



DirectFB Driver Feature List

Revision History

Revision	Date	Change Description
DirectFB-AN103-R	10/21/13	Updated: <ul style="list-style-type: none">• Version of the software to 1.7.1 v1.0 throughout the manual.• Table 1: “DirectFB Primitives,” on page 7• Table 7: “DirectFB Higher Level Features,” on page 12.
DirectFB-AN102-R	07/15/13	Updated: <ul style="list-style-type: none">• Version of the software to 1.7.0 v1.0 throughout the manual.• The two “Draw Lines” rows from Table 1 on page 7; also the “Fill Trapezoids” row’s Notes column, removing the PX3D core.• The DSBLIT_ROTATE90 and DSBLIT_ROTATE270 rows from Table 2 on page 9.• The DSRO_MATRIX row from Table 4 on page 10.• The version numbers in the following rows in Table 7 on page 12: linux-fusion, SaWMan, ++DFB, DirectFB-examples, and Insignia. Added: <ul style="list-style-type: none">• The BCM7145 to the list of chips supported by the driver on page 6. Removed: <ul style="list-style-type: none">• The BCM7409 and BCM7420 from the list of chips supported by the driver.• The three “Fill Triangle” rows from Table 1 on page 7.• The two “Three Triangle” rows and the “Texture Triangles” row from Table 1 on page 7.• “Unsupported Features” on page 14.• The “video playback bullet” from “Unsupported Features” on page 14.
DirectFB-AN101-R	02/28/13	Updated: <ul style="list-style-type: none">• Version of the software to 1.4.17 v1.6 throughout the manual. Added: <ul style="list-style-type: none">• BCM7445 to the list of supported chips in “Introduction” on page 6• DSPF_LUT1 to Table 7: “DirectFB Higher Level Features,” on page 12
DirectFB-AN100-R	12/19/12	Initial release.

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About This Document

Purpose and Audience

This document describes the various supported features of the Broadcom® Nexus DirectFB driver. It also describes which features are *not* supported by the driver. It is intended for software and hardware engineers with a basic knowledge of DirectFB.

Acronyms and Abbreviations

In most cases, acronyms and abbreviations are defined on first use.

For a comprehensive list of acronyms and other terms used in Broadcom documents, go to:
<http://www.broadcom.com/press/glossary.php>.

Document Conventions

The following conventions may be used in this document:

<i>Convention</i>	<i>Description</i>
Bold	User input and actions: for example, type exit , click OK , press Alt+C
Monospace	Code: <code>#include <iostream></code> HTML: <code><td rowspan = 3></code> Command line commands and parameters: <code>wl [-1] <command></code>
<code>< ></code>	Placeholders for <i>required</i> elements: enter your <code><username></code> or <code>wl <command></code>
<code>[]</code>	Indicates <i>optional</i> command-line parameters: <code>wl [-1]</code> Indicates bit and byte ranges (inclusive): <code>[0:3]</code> or <code>[7:0]</code>

Technical Support

Broadcom provides customer access to a wide range of information, including technical documentation, schematic diagrams, product bill of materials, PCB layout information, and software updates through its customer support portal (<https://support.broadcom.com>). For a CSP account, contact your Sales or Engineering support representative.

In addition, Broadcom provides other product support through its Downloads and Support site (<http://www.broadcom.com/support/>).

Introduction

This document describes the various supported features of the Broadcom Nexus DirectFB driver. It also describes which features are *not* supported by the driver. Broadcom has many different products and some of these products may have DirectFB drivers associated with them.

This driver is specific to the following set-top chips:

- BCM7145
- BCM7231
- BCM7241
- BCM7346
- BCM7358
- BCM7425
- BCM7429
- BCM7435
- BCM7445
- BCM7552

This driver will be referred to as the “bcmnexus driver,” because it is based on the Broadband Systems Engineering Nexus library.

DirectFB is a graphics library designed with embedded systems in mind. It offers maximum hardware-accelerated performance at a minimum of resource usage and overhead. When hardware acceleration is not available for a feature, DirectFB usually has a software implementation. This is referred to in this document as an “unaccelerated primitive.” Even when the driver provides acceleration for a primitive, it is possible, via APIs, to override the acceleration and use the soft version of the primitive.

Supported Graphics Operations

Supported Graphics Primitives

[Table 1](#) presents DirectFB graphics primitives and indicates whether or not the Broadcom bcmnexus driver provides the feature and/or accelerates the feature. Some points to keep in mind when reviewing this table are:

- Variances in CPU features and Mem2MemCompositor (M2MC) features affect whether or not benchmarks run faster accelerated or unaccelerated.
- When a specific API is not accelerated in the driver, DirectFB uses logic to partially accelerate the API. For example, if the driver does not support specific hardware antialiased text acceleration, DirectFB assumes that blitting each glyph is faster than using the CPU to copy each glyph using memcpy. This may or may not be true.
- The Broadcom-accelerated support column represents only full driver acceleration; it does not indicate if a lesser acceleration is used. See the Notes column for this information.

Table 1: DirectFB Primitives

DirectFB Primitives	Broadcom-Accelerated Support?	Runs Faster Unaccelerated?	Notes
Antialiased Text	Partially	No	Defaults to blitting each glyph. Packet buffer helps to produce outstanding results.
Antialiased Text (blend)	Partially	No	Runs much faster with packet-buffer enabled.
Fill Rectangle	Yes	No	—
Fill Rectangle (blend)	Yes	No	—
Fill Multiple Rectangles	No	No	Defaults to calling accelerated fill rectangle for each rectangle.
Fill Multiple Rectangles (blend)	No	No	Defaults to calling accelerated blend fill rectangle for each rectangle.
Draw Rectangle	Yes	Depends on chip and debug/release mode	Driver composites four one-pixel filled rectangles as the outline of the rectangle. In Debug mode, this is slower than in Release mode.
Draw Rectangle (blend)	Yes	Depends on chip and debug/release mode.	Acceleration by compositing four one pixel filled rectangles as the outline of the rectangle and using either Porter-Duff or normal blended Fill operations. In Debug mode, this is slower than in Release mode.
Draw Lines	No	No	—
Draw Lines (blend)	No	No	—

Table 1: DirectFB Primitives (Cont.)

DirectFB Primitives	Broadcom-Accelerated Support?	Runs Faster Unaccelerated?	Notes
Fill Spans	Yes	No	Partial acceleration by using one pixel filled rectangles for each span row. Performance is better in packet-buffer mode.
Fill Spans (blend)	Yes	No	Partial acceleration by using one pixel filled rectangles for each span row. Performance is better in packet-buffer mode.
Fill Trapezoids	Yes	No	Uses M2MC.
Blit	Yes	No	—
Blit 180	Yes	No	Uses mirroring capability of M2MC core.
Blit color-keyed	Yes	No	—
Blit destination color-keyed	Yes	No	—
Blit with format conversion	Yes	No	—
Blit with colorizing	Yes	No	—
Blit from 32-bit (blend)	Yes	No	—
Blit from 32-bit (blend) with colorizing	Yes	No	—
Stretch Blit	Yes	No	Downscale is limited to 1/64.
Stretch Blit color-keyed	Yes	No	Downscale is limited to 1/64.
Porter-Duff Blits	Yes	No	—
Mirroring/flipping	Yes	No	Uses mirroring capability of M2MC core.

Supported Surface Blitting Flags

Table 2 provides a list of the DirectFB surface blitting flags and specifies whether or not the graphics driver provides acceleration for this operation.

Table 2: DirectFB Surface Blitting Flags

Blitting Flag	Accelerated?	Notes
DSBLIT_NOFX	Yes	Uses NEXUS_Graphics2D_FastBlit() to perform the straight blit/copy in nonpacket buffer mode.
DSBLIT_BLEND_ALPHACHANNEL	Yes	Uses the blend block in the M2MC core.
DSBLIT_BLEND_COLORALPHA	Yes	Uses the Source Color Matrix block in the M2MC core.
DSBLIT_COLORIZE	Yes	Uses the Source Color Matrix block in the M2MC core.
DSBLIT_SRC_COLORKEY	Yes	Uses the source color-key block in the M2MC.
DSBLIT_DST_COLORKEY	Yes	Should have latest Nexus/magnum changes for correct appearance, though.
DSBLIT_SRC_PREMULTIPLY	Yes	Uses source alpha premultiplication block in the scaler if available in reference software.
DSBLIT_DST_PREMULTIPLY	No	The M2MC does not currently support a destination alpha premultiplication block.
DSBLIT_DEMULTIPLY	No	The M2MC does not currently support a demultiply block.
DSBLIT_DEINTERLACE	No	—
DSBLIT_SRC_PREMULTCOLOR	Yes	Uses the Source Color Matrix block in the M2MC core.
DSBLIT_XOR	Yes	Uses the ROP block in the M2MC core.
DSBLIT_INDEX_TRANSLATION	No	—
DSBLIT_ROTATE90	No	—
DSBLIT_ROTATE180	Yes	Uses both horizontal and vertical mirroring in the M2MC core.
DSBLIT_ROTATE270	No	—
DSBLIT_COLORKEY_PROTECT	No	—
DSBLIT_SRC_MASK_ALPHA	No	—
DSBLIT_SRC_MASK_COLOR	No	—
DSBLIT_SOURCE2	Yes	M2MC supports dual-source blitting.
DSBLIT_FLIP_HORIZONTAL	Yes	Uses the horizontal mirroring capability in the M2MC core.
DSBLIT_FLIP_VERTICAL	Yes	Uses the vertical mirroring capability in the M2MC core.

Supported Surface Drawing Flags

[Table 3](#) provides a list of the DirectFB surface drawing flags and specifies whether or not the graphics driver provides acceleration for this operation.

Table 3: DirectFB Surface Drawing Flags

Drawing Flag	Accelerated?	Notes
DSDRAW_NOFX	Yes	—
DSDRAW_BLEND	Yes	For nonpacket buffer mode, DSDRAW_BLEND also supports Porter-Duff blending as long as Nexus supports the NEXUS_Graphics2D_PorterDuffFill() function. For packet-buffer mode, we support all Porter-Duff operations.
DSDRAW_DST_COLORKEY	Yes	If using the packet-buffer implementation.
DSDRAW_SRC_PREMULTIPLY	Yes	—
DSDRAW_DST_PREMULTIPLY	No	—
DSDRAW_DEMULTIPLY	No	—
DSDRAW_XOR	Yes	If using the packet-buffer implementation.

Supported Surface Render Options

[Table 4](#) provides a list of the DirectFB surface render options and specifies whether or not the graphics driver provides acceleration for this operation.

Table 4: DirectFB Surface Render Options

Drawing Flag	Accelerated?	Notes
DSRO_NONE	Yes	—
DSRO_SMOOTH_UPSCALE	Yes	Only enabled if “smooth-upscale” DirectFB option is set and performing a stretch blit.
DSRO_SMOOTH_DOWNSCALE	Yes	Only enabled if “smooth-downscale” DirectFB option is set and performing a stretch blit.
DSRO_MATRIX	No	—
DSRO_ANTIALIAS	No	—

Supported Graphics Display Layer Capabilities

Table 5 provides a list of the DirectFB display layer capabilities that are supported by the Broadcom display layer graphics driver.

Table 5: DirectFB Display Layer Capabilities

Drawing Flag	Notes
DLCAPS_SURFACE	–
DLCAPS_OPACITY	The opacity of the layer can be adjusted if the layer option is set up beforehand.
DLCAPS_ALPHACHANNEL	The layer's default option.
DLCAPS_PREMULTIPLIED	–
DLCAPS_SRC_COLORKEY	–
DLCAPS_LEVELS	Can change the z-order of the graphics layer relative to the video layer(s).
DLCAPS_SCREEN_POSITION	–
DLCAPS_SCREEN_SIZE	Uses M2MC for vertical scaling if the graphics feeder doesn't support a vertical scaler.
DLCAPS_SOURCES	Used to allow mirroring of primary graphics layer on to secondary graphics layer/output.
DLCAPS_LR_MONO	Supports a single buffer per surface with z-offset.
DLCAPS_STEREO	Supports two unique buffers per surface.
DLCAPS_FOLLOW_VIDEO	Only supported on the Blu-ray® platforms.

Supported Screen Capabilities

Table 6 provides a list of the DirectFB screen capabilities that are supported by the Broadcom display screen driver.

Table 6: DirectFB Screen Capabilities

Drawing Flag	Notes
DSCCAPS_VSYNC	Available on all outputs of the STB.
DSCCAPS_OUTPUTS	–
DSCCAPS_ENCODERS	Available on primary and secondary outputs.
DSCCAPS_MIXERS	Only available on primary output of STB.

Supported Higher-Level Functions

The items given in [Table 7](#) represent higher-level features in DirectFB that are platform-dependent. [Table 7](#) also describes whether or not the Broadcom bcmnexus build supports each feature.

Table 7: DirectFB Higher Level Features

Feature	Broadcom bcmnexus Support?	Notes
Layers		
Graphics Display Layer	Yes	—
Video Display Layer	Yes	—
Still Picture Layer	No	—
Background Layer	No	—
Inputs		
Keyboard Input	Yes	—
Mouse Input	Yes	—
IR Remote	Yes	—
Front Panel Buttons	Yes	Needs LED controller to be initialized first.
Supported Surface Formats		
DSPF_A1	Depends	Yes, if Nexus supports it.
DSPF_A4	Depends	Yes, if Nexus supports it.
DSPF_A8	Yes	—
DSPF_LUT1	Yes	—
DSPF_LUT2	Yes	—
DSPF_LUT4	Yes	—
DSPF_LUT8	Yes	—
DSPF_ALUT8	Yes	—
DSPF_RGB444	Depends	Yes, if Nexus supports it.
DSPF_RGB555	Depends	Yes, if Nexus supports it.
DSPF_BGR555	Depends	Yes, if Nexus supports it.
DSPF_ARGB1555	Yes	—
DSPF_RGB16	Yes	—
DSPF_ARGB4444	Yes	—
DSPF_RGBA4444	Yes	—
DSPF_RGB24	Depends	Yes, if Nexus supports it.
DSPF_ARGB	Yes	—
DSPF_ABGR	Yes	—

Table 7: DirectFB Higher Level Features (Cont.)

Feature	Broadcom bcmnexus Support?	Notes
DSPF_RGB32	Depends	Yes, if Nexus supports it; otherwise it reverts to the same format as DSPF_ARGB.
DSPF_YUY2	Yes	—
DSPF_UYVY	Yes	—
DSPF_AYUV	Yes	—
Other Supported Features		
Broadcom still image provider	Yes	Only available on chips that have SID hardware block (for example, the BCM7425).
JPEG image provider	Yes	—
PNG image provider	Yes	—
GIF image provider	Yes	—
Animated GIF video provider	Yes	—
BMP image provider	Yes	Software-only solution.
FFmpeg image provider	Yes	Supports software decode and render of MPEG-2 I-frames and H.264/AVC I/IDR still pictures.
zlib-1.2.6	Yes	—
Freetype 2.4.9	Yes	—
libpng-1.5.10	Yes	—
jpeg-8d	Yes	—
FFmpeg 0.10.3	Yes	—
Coexistence with Nexus	Yes	Indicates that DirectFB and Nexus calls can coexist in an application.
Multiapplication support	Yes	With or without SaWMan and linux-fusion.
linux-fusion (a.k.a. fusion)	Yes	Version 9.0.1.
SaWMan	Yes	Part of the open-source DirectFB source tree.
++DFB	Yes	Part of the open-source DirectFB source tree.
DiVine	Yes	Version 0.4.0.
DirectFB-examples	Yes	Version 1.7.0.
Insignia	Yes	Version 1.0.1.
Tacho	Yes	Version 0.1.2 (requires external SLA).

Unsupported DirectFB APIs

Table 8 lists the DirectFB APIs that are not supported in the Broadcom bcmnexus implementation of DirectFB.

Table 8: Unsupported DirectFB APIs

DirectFB API	Notes
Interface: IDirectFB()	–
CreateVideoProvider()	Only animated GIFs are supported.
GetFramebufferOffset()	–
WriteBack()	Imageprovider API.
GetOutputDescriptions()	Screen API.
GetOutputConfiguration()	Screen API.
TestOutputConfiguration()	Screen API.
SetOutputConfiguration()	Screen API.
GetVSyncCount()	Screen API.

Unsupported Features

The following list indicates which features are not supported or have never been tried with the Broadcom bcmnexus driver:

- Linux fbdev
- Video4Linux video provider
- Video4Linux2 support
- vnc
- FusionSound
- Disko

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