



DIRECTFB DRIVER FEATURE LIST

For the DirectFB-1.4.1 Phase 3.0 Release

REVISION HISTORY

<i>Revision Number</i>	<i>Date</i>	<i>By</i>	<i>Change Description</i>
A1	Sept 12, 2008	T Trammel	Initial version.
A2	Sept 14, 2008	T Trammel	Add Broadcom Specific functions.
A3	Dec 23, 2009	Rob McConnell	DirectFB-1.4.1 Phase 1.5 features added
A4	Apr 19, 2009	Rob McConnell	DirectFB-1.4.1 Phase 2.0 features added
A5	Aug 17, 2010	Rob McConnell	DirectFB-1.4.1 Phase 2.5 features added
A6	Oct 21, 2010	Rob McConnell	DirectFB-1.4.5 Phase 1.0 features added
A7	Mar 18, 2011	Rob McConnell	DirectFB-1.4.1 Phase 3.0 features added

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INTRODUCTION

This document describes the various supported features of the Broadband Systems Engineering 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 settop and digital TV chips primarily:

- 3548/9
- 3556
- 35125
- 35230
- 7019
- 7125
- 7208
- 7231
- 7325
- 7335
- 7336
- 7340
- 7342
- 7344
- 7346
- 7400
- 7401
- 7403
- 7405
- 7408
- 7413
- 7420
- 7422
- 7425
- 7468
- 7540
- 7550



This driver will be referred to as the bcmnexus driver because it is based on the Broadband Systems Engineering NEXUS library. This document does not address other Broadcom implementations of DirectFB.

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 Mem2MC (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 1.4.1 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 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
Fill Triangle	Depends on whether chip has PX3D core	No	If compiled with GL_SUPPORT=y, then h/w accelerated.
Fill Triangle (blend)	Depends on whether chip has PX3D core	No	If compiled with GL_SUPPORT=y, then h/w accelerated.
Fill Triangles (with and without blending)	Yes	No	Default to a single call that is much faster than iterating over the list of triangles in software.



DirectFB 1.4.1 Primitives	Broadcom Accelerated Support?	Runs faster unaccelerated?	Notes
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)	No	N/A	
Fill Spans	No	Depends on chip	Partial acceleration by using one pixel filled rectangles for each span row
Fill Spans (blend)	No	No	Partial acceleration by using one pixel filled rectangles for each span row
Fill Trapezoids	Yes	No	Uses the PX3D core or M2MC.
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	Shrink size limited to 1/8
Stretch Blit colorkeyed	Yes	No	Shrink size limited to 1/8
Porter-Duff Blits	Yes	No	
Texture Triangles acceleration	Depends on whether chip has PX3D core	N/A	Is available accelerated if compiled with GL_SUPPORT=y.
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.
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	
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. Otherwise, if used in conjunction with DSBLIT_BLEND_XXX and not an Ax surface, then requires 2 passes in the M2MC core.
DSBLIT_DST_PREMULTIPLY	No	
DSBLIT_DEMULTIPLY	No	
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_FLIP_HORIZONTAL	Yes	
DSBLIT_FLIP_VERTICAL	Yes	



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	Also supports Porter-Duff blending as long as Nexus supports the NEXUS_Graphics2D_PorterDuffFill() function.
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.

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	
DSCCAPS_OUTPUTS	
DSCCAPS_ENCODERS	Only on primary output



SUPPORTED HIGHER LEVEL FEATURES

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	
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. BCM93556).
JPEG image provider	Yes	
PNG image provider	Yes	
GIF image provider	Yes	
Animated GIF video provider	Yes	
zlib-1.2.3	Yes	
Freetype 2.3.7	Yes	
libpng-1.2.29	Yes	
libpng-1.4.x	Yes	
jpeg-6b	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
linux-fusion (aka fusion)	Yes	Version 8.1.1
SaWMan	Yes	Version 1.4.1
FusionDale	Yes	Version 0.8.1
++DFB	Yes	Version 1.4.1
DiVine	Yes	Version 0.4.0
Insignia	Yes	Version 0.1.1 (requires external SLA)
Tacho	Yes	Version 0.1.1 (requires external SLA)

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 framebuffer is also configured to the appropriate width and height. An optional startup parameter can be used to override the default framebuffer size.
- **TV panel output support** – When running the BCM3548/9/, BCM93556, BCM935251 or BCM935230 version of the driver, a startup parameter is provided to allow either LVDS panel or component output (e.g. panel_type=B552 for LVDS to DVI output).
- **Adjustable GFX memory size** – A startup parameter is provided that directly controls how much GFX memory is allocated by the driver. This is the “gfx_heap_size” environment variable.
- **check_domain** – new “direct” API that allows the debug domain to be queried to see whether it is enabled. Used with “D_CHECK_DOMAIN(X)” macro.
- **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
- X11
- vnc
- FusionSound
- Video playback
- disko