text layout, and renders text using the *xft* library. Additionally, the **fontNames** and related global properties will now reflect the full collection of fonts installed on the system via the *fontconfig* mechanism (this is the font selection system that powers pango).

Legacy font support

If the linux distribution does not have the necessary libraries installed, the engine will fallback to using the old X11 font mechanism. This has vastly reduced support for unicode text, and renders without anti-aliasing.

You can force this fallback by passing `-xftoff` as a command-line parameter to the engine.

Linux – themeing improvements

Some work has been done to improve the appearance of applications on Linux. Although still not perfect, the native theme support should now correctly handle themes that have a transparent/alpha blended background on some of their parts.

In particular, the default theme in the latest distributions such as Ubuntu 10 look much improved.

Linux – ssl improvements

In order to provide ssl and industrial strength encryption, the engine utilizes the *OpenSSL* library. However, the OpenSSL team does not, unfortunately, guarantee binary compatibility between different versions. This has long caused an issue for the engine on Linux where the specific version the engine needs may not be present.

In order to solve this issue, the linux engine no longer depends on any installed OpenSSL library and will, instead, (attempt to) load *revsecurity.so*.

This loadable library is a custom build of the latest OpenSSL distribution (1.0.0a at time of writing) and includes both the ssl and crypto components.

Runtime dependency

This change introduces a new (optional) runtime dependency for linux standalones. The standalone

builder will automatically include this in the appropriate place when building standalones that have specified a need for the 'SSL and Security' library.

Any custom code that deals with standalones which use this feature must make sure that the revsecurity library resides next to the engine executable.

Mac OS X – bundle changes

In previous engines there were various support bundles present in the *PlugIns* folder inside the engine bundle. These are no longer required as their functionality has been integrated into the main engine executable.

Any code that builds standalones, or manipulates built standalones will need to be updated to not expect these to be present.

Mac OS X – dock icon support

Previously unsupported syntax for manipulating the dock icon on Mac OS X is now experimental.

Choosing an image

The current dock icon image can be set by using the global **icon** property:

set the icon to *imageId*

The engine will attempt to find an image with the given id, resize it to 128x128 and then set it as the dock icon for the application.

This property has no effect on other platforms.

Note: The image is only guaranteed to persist while the application runs, although in some cases the OS does appear to cache it beyond this.

Configuring the dock icon menu

In addition to changing the dock icon image, you can also configure the menu that appears when the user clicks on it.

To set the dock icon menu use the global **iconMenu** property:

set the iconMenu to *iconMenuSpec*

Here, *iconMenuSpec* is a string describing the menu. This uses a subset of the standard menu specification syntax. The string should be a return-delimited list of items specified as follows:

```
[ <tab> * ] [ '(' <label> [ '|' <tag> ]
```

Here the number of tabs determines the depth of the menu (i.e. use this to create sub-menus). The optional tag is used when calling the **iconMenuPick** message.

Before the engine displays the icon menu, it will send a **iconMenuOpening** menu to the current card of the defaultStack. You can use this opportunity to change the icon menu before it is displayed, this is an analog to handling *mouseDown* in a menu button.

When the user selects an item from the dock menu, the engine will send an **iconMenuPick** message to the current card of the default stack:

iconMenuPick *which*

Here *which* will be a list of labels or tags (if specified) separated by '|' which determines which item was selected.

Important: This feature is currently experimental. This means that it may not be complete, or may fail in some circumstances that you would expect it to work. Please do not be afraid to try it out as we need feedback to develop it further.

Windows – ssl improvements (4.5.1)

The SSL libraries required for encryption and HTTPS on Windows have been updated to use OpenSSL 1.0.0a and have been compiled into a single DLL – revsecurity.dll.

This DLL must be present in the same folder as the (standalone) engine for these features to work (note the standalone builder automatically includes this library if the appropriate inclusion is set).

Specific bug fixes

(bug fixes specific to the current build are highlighted in bold, bug fixes that have been reverted are stricken through)

9178 'do as vbscript' fails after several runs (Windows)

9179 hostNameToAddress can cause LiveCode to crash (Windows)

Language bar disappears when LiveCode has focus on Windows Vista/7

PDF printing fails on Vista when rendering text

'No disk' exception on startup on some Windows machines

VideoGrabber settings can be reset to defaults before showing dialogs when using DirectX

Volume control slider inaccessible in QT players on Windows

Crash after setting the label of a graphic to empty in certain circumstances

Engine fails to launch on Mac 10.3.9.

crash when using 'open elevated process' on Mac

'open elevated process' fails on Linux if spaces in engine or command path

Editing and selection of Unicode surrogates does not work correctly

MySQL driver now returns appropriate error if SSL could not be established

Crash when relayering groups in response to mouseEnter

Redraw issue when showing hidden stack in a specific case on Windows

5 Images needs to be RLE compressed to be used as cursors

1413 Some PNGs do not import correctly

1690 'beep n' beeps (n-1) times

2117 Engine blocks on DNS query

2398 Cursor size limit

3568 Crash on using a non-RLE compressed/color image when setting a cursor

3977 Mac OS X cursors are scaled down to 16x16

4022 Immediate 'read from process' causes hang on Windows

5246 Put ... into url ("file:~...") causes crash when ~ does not resolve to a user

6044 System cursor theme ignored on Linux

6215 Arrow keys give keyUp message after typing into field

6506 the watchedVariables doesn't support globals

6753 Rotated image moves when toggling dontDither

6866 Crash when fetching htmlText of field under certain circumstances

- 7476 'edit script of ...' doesn't work if lock messages is in effect
- 7490 Default buttons render incorrectly on Linux
- 7613 Crash when throwing an error in newButton handler
- 7649 Filter command incorrectly removing empty lines
- 7652 Some cursors turn white on Mac OS X
- 7666 revDatabaseCursors function adds trailing comma
- 7670 Handlers passing through groups do not pass through backgrounds
- 7744 Parser allows duplicate parameters
- 7792 Handlers can be compiled with builtin function names even though they cannot be invoked
- 7815 Ask file can't handle folder name in path longer than 31 characters on Mac OS X
- 7864 Line length limit of 65535 chars in filter command
- 7872 Crash on testing if path containing ~<non-existent-user> exists
- 7892 RevBrowser vScroll/hScroll properties do not work on Windows
- 7988 SpecialFolderPath() can returns a non-empty result even if it succeeded on Windows
- 8064 Flip command crashes rev in certain circumstances
- 8107 Graphic object auto-closes polygons when it shouldn't
- 8143 Left and right quotes and double-quotes don't appear when pasted into Rev from WordPad
- 8151 Stack title changes when stack opacity goes from 0 to non-zero on Windows
- 8218 Delete/backspace doesn't work if the shift key is down
- 8259 'there is a folder' returns False for network shares
- 8264 Crash when using replaceText function in certain specific circumstances
- 8268 Crash when compacting stack after deleting cards with background group
- 8273 revDatabaseColumnIsNull reports False for NULL columns in SQLite
- 8280 Stack behavior not resolved on open
- 8327 Copying text from Safari can cause dataloss and strange characters on Mac OS X
- 8351 SQLite query errors returning unhelpful generic error messages
- 8352 allowInterrupts not false in standalones
- 8427 Crash when exporting JPEG images in certain circumstances
- 8494 Clone fails on groups when in 'edit group' mode
- 8549 revBrowser not loading htmlText before a url has been opened on Windows.
- 8559 Setting the menuHistory of an option menu does not change the scroll position on Windows
- 8560 Incorrect hilighting of tab buttons after using menuHistory
- 8562 Crash when calling 'cancel printing' after 'open printing to pdf'
- 8564 Image borders don't print to PDF
- 8571 Setting the icon fails to set the dock icon on Mac OS X unless the image is edited first
- 8572 printMargins causes issues when printing to pdf
- 8573 Menu separators and disabled menu items not working in OS X Plugin.
- 8585 Single line tooltips on controls near the taskbar flash
- 8593 Scrollbar thumb on list field can disappear
- 8595 CMYK jpegs without an ICC profile fail to display
- 8597 Crash in some cases when using graphic effects on images
- 8598 Mac OS X tab buttons render with increased margin
- 8601 Cannot slide a slider is startValue > endValue
- 8610 Passkey property doesn't give any indication of whether the script is available
- 8620 revDatabaseTableNames truncating data with large number of tables
- 8621 revDatabaseTableNames doesn't remove trailing return character
- 8622 Buttons not working properly in licensing dialog
- 8624 Standalones not made executable on OS X if they had accented chars in path
- 8627 Spanish dates have no spaces on Mac OS X

- 8628 Problem when moving between different types of pulldown menu in specific circumstances
- 8640 The hilitedLines doesn't allow indices > 65535
- ~~8644 Empty line appears in openStacks on Windows when a menu is showing~~
- 8650 Crash when operating ComboBox using keyboard on OS X
- 8661 show/hide with visual effect doesn't take into bitmap effects
- 8662 Printing to pdf doesn't take account of the printPaperOrientation
- 8671 SQLite incorrectly returning empty for columns in some queries
- 8716 Stacks containing large custom prop arrays won't load
- 8746 Resizing a menubar group, or a menu button causes its accelerators to stop working.
- 8769 Crash when using graphic effects on Linux in some cases
- 8773 Player object cannot use https streams
- 8847 Events and messages stop working in some circumstances on Linux
- 8848 Context menu clicks on datagrids in the IDE causes contents of the datagrid to be lost
- 8888 In list behavior mode, 'the hilitedLines' are not preserved across fetching htmlText chunks
- 8889 Video grabber set settings crashes if given an invalid parameter
- 8929 Shell command blocks when it shouldn't
- 8936 HTTPS only works if sslCertificates has been set correctly
- 8943 Blocking url call doesn't start until an event message has been sent
- 8946 Crash in script editor when editing specific script
- 8947 Drag cursor doesn't get set to 'not allowed' on Mac OS X
- 8956 QT Unloaded when it shouldn't be causing delay in first visual effect.
- 8968 Manipulating the currentCard of the templateStack causes a crash
- 8969 shell() does not block when it should on Windows
- 8972 RevSetVideoGrabSettings has no effect
- 8973 LiveCode crashes when fetching a 16-bit image from the clipboardData on Windows
- 8980 revDataFromQuery truncates output for NULL columns with SQLite
- 8994 Bucket and pencil cursors do not appear on Mac
- 8999 Landscape orientation does not work correctly with pdf printing
- 9005 Recursion limit can be set to an invalid value on Windows
- 9021 Cursor setting related crash on Mac
- 9023 The printRectangle is not updated after setting the print* properties
- 9027 Odd behavior of scrolling field after move command
- 9031 'print card into rect' requires explicit 'go to card'
- 9032 Crash when fetching revBrowser htmlText property
- 9034 Crash when doing 'filter empty ...' in certain cases
- 9035 Hierarchical submenus disappear if the first item is disabled
- 9041 Toggling resizable of a stack causes browser content to disappear
- 9048 Text in opaque fields does not render reliably on Linux
- 9055 Inconsistency of mouse messages in pointer tool mode
- 9059 capsLockKey function non-functional on Linux
- 9102 the printRanges reports invalid value, does not coalesce ranges correctly
- 9115 Non-Unicode text does not print to pdf correctly in some cases on Mac
- 9118 Fill patterns do not print correctly on Windows
- 9120 hostNameToAddress does not return immediately in some cases on Mac
- 9123 'clone invisible <object>' causes rendering artifact
- 9134 'openProcesses' not cleared if process quits on Windows
- 9149 LiveCode should not auto-sync keyboard to text

IDE changes

Update checker

The update checker and its corresponding menu item in *Help* have been temporarily removed in dp-4. The version checking method is changing, and this option will re-appear in a subsequent build.

Affiliate registration

The affiliate registration item in the *Help* menu has been temporarily removed in dp-4. The method of affiliate registration is changing, and this option will re-appear in a subsequent build.

Database query builder

Use of the database query builder has been deprecated.

To access its functionality, choose the *Enable database query builder* option on the *Compatibility & Updates* pane of the preferences.

Note: *The database query builder will be removed entirely in version 5.0.*

Standalone builder

MacOS Classic

Support for MacOS classic building has been removed. If you wish to build MacOS classic applications then you must use a previous version to do so.

Windows – U3 Support

Support for building for U3 on Windows has been removed. If you wish to build applications for U3 then you must use a previous version to do so.

Windows – UAC Manifest

It is now possible to specify what action UAC should take on Windows Vista and higher when the standalone is launched. You can choose one of the following options:

| | |
|------------------------------|---|
| <i>Default</i> | No UAC option is provided in the manifest. |
| <i>Save as Invoker</i> | The application will run with the same privileges as the process that invoked it. |
| <i>Highest available</i> | The application will be elevated to the highest privilege level the current user is allowed. |
| <i>Require administrator</i> | The application will be run as administrator after prompting the user for appropriate login/elevation rights. |

Web

Using the 4.5 standalone builder to build for Web will create revlets. These are compatible with the existing revWeb plug-in available from revweb.runrev.com.

An updated version of the IDE for producing LiveCode Applets and the associated LiveCode player will be made available in due course.

Note: As the currently available revWeb plug-in uses the 4.0 engine, you must be careful to only use features that are present in that version.

Datagrid

The datagrid has been updated to version 1.0.2 build 11. The following changes have been made to it since 1.0.1:

1.0.2 build 11 dgDragMove was not setting the dragAction to "move"

Added dgColumnLabelEncoding[pColumn] property. Returns "mac" or "iso" depending on the platform the dgColumnLabel[pColumn] was set on. Only returns a value if label is set with a version of the behavior \geq 1.0.2 build 11.

Setting the dgColumnLabel now stores an encoding property of "iso" or "mac" depending on the platform the label is set on.

Setting the dgLabel property of a column header now includes the encoding based on the platform the label was set on: dgLabel [pEncoding]. This applies to the Default Header behavior.

1.0.2 build 10 ColumnControlOfIndex now returns the long id of the control. The id being returned was only to be used internally and would not work outside of a script running in the data gid group itself.

1.0.2 build 9 RefreshList now maintains the hilited line (index) in the data grid.

1.0.2 build 8 Removed unnecessary lock/unlock screen in dgMouseDown when clicking with left mouse button.

You can now pass multiple key/value pairs to SetDataOfIndex/Line.

RefreshList now works with cached controls.

_CreateDragImageFromIndex and _CreateDragImageFromControl now reset the templateImage.

Fetching dgText and dgData now restore persistent data if the control has yet to be opened.

1.0.2 build 7 "column labels" was returning a comma delimited list instead of a line delimited list.

arrowKey message is always passed now. Previously it was not passed if the data grid acted on the arrowKey message.

The internal function that returned the list of visible controls was not always returning the proper controls and/or order of controls for tables.

When refreshing data in indexes when the data grid had focus the focused control would revert to the card rather than staying within the data grid.

Message catcher in dgList behavior was watching for setProp dgDataControl instead

of `getProp dgDataOfControl`.

Clicking in the vertical scrollbar area no longer selects rows when the scrollbar isn't displaying a thumb.

Added `dgClickLine`, `dgClickIndex` and `dgClickedInDataView`.

You can now set "dimmed hilite color".

Added `getprops` for "text color", "effective text color", "header text color" and "effective header text color".

`_table.RepositionColumns` was not setting "lock messages" to value it had when entering the handler.

Added in `getProp` for "border color" and "effective border color".

1.0.2 build 6 `AddLine` now returns the line number of the newly added data.

Added `ColumnControlOfLine`.

Registry is no longer accessed unless `registryRead` is among the items of the `securityPermissions` property.

Column header label, horizontal and vertical scrollbars no longer have `traversalOn` set to true.

The Data Grid no longer deletes row/column controls when setting the `dgData/dgText` or deleting the last row in a data grid. This means no more error messages if any of the above events occur as the result of a handler called within a row/column behavior script.

A `ResetData` message is now sent to rows (form) or column (tables) instances of the templates whenever it is being hidden and the data being displayed is empty. This allows the developer to reset any controls and clear any caches.

Instances of a data grid form row/table column templates now receive the `PreFillInData` message when data in the row is being cleared and new data inserted. This allows the developer to clear any caches if need be.

Messages sent to rows/columns are now trapped before getting to the Data Grid group. This insulates the outside world from these internal messages if not handled in the template behavior script.

1.0.2 build 5 `dgColumn` name no longer accepts an empty string for a column name.

1.0.2 build 4 Internal private function that returned list of visible controls would return more controls than there were actual records for tables that had less records than visible rows. This caused issues with visual feedback during drag reordering.

When drag reordering the drop indicator was not being positioned properly when dragging above the first line of the grid.

Drop indicator now draws all the way to the right in Data Grid forms.

1.0.2 build 3 Custom column controls now inherit the standard column behavior or the "default

column behavior" (if set) if no behavior has been assigned to the control.

1.0.2 build 2 Column headers were not properly aligned when redrawing the Data Grid.
Column header labels were not being properly positioned when rednering if header alignment was centered.

1.0.2 build 1 If a Data Grid table didn't have any data in it then the horizontal scrollbar would not keep the column headers and columns in sync if the column width was wider than the visible area of the Data Grid.

Setting "fixed row height" now calls ResetList internally. This ensures that all data and accompanying row hilites are redrawn properly based on new setting.

_VisibleSequences was not returning proper values in all cases. This affected dgVisibleLines.

Added "header divider color" and "header divider threed color"

AddData could potentially send "FillInData" with messages locked if a developer had locked messages before calling it.

Specific bug fixes

(bug fixes specific to the current build are highlighted in bold)

9160 Missing shortcuts from menubar

9165 Group context menu item 'Lock Location' doesn't work.

Whitespace not stripped from fields in activation dialog

Standalone builder creates incorrect plist for Mac and fails to include default icon.

Corrected 'LiveTalk' reference in about dialog.

Resource Center can open in a corrupted state.

Revolution appears in the re-license dialog.

revPrintField does not work well with 'open printing to pdf'

Standalone Builder doesn't include externals

Standalone Builder doesn't include revsecurity.so when needed on Linux

Changed references to Revolution to LiveCode in various dialogs and windows

Standalone settings does not update 'PDF Printer' check box correctly

User image libraries not sorted in drop-down lists

User image libraries created with conflicting ID ranges

'File > Close and Remove From Memory' non-functional

5117 Custom functions called from msg box can't use variable values from debugger

6505 WatchedVariables not supporting globals.

7031 Icon chooser does not display user image libraries

7136 lockMessages being displayed in the Message Box list makes no sense

7291 Property inspector windowShape field behavior not the most friendly

7411 Nudging objects with arrow keys does not work when Suppress Messages is on

7700 Property inspector doesn't allow firstIndent to be set back to zero

7879 Standalone builder won't allow custom plist to be removed from settings

7929 revNumberOfRecords function incorrectly documented return value

- 7970 Standalone builder gives unhelpful warning when attempting to include Oracle driver in Linux build
- 7992 Data Grid cannot be created from main IDE menu bar
- 7995 RevMail fails with messages > 2000 chars on Windows
- 8002 Property inspector doesn't allow changing stack name where only case is different
- 8023 Inconsistency between creating Data Grid by dragging and by double clicking
- 8046 Column resizing button in Data Grid inspector not disabling correctly
- 8079 Dictionary doesn't reset scroll when changing entry
- 8088 Script editor resizing problem on Mac OS X
- 8138 Image library throws an error then '(This stack' item selected
- 8142 Polygon tool can't draw polygons with more than 10 sides
- 8147 Duplicate stack error when resuming suspended development tools
- 8148 Various IDE windows resizing problems
- 8152 Recent stack icons in Start Center not responding to mouse click
- 8157 Stacks with "!" at beginning of name don't show properly in IDE Window menu
- 8179 Launch document documentation needed improvement
- 8206 Text clipping problem in Property Inspector
- 8236 Logging message left in IDE
- 8286 Message box not showing error hints
- 8291 Command + A doesn't work to select all in script editor find field
- 8299 Command+w closes debugger when variable visualizer is focused
- 8300 Documentation incorrect for password property
- 8311 Documentation example problem for preOpenControl message
- 8321 Script editor documentation pane doesn't disambiguate clashing keywords
- 8376 Cancelling revBrowser navigation using browserCancel doesn't work
- 8388 Script editor handler list not updating when closing tab
- 8400 Build for Mac OS Classic checkbox incorrectly enabled on Windows and Linux
- 8431 Typo in message box scrolling code throws error
- 8438 Installer is PowerPC only and requires Rosetta to run
- 8450 Messages sent to stack while building standalone with externals
- 8454 revStudio dock icon badging is wrong
- 8470 Standalone build fails when building for multiple platforms and using cursors
- 8486 Dictionary resizing error
- 8491 Documentation entries for revTalk objects contained incorrect syntax section
- 8497 Variable viewer panes being incorrectly hidden when debugger regains focus
- 8523 Line number in Script Editor overlaps horizontal scrollbar
- 8536 Database external not included in Linux standalone with search for inclusions
- 8546 Message box too picky about function syntax
- 8548 Script editor handler list not updating after unlocking passworded script
- 8579 Menu builder preview bar not working properly due to extra controls
- 8600 IDE does not work correctly with Suppress Messages is on
- 8608 Stacks with trailing spaces in their names fail to build on Windows
- 8651 Graphic with showName and lineSize of zero breaks property inspector
- 8655 Content-Length sent by libUrl causes issues with some servers
- 8655 LibUrl sending incorrect content-length header
- 8715 Command-A not working on dictionary
- 8719 Mnemonics for View and Edit in the main IDE menubar are the same
- 8734 Application browser not working well with edit group mode
- 8744 Images emptied by standalone builder with Copy Referenced files turned on

- 8940 IDE does not take 'cantSelect' property into account when testing for edit mode
- 8965 Pasting text into the S/E find field causes it to be overwritten rather than inserted
- 8966 Cancelling installation does not work correctly.
- 8970 Ctrl-C fails in variable visualizer
- 8982 Spelling error in revEnvironmentExternalsPath in release notes
- 8983 Typo in get url example in release notes
- 8988 Script handler list not updated when it should be in script editor
- 8990 Printer Chooser throws an error in preOpenCard
- 8995 Accented characters not displayed correctly in the splash screen
- 9016 Printer dialog 'printer list' has disabled scrollbar when it shouldn't
- 9017 Printer dialog misses 'current' print range option
- 9024 Printer dialog does not set some print* properties
- 9026 Script error when turning Windows builds on or off in Standalone Builder.
- 9060 revSetCardProfile broken
- 9069 Standalone builder requires stack to have '.rev' or '.livecode' extension
- 9070 Duplicate object non-functional
- 9090 Go commands disabled in View menu
- 9158 New Control menu item disabled when it should be enabled

Revisions

- | | | |
|-------------------|----|---|
| <i>Revision 1</i> | MW | Document created for issue with 4.5-dp-4. |
| <i>Revision 2</i> | MW | Updated engine bug fix list for 4.5-dp-5. Updated IDE bug fix list for 4.5-dp-5. Added section on new public-key cryptography support. Added section on new randomBytes support. Added section on SHA-1 digest support. Added section on root certificate discovery support. |
| <i>Revision 3</i> | MW | Updated engine bug fix list for 4.5-rc-1. Updated IDE bug fix list for 4.5-rc-1. Revised section on new licensing system |
| <i>Revision 4</i> | MW | Fixed broken engine bug fix list. |
| <i>Revision 5</i> | MW | Updated engine bug fix list for 4.5-rc-2. Updated IDE bug fix list for 4.5-rc-2. Updated standalone builder 'Web' section. |
| <i>Revision 6</i> | MW | Updated engine bug fix list for 4.5 release. Updated IDE bug fix list for 4.5 release. Updated licensing section. |
| <i>Revision 7</i> | MW | Updated engine bug fix list for 4.5.1-dp-1. Updated IDE bug fix list for 4.5.1-dp-1. Updated datagrid section for 4.5.1-dp-1. Updated 'Improved cursor support' section Corrected example in 'slave process' section Added section on changes to recursion and stack handling Added section on improvements to MySQL driver Added section on improvements to revXML Added section on changes to SSL support on Windows Added section on improvements to revBrowser |

| | | |
|--------------------|----|--|
| <i>Revision 8</i> | MW | Updated engine bug fix list for 4.5.1-dp-2. Update IDE bug fix list for 4.5.1-dp-2. |
| <i>Revision 9</i> | MW | Updated engine bug fix list for 4.5.1-dp-3. Updated IDE bug fix list for 4.5.1-dp-3. Added section on allowInterrupts in standalones Added section on keyboard synching in fields |
| <i>Revision 10</i> | MW | Updated engine bug fix list for 4.5.1-rc-1 Updated IDE bug fix list for 4.5.1-rc-1 |
| <i>Revision 11</i> | MW | Updated engine bug fix list for 4.5.1 release Updated IDE bug fix list for 4.5.1 release Updated revEnvironment function section. |