



DirectFB-1.4.17 version 1.5

Driver Feature List

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Revision History

Revision	Date	Change Description
A1	Sep 12, 2008	Initial version.
A2	Sep 14, 2008	Add Broadcom Specific functions.
A3	Dec 23, 2009	DirectFB-1.4.1 Phase 1.5 features added.
A4	Apr 19, 2009	DirectFB-1.4.1 Phase 2.0 features added.
A5	Aug 17, 2010	DirectFB-1.4.1 Phase 2.5 features added.
A6	Oct 21, 2010	DirectFB-1.4.5 Phase 1.0 features added.
A7	Mar 18, 2011	DirectFB-1.4.1 Phase 3.0 features added
A8	Mar 18, 2011	DirectFB-1.4.5 Phase 1.5 features added.
A9	Jun 30, 2011	DirectFB-1.4.5 Phase 2.0 features added.
A10	Oct 21, 2011	DirectFB-1.4.15 Phase 1.0 features added.
A11	Nov 11, 2011	DirectFB-1.4.15 Phase 1.5 features added.
A12	Dec 21, 2011	DirectFB-1.4.5 Phase 4.0 features added.
A13	Feb 29, 2012	DirectFB-1.4.15 Phase 2.0 features added.
A14	May 23, 2012	DirectFB-1.4.17 version 1.0 features added.
A15	Jun 22, 2012	Updated template and unsupported API list.
A16	Oct 18, 2012	DirectFB-1.4.17 version 1.5 features added.

Table of Contents

Introduction 1

Supported Graphics Operations 2

 Supported Graphics Primitives 2

 Supported Surface Blitting Flags 5

 Supported Surface Drawing Flags 7

 Supported Surface Render Options 7

 Supported Graphics Display Layer Capabilities 8

 Supported Screen Capabilities 8

Supported Higher Level Functions 9

Un-Supported DirectFB APIs 12

Broadcom Specific Features 13

Unsupported Features 13

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. It is important to understand that Broadcom has many different products and some of these products may have DirectFB drivers associated with them, this driver is specific to set top chips primarily:

- 7231
- 7241
- 7346
- 7358
- 7409
- 7420
- 7425
- 7429
- 7435
- 7552

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 which was designed with embedded systems in mind. It offers maximum hardware accelerated performance at a minimum of resource usage and overhead. The Broadcom bcmnexus DirectFB driver provides access to the hardware acceleration for the chips given above. When hardware acceleration is not available for a feature, DirectFB usually has a software implementation. This is referred to in this document as an “un-accelerated” 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

The following table presents DirectFB graphics primitive 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 the table are:

- Variances in CPU features and Mem2MemCompositor (M2MC) features affect whether or not benchmarks run faster accelerated or un-accelerated.
- 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 anti-aliased text acceleration, DirectFB assumes that blitting each glyph is faster than using the CPU to memcpy each glyph. This may or may not be true.
- The Broadcom accelerated support column only represents full driver acceleration, it does not indicate if a lesser acceleration is used. See the notes column for this information.

DirectFB 1.4.17 Primitives	Broadcom Accelerated Support?	Runs faster unaccelerated?	Notes
Anti-aliased Text	Partially	No	Defaults to blitting each glyph. Packet-buffer helps to produce outstanding results.
Anti-aliased Text (blend)	Partially	No	Runs much master 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
Fill Triangle	Depends on whether chip has PX3D core	No	If PX3D core available and compiled with GL_SUPPORT=y, then h/w accelerated.
Fill Triangle (blend)	Depends on whether chip has	No	If PX3D core available and compiled with GL_SUPPORT=y, then h/w

DirectFB 1.4.17 Primitives	Broadcom Accelerated Support?	Runs faster unaccelerated?	Notes
	PX3D core		accelerated.
Fill Triangles (with and without blending)	Yes	No	If PX3D core available and compiled with GL_SUPPORT=y, then h/w accelerated. Note: This defaults to a single call that is much faster than iterating over the list of triangles in software.
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	Depends on chip	Depends on chip	This is h/w accelerated for PX3D capable devices only.
Draw Lines (blend)	Depends on chip	Depends on chip	This is h/w accelerated for PX3D capable devices only.
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 the PX3D core or M2MC.

DirectFB 1.4.17 Primitives	Broadcom Accelerated Support?	Runs faster unaccelerated?	Notes
Blit	Yes	No	
Blit 180	Yes	No	Using mirroring capability of M2MC core.
Blit colorkeyed	Yes	No	
Blit destination colorkeyed	Yes	No	
Blit with format conversion	Yes	No	
Blit with colorizing	Yes	No	
Blit from 32bit (blend)	Yes	No	
Blit from 32bit (blend) with colorizing	Yes	No	
Stretch Blit	Yes	No	Downscale limited to 1/64
Stretch Blit colorkeyed	Yes	No	Downscale limited to 1/64
Porter-Duff Blits	Yes	No	
Texture Triangles acceleration	Depends on whether chip has PX3D core	No	Accelerated if PX3D core available and compiled with GL_SUPPORT=y. Software support available.
Mirroring / flipping	Yes	No	Uses mirroring capability of M2MC core.

Supported Surface Blitting Flags

The table below lists the DirectFB surface blitting flags and whether or not the graphics driver provides acceleration for this operation or not.

Blitting Flag	Accelerated?	Notes
DSBLIT_NOFX	Yes	Uses NEXUS_Graphics2D_FastBlit() to perform the straight blit/copy in non-packet 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 pre-multiplication block in the scaler if available in reference software.
DSBLIT_DST_PREMULTIPLY	No	The M2MC does not currently support a destination alpha pre-multiplication block.
DSBLIT_DEMULTIPLY	No	The M2MC does not currently support a de-multiply 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	Depends	If the PX3D core is available and GL_SUPPORT=y is set when compiling Nexus/DFB, then this is hardware accelerated, otherwise we fall back to using software.s
DSBLIT_ROTATE180	Yes	Uses both horizontal and vertical mirroring in the M2MC core.

Blitting Flag	Accelerated?	Notes
DSBLIT_ROTATE270	Depends	If the PX3D core is available and GL_SUPPORT=y is set when compiling Nexus/DFB, then this is hardware accelerated, otherwise we fall back to using software.s
DSBLIT_COLORKEY_PROTECT	No	
DSBLIT_SRC_MASK_ALPHA	No	
DSBLIT_SRC_MASK_COLOR	No	
DSBLIT_SOURCE2	Yes	M2MC support 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

The table below lists the DirectFB surface drawing flags and whether or not the graphics driver provides acceleration for this operation or not.

Drawing Flag	Accelerated?	Notes
DSDRAW_NOFX	Yes	
DSDRAW_BLEND	Yes	For non-packet 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

The table below lists the DirectFB surface render options and whether or not the graphics driver provides acceleration for this operation or not.

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	Yes	Uses the PX3D core to perform transformation and the M2MC to perform translations.
DSRO_ANTIALIAS	No	

Supported Graphics Display Layer Capabilities

The table below lists the DirectFB display layer capabilities that are supported by the Broadcom display layer graphics driver.

Drawing Flag	Notes
DLCAPS_SURFACE	
DLCAPS_OPACITY	The opacity of the layer can be adjusted if the layer option is setup 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	Support a single buffer per surface with z-offset.
DLCAPS_STEREO	Supports two unique buffers per surface.
DLCAPS_FOLLOW_VIDEO	Only supported on BluRay platforms.

Supported Screen Capabilities

The table below lists the DirectFB screen capabilities that are supported by the Broadcom display screen driver.

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

Supported Higher Level Functions

The following items represent higher level features in DirectFB that are platform dependent and whether or not the Broadcom bcmnexus build supports these 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	If Nexus supports it then Yes.
DSPF_A4	depends	If Nexus supports it then Yes.
DSPF_A8	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	

Feature	Broadcom bcmnexus Support?	Notes
DSPF_RGB16	Yes	
DSPF_ARGB4444	Yes	
DSPF_RGBA4444	Yes	
DSPF_RGB24	depends	Yes if Nexus supports it.
DSPF_ARGB	Yes	
DSPF_ABGR	Yes	
DSPF_RGB32	depends	Yes if Nexus supports it, otherwise we revert to 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 (e.g. 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	
Co-existence with Nexus	Yes	Indicates that DirectFB and Nexus calls can co-exist in an application.
Multi-app Support	Yes	With or without SaWMan and linux-fusion

Feature	Broadcom bcmnexus Support?	Notes
linux-fusion (aka fusion)	Yes	Version 8.10.4
SaWMan	Yes	Version 1.5.4 + patches
++DFB	Yes	Version 1.4.2
DiVine	Yes	Version 0.4.0
DirectFB-examples	Yes	Version 1.6.0pre
Insignia	Yes	Version 0.1.2 (requires external SLA)
Tacho	Yes	Version 0.1.2 (requires external SLA)

Un-Supported DirectFB APIs

Following table lists the DirectFB APIs that are not supported in Broadcom bcmnexus implementation of 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	ScreenAPI
GetVSyncCount	Screen API

Broadcom Specific Features

This section describes features that Broadcom has added to this driver that are not part of the standard DirectFB feature set. The following features are unique to this Broadcom driver:

- HD resolution support – The ability to configure the output display resolution to 480i, 480p, 576i, 576p, 720p24, 720p25, 720p30, 1080i25, 1080i30, 1080p24, 1080p25, 1080p30, 1080p50, 1080p60, VGA, SVGA, XGA with a DirectFB startup parameter. The size of the frame buffer is also configured to the appropriate width and height. An optional startup parameter can be used to override the default frame buffer size.
- DXFL_FILLTRIANGLES support – the graphics driver can now support blitting multiple triangles in one operation.

Unsupported Features

The following list, as best as possible, 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
- Video playback using video provider API
- Disko