i.MX Linux® Release Notes

1 Release Contents

This document contains important information about the package contents, supported features, known issues and limitations in this release.

Supported hardware SoC/board

This release has support for the following boards but has only been tested on i.MX 6UltraLite EVK board.

- i.MX 6Quad SABRE-SD Board and Platform

- i.MX 6DualLite SABRE-SD Board

- i.MX 6QuadPlus SABRE-AI Board (beta quality)

- i.MX 6Quad SABRE-AI Board

- i.MX 6DualLite SABRE-AI Board

- i.MX 6SoloLite EVK Board

- i.MX 6SoloX SABRE-SD Board

- i.MX 6SoloX SABRE-AI Board

- i.MX 6UltraLite EVK Board

> **NOTE**
>
> In this document, the following notation is used:

Contents

- 6SABRE-SD means the i.MX 6Quad and i.MX 6DualLite SABRE-SD Platforms.
- 6SABRE-AI means the i.MX 6Quad, i.MX 6QuadPlus, and i.MX 6DualLite SABRE-AI Platforms.
- 6SoloLite means the i.MX 6SoloLite EVK
- 6SoloX-SD means the i.MX 6SoloX SABRE-SD Platform.
- 6SoloX-AI means the i.MX 6SoloX SABRE-AI Platform.
- 6UltraLite means the i.MX 6UltraLite EVK Platform.

1.1 Contents

This release consists of the following package files:

- L3.14.38_6ul-ga.tar.gz
- L3.14.38_6ul-ga_mfg-tools.tar.gz
- fsl-yocto-L3.14.38_6ul-ga.tar.gz

The release version is named "L<Kernel_version>_<x.y.z>."

"<Kernel_version>": BSP Kernel version. (For example, "L3.14.38" indicates that this BSP release is based on the kernel version 3.14.38.)

"<x.y.z>": Semantic versioning specification, where X is the major version, Y is the minor version, and Z is the patch version.

The following tables list the contents included in each package.

Table 1. Release contents

Component	Description
Linux® OS Kernel and Device Trees	3.14.38
U-Boot Configurations	v2015.04
SD Card images	Images
Manufacturing Tools	Manufacturing tools support

In the following table, the U-Boot configurations are listed for each machine configuration. The machine configurations are provided through the Yocto Project layers in the meta-fsl-arm and meta-fsl-bsp-release layers in the `conf/machine` sub-directory.

Table 2. U-Boot configurations

U-Boot configuration for Boot device	Description	Supported machine configuration
sd	This supports booting from the SD card. This is the default U-Boot configuration.	imx6qsabresd, imx6dlsabresd imx6qsabreauto, imx6dlsabreauto imx6slevk imx6qpsabreauto imx6sxsabresd imx6sxsabreauto imx6ulevk
spi-nor	This supports booting from SPI-NOR	imx6qsabreauto, imx6dlsabreauto imx6qpsabreauto

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Table 2. U-Boot configurations (continued)

U-Boot configuration for Boot device	Description	Supported machine configuration
		imx6slevk
eim-nor	This supports booting from Parallel NOR.	imx6qsabreauto, imx6dlsabreauto, imx6solosabreauto imx6qpsabreauto
nand	This supports booting from NAND.	imx6qsabreauto, imx6dlsabreauto, imx6solosabreauto imx6qpsabreauto imx6sxsabreauto
sata	This supports booting from SATA.	imx6qsabresd imx6qsabreauto imx6qpsabreauto
qspi2	This supports booting from QSPI2. Booting from the ARM® Cortex®-M4 processor is supported through QSPI2. Use U-Boot command "bootaux" to boot ARM Cortex-M4 processor. The booting address is 0x78000000	imx6sxsabresd
qspi1	This supports booting from QSPI1. Booting from the ARM Cortex-M4 processor is supported through QSPI1. Use U-Boot command "bootaux" to boot ARM Cortex-M4 processor. The booting address is changed to 0x68000000.	imx6sxsabreauto imx6ulevk
emmc	This supports booting from EMMC.	imx6sxsabresd
m4fastup	This supports booting from ARM Cortex-M4 processor by disabling QSPI2 from using ARM Cortex-M4 processor.	imx6sxsabresd

The following table describes the kernel and device trees supported in this release. A list of several device tree files are provided for each board to offer examples on how to handle different pin conflicts due to pin muxing.

Table 3. Kernel and device tree configurations

Kernel and device tree configuration	Description
zImage	Binary kernel image for the 3.14.38 kernel. This kernel is built with the imx_v7_defconfig for any i.MX 6 or i.MX 7 boards.
Standard	Each reference board has a standard device tree as follows: • zImage-imx6q-sabresd.dtb • zImage-imx6dl-sabresd.dtb • zImage-imx6q-sabreauto.dtb zImage-imx6qp-sabreauto.dtb • zImage-imx6dl-sabreauto.dtb • zImage-imx6sl-evk.dtb • zImage-imx6sx-sdb.dtb zImage-imx6sx-sdb-reva.dtb • zImage-imx6sx-sabreauto.dtb • zImage-imx6ul-14x14-evk.dtb Note: zImage-imx6sx-sdb.dtb is used for supporting the i.MX 6SoloX SABRE-SDB Rev. B board, and imx6sx-sdb-reva.dtb is used for supporting the legacy SABRE-SDB Rev. A board.

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Table 3.   Kernel and device tree configurations (continued)

Kernel and device tree configuration	Description
GPMI and EIM_NOR	Enables the GPMI and EIM-NOR. Due to pin conflict, the GPMI and EIM-NOR are disabled by default. See the device tree file for more details: • zImage-imx6dl-sabreauto-gpmi-weim.dtb • zImage-imx6q-sabreauto-gpmi-weim.dtb • zImage-imx6qp-sabreauto-gpmi-weim.dtb
ldo	Enables the LDO feature. By default, the LDO bypass is enabled. Use LDO devices trees on configurations with CPU@1.2GHZ, which does not support LDO bypass mode. • zImage-imx6q-sabresd-ldo.dtb, zImage-imx6dl-sabresd-ldo.dtb • zImage-imx6sl-evk-ldo.dtb • zImage-imx6sx-sdb-ldo .dtb, zImage-imx6sx-sdb-reva-ldo.dtb
hdcp	Enables the HDMI-HDCP feature. This avoids the pin conflict between the I2C2 and HDCP-DDC pins. • zImage-imx6q-sabresd-hdcp.dtb • zImage-imx6dl-sabresd-hdcp.dtb
ecspi	Enables eCSPI, which is disabled by default. • zImage-imx6dl-sabreauto-ecspi.dtb • zImage-imx6q-sabreauto-ecspi.dtb • zImage-imx6qp-sabreauto-ecspi.dtb
flexcan1	Enables flexcan1, which is disabled by default due to pin conflicts with fec. • zImage-imx6q-sabreauto-flexcan1.dtb • zImage-imx6dl-sabreauto-flexcan1.dtb • zImage-imx6qp-sabreauto-flexcan1.dtb
csi	Enables CSI support for V4L2. On i.MX 6UltraLite EVK this device tree fixes the pin conflict between SIM and CSI. • zImage-imx6sl-evk-csi.dtb • zImage-imx6ul-14x14-evk-csi.dtb
pf200	Enables PMIC pf200 support. • zImage-imx6sl-evk-pf200.dtb • zImage-imx6dl-sabresd-pf200.dtb
enetirq	An example to demonstrate GPIO6 workaround for bug where only the ENET wake-up interrupt request can wake the system from Wait mode. Since the pad GPIO6 is used by I2C3 on the board, these device trees have I2C3 disabled to enable this workaround. • zImage-imx6q-sabresd-enetirq.dtb zImage-imx6dl-sabresd-enetirq.dtb
uart	Enables UART support on SABRE-SD boards to support bluetooth UART devices. • zImage-imx6q-sabresd-uart.dtb • zImage-imx6sl-evk-uart.dtb
emmc	The eMMC chip is DNP by default. This requires hardware modifications to burn the eMMC4.5 chip on the eMMC socket on uSDHC4 and connect eMMC signals as well as disconnect BOOT SD CARD slot signals. • zImage-imx6sx-sdb-emmc.dtb

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Table 3. Kernel and device tree configurations (continued)

Kernel and device tree configuration	Description
M4	Disables ADC 1 & 2, flexcan 1 & 2, I2C3, UART 2 and QSPI 2 when ARM Cortex-M4 processor is running. • zImage-imx6sx-sdb-m4.dtb • zImage-imx6sx-sabreauto-m4.dtb
epdc	Pin conflict between HDMI and EPDC, disable HDMI for EPDC. • zImage-imx7d-sdb-epdc.dtb

The release package contains the following pre-built images.

Table 4. Pre-built images

Package	Description
X11 SDCard	This release provides the following SD card images. These images are GUI with X11 backend. The imx_mfgtools image works on all i.MX 6 SABRE-SD, i.MX 6 SABRE-AI, and i.MX 7 SABRE-SD boards with U-Boot and device tree changes. To change U-Boot and the device tree, see the *i.MX Linux® User's Guide* (IMXLUG). • fsl-image-gui-x11-imx6ulevk.sdcard
Kernel	Kernel and device trees as specified in Table 3.
U-Boot	U-Boot files as specified in Table 2.
mfgtools_with_rootfs.tar.gz	Manufacturing tools are supported with the manufacturing tools kernel.

Table 5. fsl-yocto-L3.14.38_6ul-ga.tar.gz content

File name	Description
Freescale_Yocto_Project_Users_Guide.pdf	Freescale Yocto Project User's Guide
README	Freescale README for L3.14.38_6ul-ga
/doc	i.MX Linux® BSP Release Notes, User's Guide, and Reference Manual

Table 6. Multimedia standard packages

File name	Description	Comment
gst1.0-fsl-plugins-4.0.7.tar.gz	GStreamer plugins	Freescale GStreamer plugins
libfslcodec-4.0.7.bin	Freescale codecs	Freescale optimized A/V core codec
libfslparser-4.0.7.bin	Freescale parser	Freescale optimized core parser
libfslvpuwrap-1.0.58.bin	Freescale VPU wrapper	Freescale VPU wrapper for VPU library
fslqtapplications-1.0.5.bin	Freescale Qt applications	Freescale Qt applications

Contact marketing representative to get access to the following controlled packages.

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Table 7. Controlled access packages

File name	Description	Comment
libfslaacpcodec-4.0.7.bin	AACplus decoder	Freescale optimized AACplus decoder
libfslmscodec-4.0.7.bin	Microsoft codecs	Freescale optimized Microsoft codecs
libfslmsparser-4.0.7.bin	Microsoft parser	Freescale optimized Microsoft ASF parser
libfslac3codec-4.0.7.bin	AC3 decoder	Freescale optimized Dolby audio AC3 decoder
libfslddpcodec-4.0.7.bin	DDplus decoder	Freescale optimized Dolby audio DDplus decoder
libfslreal-4.0.7.bin	Real Networks codecs and parser	Freescale optimized Real Networks real audio decoder, real media parser, and real video firmware

1.2   License

All source code files of the Board Support Package (BSP) are either GNU General Public License (GPL), GNU Lesser General Public License (LGPL), or another open source license.

The following components are released as binary files on the Yocto Project Mirror and have Freescale Proprietary Licenses. During the Yocto Project setup, to set up an i.MX build, the user needs to accept the Freescale license. This acceptance is recorded in the build configuration files so that the following proprietary binaries can be extracted during the build process.The Freescale proprietary packages contain a Software Content Register (SCR) file that lists information about the package

- imx-gpu-viv
- fsl-gpu-sdk
- imx-vpu
- fslqtapplications
- firmware-imx
- libfslcodec
- libfslparser
- libfslvpuwrap

1.3   Proprietary Licensing Packages

Freescale packages can be found in two locations:

- Standard packages are provided on the Freescale mirror. They are accessed automatically by the Yocto Project scripts as needed.

- Limited Access packages are provided on freescale.com with controlled access. Contact your marketing representative for access. They are listed in the following table. These include codecs to support WMA, WMV, RMVB, AAC+, AC3, DD+ decoding, WMA, Broadcom firmware and E Ink firmware. encoding. Each package has its own README file with instructions on how to build, install, and run.

Table 8.   Limited access packages for Yocto project releases

Name	Package	Comment
AACPlus Decoder	libfslaacpcodec-[version].bin	Freescale AACplus core decoder
Microsoft Codec	libfslmscodec-[version].bin	Freescale optimized MS codec
Microsoft Parser	libfslmsparser-[version].bin	Freescale optimized ASF parser
AC3 Decoder	libfslac3codec-[version].bin	Freescale AC3 core decoder
DDplus Decoder	libfslddpcodec-[version].bin	Freescale DD-plus decoder
RMVB Decoders and Parser	libfslreal-[version].bin	Freescale Real Networks
E Ink Waveform	firmware-eink-[version].bin	E Ink RegalD waveform for i.MX 7D SABRE-SD
Broadcom Firmware	firmware-bcmd-[version].bin	Broadcom bluetooth and Wi-Fi firmware

1.4   References

This release includes the following references and additional information.

- *i.MX Linux® Release Notes* (IMXLXRN) - Provides the release information.
- *i.MX Linux® User's Guide* (IMXLUG) - Contains the information on installing U-Boot and Linux OS and using i.MX-specific features.
- *Freescale Yocto Project User's Guide* (IMXLXYOCTOUG) - Contains the instructions for setting up and building Linux OS in the Yocto Project.
- *i.MX Linux® Reference Manual* (IMXLXRM) - Contains the information on Linux drivers for i.MX.
- *i.MX 6 Graphics User's Guide* (IMX6GRAPHICUG) - Describes the graphics used.
- *i.MX BSP Porting Guide* (IMXXBSPPG) - Contains the instructions on porting the BSP to a new board.
- *i.MX VPU Application Programming Interface Linux® Reference Manual* (IMXVPUAPI) - Provides the reference information on the VPU API.

The quick start guides contain basic information on the board and setting it up. They are on the Freescale website.

- SABRE Platform Quick Start Guide (IMX6QSDPQSG)
- SABRE Board Quick Start Guide (IMX6QSDBQSG)
- SABRE Automotive Infotainment Quick Start Guide (IMX6SABREINFOQSG)
- i.MX 6SoloLite Evaluation Kit Quick Start Guide (IMX6SLEVKQSG)

Documentation is available online at freescale.com.

- i.MX 6 information is at freescale.com/iMX6series
- i.MX 6 SABRE information is at freescale.com/imxSABRE
- i.MX 6SoloLite EVK information is at freescale.com/6SLEVK
- i.MX 7Dual information is at freescale.com/webapp/sps/site/prod_summary.jsp?code=i.MX7D
- i.MX 6UltraLite information is at freescale.com/webapp/sps/site/prod_summary.jsp?code=i.MX6UL.

2   What's New?

This section describes the changes in this release, including new features and defect fixes.

2.1 New features

A summary of the main new features is as follows.

New features added for all supported boards:

- Yocto Project upgraded to version 1.8 Fido.
- Supports the GCC 4.9.2 toolchain.
- The Linux kernel is upgraded to v3.14.38.
- The U-Boot is upgraded to 2015.04.
- New graphics features:
    - GPU driver upgraded to Vivante v5.0.11p7.1.
- New multimedia features and changes:
    - Freescale GStreamer 0.10.x version plugins are removed from this release.
    - OpenGL (ES) plugins (glimagesink, gleffects) are supported in X11, Wayland and FB backends, accelerated with Vivante APIs.
    - Gstreamer recording engine API is supported, providing high-level APIs for performing image capture and video recording to various audio video and file formats. Qt demo application is provided based on this recording engine.
    - Both internal and external subtitles are supported.

Features on new i.MX 6UltraLite:

- ARM Cortex-A7 revision r0p5 with 32K I/D L1 cache and 128K L2 cache
- MSL including CCM, IOMUX, GIC400, GPIO, OCOTP Fuse, SDMA, WDOG, system counter
- Connectivity including with I2C, ECSPI, ENET, USB, CAN BUS, UART/BT, SIMv2, Touch screen, and ADC
- Storage including RawNAND, QSPI, and SD/MMC
- Multimedia including SAI, ASRC, MQS, SPDIF, CSI camera, LCDIF and PXP
- Security including CAAM, SNVS, Bus Encryption Engine, and HAB boot
- Sensor through the I2C interface including eCompass (MAG3110FCR2) and 3-Axis Accelerometer (fxls8471)

Features on new i.MX 6QuadPlus:

- i.MX 6QuadPlus TO1.0 SOC support added.
- Only i.MX 6QuadPlus SABRE-AI board supported.
- PRE-Prefetch Resolve Engine - Prefetching of IPU data to improve overall memory access and larger on chip RAM.
- NOC-based interconnect fabric with scheduler - Improves overall memory access efficiency.
- 3D GPU enhanced to GC2000+ supporting improved tile buffer handling.
- 2D GPU enhanced to GC320 supporting 8 overlays and improved tile buffer handling.

2.2 Power management supported features

The following common power management features are supported:

- CPU/GPU frequency throttle for SoC with GPU
- GPU dynamic power management for SoC with GPU
- CPU idle framework support with two working levels: pure WFI and WFI with wait mode enabled
- Low power mode support: standby and dormant (mem) mode
- Thermal temperature support

Power management features on 6SoloLite are supported:

- LDO bypass

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Power management features on 6SABRE-SD and 6SABRE-AI are supported:

- CPUFreq driver support: CPU frequency adjusted based on the CPU loading and Interactive governor
- VPU/GPU dynamic power management for SoC with VPU and GPU
- LDO bypass
- Bus requency support
- SD3.0 dynamic clock management
- USB remote wake-up and USB charger

2.3 Graphics

This section describes new features and bug fixes for the graphics provided in this release.

Table 9. New features

Feature	Description
Khronos OpenGL ES 3.0 API	The GPU 5.x driver fully supports the latest Khronos OpenGL ES 3.0 API (current 3.0.2 spec dated 8 April 2013) and compliant to Khronos OpenGL ES 3.0 conformance test. From the Khronos announcement, new functionality in the OpenGL ES 3.0 API includes: • Rendering pipeline enhancements to enable acceleration of advanced visual effects, including occlusion queries, transform feedback, instanced rendering, and support for four or more rendering targets. • High quality ETC2/EAC texture compression, which eliminates the need for a different set of textures for each platform. • Shading language enhancements, which include full support for integer and 32-bit floating point operations. • Enhanced texturing functionality, including guaranteed support for floating point, 3D, depth, vertex, NPOT, R/RG, immutable, and 2D array textures, as well as for swizzles, LOD and mip level clamps, seamless cube maps, and sampler objects. • Extensive set of required, explicitly sized texture and render-buffer formats, which reduces implementation variability and makes it much easier to write portable applications.
Compatible with 4.x Driver for OpenGLES 2.0 API	• The GPU 5.x driver is compatible with the the 4.x driver. Applications developed using 4.x drivers can run on the 5.x driver without any changes. • Application performance on the 5.x driver is better than or equal to that with the 4.x driver.
Bug Fixes	• 2D: Optimize block size setting in multisrcblit for GC300. • 2D: Refinements for using 2D hardware objects in 2D engine. • 2D: Resolve negative coordinate issue in 2D filterblit and DFB. • 2D: Disable L2 cache when src format is YUV420 and operation is vertical fiterblit. • 2D: Refine 2D RG16 format swizzle setting for TPC compression. • 2D: Adjust 2D bitblit default blocksize setting when feature 2D_COMPRESSION is supported. • 2D: Add YVYU/VYUY format check in 2D filterblit and correct temp surface format setting in TPF. • 2D: Adjust the logic for using contiguous memory allocation. • 2D: Adjust 2D quad settings in MultiSrcBlitV2 when surface has rotation and stretch. • 2D: Refine files for customer-specific TPC support in 2D driver. • 2D: MGS-568 [#1654] Linux GC320 GPU freezes the system. • 2D-VG: MGS-736 [#1737] OpenVG cannot run with multiple buffers

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Table 9. New features

Feature	Description
	• 2D-VG: MGS-742 [#1733] No picture display when run OpenVG 3D SDK • 2D-VG: MGS-747 [#1664] 3D OpenVG cannot work with No-resolved framebuffer • 2D-VG: MGS-517 [#1590] fix gc355 cannot work on FB/Wayland • 2D-VG: Add vgDrawWarpedImage extension support for 2D-VG. • 2D-VG: Refinements for record memory usage when drawing glyph. • 2D-VG: Adjust the output format of GC355_MEM_PRINT.(CL30491/30503) (30510) • 2D-VG: Support register reads from 2D-VG core. • 2D-VG: Resolve a 2D-VG MMU flush issue. • 2D-VG: Check if GPU is present and awake before GPU powered on. • 2D-VG: Only set irqLineVG when gcdENABLE_VG = 1. • 2D-VG: Add option so profiler works in both standard 2D-VG and MOVG without need to recompile. • 2D-VG: Provide correct profiler data for MOVG. • 3D: Disable GL_EXTID_VIV_tex_direct extension when running WebGL conformance test 1.02. • 3D: Force use of RGBA8 format instead of RGBA551 for GC400T. • 3D: Resolve build issues found on Android™ platform L. • 3D: Fix dEQP-GLES3.functional.fbo.render.shared_colorbuffer.tex2d_rgba8_depth_stencil_rbo_depth24_stencil8 single failures. • 3D: Add support for GL_ALPHA and GL_LUMINANCE8_ALPHA8_EXT textures in the directVIV extensions. • 3D: Refinements for dEQP TFB splitDraw. • 3D: Add semaphore stall before flushing the texture cache through vertex shader. • 3D: MGS-738 [#1727] fix es20/es30 conformance failures • 3D: MGS-630 [#1678] [MX6DQP-ARD] X11: glmark2 test glacore hang 100% • 3D: MGS-706 [#1713] duokantv-test APK renders incorrectly on sabreauto_6qp. • 3D: MGS-578 [#1657] Google Earth APK meet shader compile error. • 3D: MGS-511-2 [#1593] qt 3D app cannot run in sx board • 3D: MA-6208 [#1543] fix com.drawelements.deqp.gles3 cts fail • Compiler 3D: Refine checking for whether an expression is dereferencing a variable associated with array subscripting. • Compiler 3D: Resolve some build warnings found by Klocwork. • Compiler 3D: Fix a compiler hang found during macro option build test in OCL conformance. • Compiler 3D: Add 'Real attribute count' when computing binary buffer size. • Compiler 3D: Refinements for saving shader binary. • DFB: Refine state Clear in SetState() when DFB changes between blit and draw operations. • DFB: Refinesetting of 2D hardware type inside DFB state set function. • DFB: Allow DFB to destroy surface in different process in which it is allocated. • DFB: MGS-346 [#1478] DFB: Refine the makefile of the 2D unit test • EGL: MGS-708 [#1716] fix nonstd format on the fly change • EGL: MGS-713 [#1703] Sync the No-resolve implementation with FB backend • EGL: MGS-679 [#1703] fix Ctrl-C issues with multiple buffers • EGL: MGS-352-1 [#1453] Creating context on 5.x is slower than 4.x due to process name read. • EGL: MGS-746 [#1684] No HDMI display when run any vdk demo first • EGL: MGS-746 [#1684] support no-resolve for all display resolution • EGL: MGS-752 [#1738] EGL error handling issues • EGL: MGS-758 [#1743] fix fbdev multiple instance issue • EGL: MGS-734-2 [#1736] fix Wayland build broken issue

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Table 9. New features

Feature	Description
	• EGL: MGS-734 [#1736] fix unresolved display flicker on 1080p multiple buffer • EGL: MGS-703 [X11] Disable GPU_VIV_EXT_RESOLVE by default • EGL: MGS-702 [X11] Do not go NO_RESOLVE path if PRESERVE bit is set • EGL: MGS-701 [X11] Build for DRI_PIXMAPRENDER_GL is broken • EGL: GRPH-56 add enviroment variable to turn off zero fill memory • EGL: MGS-679 [#1703] Ctrl-C issue for framebuffer no-resolve feature • EGL: MGS-678 Disable FB prefetch in Wayland compositor side. • EGL: MGS-628-2 [#1664] platform addon for fbdev no resolve • EGL: MGS-628-1 [#1664] add tiling setting when create EGL Window Surface • EGL: MGS-560Optimize X11:Eliminate GC2000+ resolving using and pass on to GC328 • EGL: MGS-597-2 [#1667] Set the environment parameter of ext resolve • EGL: MGS-561-6 Add no-resolve implementation for Wayland client • EGL: MGS-528 Wayland does not free window memory until app exits • EGL: MGS-597 [#1667] Set the environment parameter NO_RESOLVE • EGL: MGS-638 [#1682] fix eglInit failure with fb no-resolved • EGL: Allow 2D-VG to run with DFB/EGL backend. • EGL: kip query of symbols in Android wrapper libraries. • EGL: veglDestroyImage dereferences first then checks if destroy is needed. • EGL: Resolve EGL_POST_SUB_BUFFER_SUPPORTED_NV query support in EGL and refine gcdFLUSH_FILE settings. • EGL: Add support for Android L and modify dequeuebuffer logic in veglSetANWBufferCount. • Wayland: MGS-737 [#1731] Segmentation fault when test the Wayland GLES sdk • Wayland: MGS-622 [#1729] Galcore hang when do suspend/resume test • Wayland: MGS-718 [#1719] fix Gal2D compositor garbage issue • EXA: CL31344: Update EXA driver to meet the new X server changes. • General: MGS-729 [#1726] prevent gpu auto recovery with fake hang alert • General: MGS-688 fix I420/YV12 stride issue in g2d • General: MGS-635 [#1680] OpenCL unit test failed in some cases • General: MA-6540 [#1672] fix native fence fd leak found by Android CTS • General: MGS-618 directviv_test display abnormal • General: MA-6527 [#1666] fix android.webgl.cts.WebGLTest CTS fail • General: MA-6481 [#1671] fix dual display can't boot up issue • General: MGS-633 [#1667] Invalid pointer reported when vdk use cases quit • General: MGS-507 [#1323] RenderToTexture has distored pictures on screen in DL board • General: MGS-608 [#1592] disable GC2000 TX clock gate • General: MGS-567 [#1658] fix GPU kernel crash when setup mmu entries • General: MGS-575 [#1655] GPU 2D blit performance tuning • General: MGS-574 [#1654] enable tile status for fbdev no-resolve • General: MGS-569 [#1650] MX6+ Update GPU AXI cache atttribute • General: MGS-564 Resolve race condition in display frame sync • General: MGS-367 [#1589] "CTRL+C" to close the "tutorial7_es20" caused GPU hang • General: MGS-543 [#1604] remove some unsupported extensions in gles10 • General: MGS-539 GPU driver build break with 3.0.101 kernel • General: MGS-524 [#1597]Immigrate the qosc optimizing logic to GPU driver • General: MGS-554 [#1644] fix the false alert with GPU commit dirty • General: MGS-436 Memory leak in glimagesink video loop playback • General: MGS-503 [#1547] fix the incorrect profiler counters • General: MGS-724 [#1722] multiple buffer does not work on 1080p display • General: MGS-664 [#1704] viv direct texture cannot work in QP board • General: MGS-622 [#1729] Suspend/resume test cause GPU hang

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Table 9. New features

Feature	Description
	• General: Add support for 40bit physical addresses. • General: Refine surface resampling. • General: Get correct kernel object from a valid device. • General: Refine GPU idle time statistics. • General: Refine reset fortile format setting registers. • General: Allow dump from MC1 of MMU exception on error. • General: Add support for vCompiler running on Linux OS. • General: Always read MMU status during debug register dump. • General: Collect more debug information from driver. • General: Enlarge the link queue of the context/command buffer to record more history for debugging. • General: Ensure the start address of a dynamic index buffer is 16 bytes aligned. • General: Add support in platform framework for additional customer platforms. • General: Enhance command buffer dump function in kernel driver. • General: Avoid repeat reading of the process cmdline entry to improve context creation performance. • General: Resolve more build warnings found by Klocwork. • General: Optimize GPU address query to avoid using user address as a key and correct the command buffer commit count. • General: Add support to read compiler arguments from vCompilers configuration file. • General: Correct some hardware feature configuration details. • General: Change class to gpu_class for a customer platform. • General: Refine pointer data cleanup when a function fails. • General: Implement gckOS_CreateMutex as a macro on Linux OS to be compatible with LOCKDEP. • General: Add support in platform framework for some customer platforms. • General: Correct a compiler warning option. • General: Resolve build warnings in driver on Android 5.0 L. • General: Add a check for the define NO_PTHREAD_ATFORK in the Linux porting layer. • General: Add a system interface for GPU idle information. • General: Add GPU state dump for AXI bus errors. • General: Enable CMA allocator by default. • General: Enhance GPU stack dump function. • General: Platform framework enhancements. • General: Removed unused gcvVERSION_TIME amd gcvVERSION_DATE. • General: Increase the stack size for WinCE to support OCL test. • GL2: MGS-572 [#1484] libGL2 build fails with mesa headers install script chaage • GL2: MGS-563 [#1484] Add GL headers to install folder • GL2: Remove unnecessary cleanup to avoid freeing the source twice. • GL2: Update OGL header files according to OGL/MESA project. • HWC: Check source rectangle in HWC prep stage. • HWC: Optimize dim layer. • OCL: Resolve build issue on customer platform. • OCL: Refine OCL command queue worker thread polling. • OCL: Add OCL command buffer dependency for performance. • OCL: Resolve OCL build issues found with new QNX tool chain. • OES30: Remove an unnecessary trace message for legal use cases. • OES30: Refine check for texture sub image arguments. • OES30: Special performance optimizations for Basemark2v2. • OES30: Always update vertex array object without check in case the newly create bufObj has the same address as the deleted ones recorded in the default vertex array object.

Table continues on the next page...

Table 9.   New features (continued)

Feature	Description
	• OES30: Add skip blit color buffer if readBuffer attachment is invalid. • OES30: Resolve a memory leak by releasing a stencil only surface. • OES30: Refinements for glGenerateMipmaps() • OES30: Destroy shadow surfaces if they are not needed. • OES30: Special refinements for uniform constants for WebGL. • OES30: Adjust power management so that PM cannot be disabled after running an OES20 application. • OES30: MGS-616 [#1677] fix GPU hang with ES30 MRT running • OES30: MGS-512 [#1493] fixed es30 conformance fails related with glReadPixels. • OES30: MGS-576-2 [#1646] fix framebuffer no-resolved configuration. • OES30: MGS-511 [#1593] qt 3D app cannot run in sx board. • G2D: MGS-493 Develop G2D multiple source blit feature. • G2D: MGS-607 fix g2d test return failure. • G2D: MGS-493 Develop G2D multiple source blit feature. • G2D: MGS-494 Develop G2D tiling format feature for no-resolved. • MGS-784: [imx6dqp_ard] The system hangs when blank and unblank HDMI and run VDK use cases continuously.100%. 100% • MGS-774: [imx6dq_ard] The VG SDK use cases cannot run and report"mxc_sdc_fb fb.23: failed to alloc PRE". • MGS-780: Ctrl-C issue for non-VDK tests. • MGS-782: [imx6dq_sd] Wayland stress suspend/resume without bootcore test failed.100%. • MGS-781: [MX6DQ_ARD] Opencl conformance test failed with "corrupted double-linked list".
Known Issues	• MGS-673: [MX6DQP_ARD] Met segmentation fault when tracing vdk app. 100% • MGS-739: [MX6DQP-ARD] FB: meet "libGAL: Target tiling=4 not supported" when test render performance 100% • MGS-756: eglLockSurfaceKHR: the surface is getting locked without checking the EGL_LOCK_SURFACE_BIT_KHR config. • MGS-777: Wayland EGL - resize corruption. • MGS-779: glMultiDrawArraysEXT on 5.x lacks optimization. • MGS-619: [MX6DQP-ARD] FB/WLD: RenderToTexture display abnormal. 100% • MGS-650: [MX6DQP_ARD] gpubench has obvious performance drop comparing with 6DQ_P6_RC1. 100%

3   BSP Supported Features

The following table describes the features that are supported in this BSP release. In this table, if no board is explicitly stated, the feature is shared across all boards listed in Supported Hardware in the Release contents section, otherwise only the boards listed.

Table 10.   Supported features

Feature	Supported board	Comment
Kernel		
Kernel	All i.MX	Kernel version: 3.14.38

Table continues on the next page...

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Table 10.   Supported features (continued)

Feature	Supported board	Comment
File System	All i.MX	EXT2/EXT3/EXT4 are used as the file system in MMC/SD Hard Disk. On i.MX 6SABRE-AI and 7D-SABRE-SD, • UBIFS is used for NAND. • JFFS2/UBIFS is used for Parallel NOR, QSPI NOR.
Bootloader		
U-Boot	All i.MX	U-Boot delivery is based on U-Boot version v2015.04. Clock, Anatop regulator, ENET, UART, MMC/SD, eMMC4.3/4.4. High Assurance Boot, ROM Plug-in Mode. SPI-NOR, Parallel NOR, SATA, NAND, QuadSPI-NOR, USB Mass Storage. Review Table 2 in Section 1.1 for U-Boot configurations supported on each board for SPI_NOR, NAND, Parallel NOR, QuadSPI-NOR, and SATA. These are not supported on all boards. i.MX 6QuadPlus/Quad/Dual Lite SABRE-SD and SABRE-AI support DDR3 528 MHz @ 64 bit. i.MX 6Dual Lite/Solo SABRE-SD and SABRE-AI support DDR3 400 MHz @ 64 bit. i.MX 6SoloX SABRE-SD and SABRE-AI support LDDR3 400 MHz @ 32 bit i.MX 6SoloLite EVK supports LPDDR2 400 MHz @ 32 bit and boot using L2Cache as OCRAM i.MX 6UltraLite EVK supports DDR3 400 Mhz @ 16 bit
Machine-specific layer		
ARM® Core	All i.MX	6SABRE-SD, 6SABRE-AI, 6SoloLite, 6SoloX-SD, and 6SoloX-AI support the ARM® Cortex®-A9 processor. 6UltraLite EVK supports the ARM® Cortex®-A7 processor. Supports reboot and power-off. Supports reboot and power-off.
Memory	All i.MX	The user/kernel space is split 2G/2G.
Interrupt	All i.MX	GIC.
Clock	All i.MX	Controls the system frequency and clock tree distribution.
Timer (GPT)	All i.MX	System timer tick support.
GPIO/EDIO	All i.MX	GPIO is initialized in earlier phase according to hardware design.
IOMUX	All i.MX	Provides the interfaces for I/O configuration. IOMUX-V3 version is used.
DMA engine		
SDMA	All i.MX	Conforms to the DMA engine framework.
APBH-Bridge-DMA	6SABRE-AI	Conforms to the DMA engine framework. This feature requires a NAND U-Boot.
Character device drivers		
MXC UART	All i.MX	i.MX 6 SABRE-SD, and SoloLite EVK support console through internal Debug UART1. i.MX 6SoloX SABRE-SD and SABRE-AI support Cortex-A9 processor through UART1 and Cortex-M4 processor through UART2. i.MX 6UltraLite EVK Cortex-A7 processor through UART1.

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Table 10. Supported features (continued)

Feature	Supported board	Comment
		i.MX 6 SABRE-AI supports console through internal Debug UART 4.
Power Management Drivers		
Anatop Regulator	All i.MX	Supports Anatop regulator management.
Lower Power mode	All i.MX	Supports standby mode and dormant (mem) mode.
CPUIdle	All i.MX	2 levels CPUIdle supported: purely WFI and WFI with wait mode enabled.
CPUFreq	All i.MX	CPUFreq can be used for CPU frequency adjustment. The Interactive governor is added and enabled by default.
BusFreq	All i.MX	Supports the system bus clock frequency scaling.
Battery charging	All i.MX	-
Networking drivers		
ENET	All i.MX	i.MX 6Quad/SoloX board supports AR8031 PHY, i.MX 6UltraLite EVK board supports KSZ8081 PHY, and i.MX 7Dual SABRE-SD board supports BCM54220 PHY. i.MX 6SoloX SABRE-SD, SABRE-AI, and i.MX 7Dual SABRE-SD support AVB Features.
IEEE 1588	All i.MX	Supports Linuxptp stack. Features: • Supports IPv4, IPv6, IEEE 802.3 transport. • Supports E2E, P2P transparent clock. • Supports IEEE802.1AS-2011 in the role of end station. Note: Linuxptp stack is open source. Command instance: `ptp4l -A -4 -H -m -i eth0`
PCIe	6SABRE-SD 6SABRE-AI 6SoloX-SD 6SoloX-AI	-
PCIe EP/RC validation system	i.MX 6Quad SD i.MX 6SoloX-SD	Two of the same i.MX 6Quad SD boards, i.MX 7Dual SABRE-SD boards, or i.MX 6SoloX SDB boards. One is used as RC, and the other is used as EP. • EP can be initialized/enumerated by RC. • EP can access the memory of RC. • RC can access the memory of EP. • EP can trigger MSI, and the triggered MSI can be captured by RC.
MediaLB	6SABRE-AI 6SoloX-AI	On i.MX 6SABRE-AI, CPU1 supports MLB 150 and MLB 25/50. On i.MX 6SABRE-AI, CPU2 and i.MX 6 QuadPlus SABRE-AI supports MLB 25/50 only. On i.MX 6SoloX-AI, it supports MLB 25/50.
FlexCAN	6SABRE-AI 6SoloX-SD 6SoloX-AI 6UltraLite EVK	Supported one CAN with default the device tree on i.MX 6SABRE-AI. Supported both CAN using the flexcan device tree but has pin conflict with FEC. Supported with default device tree on i.MX 6SoloX-SD but has pin conflict with QSPI1.

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Table 10. Supported features (continued)

Feature	Supported board	Comment
Security drivers		
CAAM	All i.MX except 6SoloLite	Security drivers
SNVS	All i.MX	-
SIMv2	6UltraLite	Smart Card Interface
Sound drivers		
WM8962/SSI WM8960/SSI	6SABRE-SD 6SoloLite 6SoloX-SD 6UltraLite EVK	Supports playback.
S/PDIF	6SABRE-SD 6SABRE-AI 6SoloX-AI	Supports 16 bit and 24 bit stereo playback from 32 KHz to 48 KHz sample rate. Supports 24 bit stereo record from 16 KHz to 96 KHz.
ASRC	6SABRE-AI 6SoloX-SD 6UltraLite EVK	Supports sample rates conversion from 5 KHz to 192 KHz and output sample rates from 32 KHz to 192 KHz. Supports ALSA plug-in library playback.
ESAI/CS42888	6SABRE-AI 6SoloX-AI	Supports 16 bit, 24 bit PCM format, channel from 2 to 6, and sample rate from 8 KHz to 192 KHz for playback with ASRC P2P. Supports sample rate from 8 KHz to 96 KHz for record and playback without ASRC. Supports 4 channels input and 8 channels output. Supports full duplex operations. Supports amixer alsamixer control from user space.
SAI/MQS	6SoloX-SD 6UltraLite EVK	Supports 16 bit, 24 bit, and 32 bit PCM format. Supports sample rate from 8 KHz to 96 KHz for record and playback . Supports full duplex operations. Supports amixer alsamixer control from user space. Supports clock control.
HDMI Audio	6SABRE-SD 6SABRE-AI	Supported on i.MX 6Dual/Quad and i.MX 6DualLite for SABRE-SD and SABRE-AI
Input device drivers		
USB devices	All i.MX	Supports USB mouse and USB keypad via USB ports.
Touch panel	All i.MX	6SABRE-SD, 6SABRE-AI. Supports EGalaxy capacitive touch screen. 6SoloLite supports E Ink® touch screen on DC2/DC3 add-on card. 6SoloX SABRE-SD and SABRE-AI support LVDS panel.
Keypad	6SoloLite	6UltraLite EVK and 7D SABRE-SD support the resistive touch panel. 6SoloLite supports 4x4 keypads on DC2/DC3 add-on card.
MTD driver		
QuadSPI-NOR	6SoloX-SD	i.MX 6SoloX SABRE-AI supports QSPI1. i.MX 6SoloX SABRE-SD supports QSPI2.

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Table 10. Supported features (continued)

Feature	Supported board	Comment
	6SoloX-AI 6UltraLite EVK	i.MX 6UltraLite EVK supports QSPI1.
SPI-NOR	6SABRE-AI 6SoloLite	Supports M25P32 On i.MX 6SABRE-SD DualQuad/DualLite there is a pin conflict for supporting SPI-NOR
NAND	6SABRE-AI 6SoloX-AI	Normal NAND and ONFI NAND asynchronous mode with BCH40.
Parallel NOR	6SABRE-AI	Supports Parallel NOR by using the EIM interface.
SATA	6SABRE-SD 6SABRE-AI	Serial ATA 2.0 supports only i.MX 6 DualQuad SABRE-SD and SABRE-AI and i.MX 6 QuadPlus SABRE-AI.
USB drivers		
USB Host	6SABRE-AI 6SoloLite 6SoloX-SD 6SoloX-AI 6UltraLite EVK	Supports USB HOST1 and USB OTG host.
USB Device	All i.MX	Supports USBOTG device mode.
USB	All i.MX	Supports USB OTG2.0 and USB Host2.0 ports. USB Host mode: MSC, HID, UVC, USB audio. USB device mode: MSC, Ethernet, Serial. USB OTG pin detect support for HNP and SRP on OTG.
Graphics drivers		
GPU	All i.MX 6 except 6UltraLite	Graphics Chips Details GC2000, GC355 and GC320 on 6Dual/6Quad GC2000+, GC355, and GC320 on 6QuadPlus GC880, GC355 and GC320 on 6Solo/DualLite GC400T on 6SoloX The GPU on the chips listed above supports these features which include 2D and 3D hardware acceleration: • Supports EGL 1.4 for fbdev, X11, directFB, Wayland • Supports OpenGL ES1.1 • Supports OpenGL ES2.0 (WebGL 1.0.1 compatible on X11) • Supports OpenGL ES3.0 • Supports OpenVG1.1 • Supports OpenCL1.1 • Supports OpenGL2.1 GC355 and GC320 on 6SoloLite which include only 2D hardware acceleration • Supports EGL 1.4 for fbdev, X, directFB, Wayland • Supports OpenVG1.1
Frame Buffer Driver	All i.MX	MXC Frame buffer driver for IPU V3 on i.MX 6SABRE-SD and i.MX 6SABRE-AI.

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Table 10.   Supported features (continued)

Feature	Supported board	Comment
		MXC Frame buffer driver for PXP on i.MX 6SoloLite, i.MX 6SoloX SABRE-SD/ SABRE-AI, i.MX 6UltraLite EVK and i.MX 7Dual SABRE-SD.
VDOA	6SABRE-SD 6SABRE-AI	Supports Video Data Order Adapter.
LVDS	6SABRE-SD 6SABRE-AI 6SoloX-SD 6SoloX-AI	Supports HannStar LVDS panel. It's the default display if no other video option is setup. On the SABRE-AI there are 2 ports. Port 0 is the default.
HDMI	6SABRE-SD 6SABRE-AI 6SoloLite 6SoloX-AI	i.MX 6SABRE-SD and SABRE-AI support on-chip DesignWare HDMI hardware module. i.MX 6SoloLite and i.MX 6SoloX SABRE-AI support external HDMI.
HDCP	6SABRE-SD	Supports HDCP v1.2 specifications.
WVGA panel	All i.MX	Supports SEIKO WVGA panel. For i.MX 6UltraLite, it supports Embest LCD8000-43T LCD panel.
PxP	6DualLite-SD 6SoloLite 6SoloX-SD 6SoloX-AI 6UltraLite EVK	Enables PXP Driver for EPDC on i.MX 6SoloLite and i.MX 6DualLite SABRE-SD. Conforms to DMA engine framework.
MIPI Display	6SABRE-SD	Supports MIPI DSI driver through MIPI daughter card.
EPDC	6DualLite-SD 6SoloLite	Supports RGB565 frame buffer format. Supports Y8 frame buffer format. Supports full and partial EPD screen updates. Supports up to 256 panel-specific waveform modes. Supports automatic optimal waveform selection for a given update. Supports synchronization by waiting for a specific update request to complete. Supports screen updates from an alternate (overlay) buffer. Supports automated collision handling. Supports 64 simultaneous update regions. Supports pixel inversion in a Y8 frame buffer format. Supports posterization of the update contents (driving all pixels to either solid black or white). Supports use of a color map to remap Y8 frame buffer contents. Supports 90, 180, and 270 degree HW-accelerated frame buffer rotation. Supports panning (y-direction only). Supports three EPDC driver display update schemes: Snapshot, Queue, and Queue and Merge.

Table continues on the next page...

Table 10. Supported features (continued)

Feature	Supported board	Comment
		Supports user control of the delay between completing all updates and powering down the EPDC.
		Supports dithering.
Multimedia Drivers		
IPU V3 driver	6SABRE-SD 6SABRE-AI	On i.MX 6SABRE-SD and i.MX 6SABRE-AI provides interfaces to access IPU V3 modules.
PRE/PRG driver	6QuadPlus SABRE_AI	On i.MX 6QuadPlus SABRE-AI provides interfaces to support prefetch linear frames or resolve tiled frames for display.
V4L2 Output	All i.MX	On i.MX 6SABRE-SD and i.MX 6SABRE-AI uses the IPU post-processing functions for video output.
		On i.MX 6SoloLite i.MX 6SoloX SABRE-SD and AI, i.MX 6UltraLite EVK and i.MX 7D SABRE-SD, they use the PXP post-processing functions for video output.
V4L2 Capture	All i.MX except 7D-SABRE-SD	Supports dual camera on i.MX 6SABRE-SD and SABRE-AI.
		Supports single camera on i.MX 6SoloLite and i.MX 6SoloX SABRE-SD, SABRE-AI and i.MX 6UltraLite EVK.
VPU	6SABRE-SD 6SABRE-AI	Encoder: MPEG-4, H.263, H.264(AVC/MVC), MJPEG
		Decoder: MPEG-4, H.263, H.264(AVC/MVC), VC-1,MPEG-2, MJPEG, AVS, VP8.
MIPI	6SABRE-SD	Supports 2 lanes CSI and DSI. Supports OV5640 camera sensor
Parallel CSI	6SABRE-SD 6SoloLite 6SoloX-SD	Supports OV5640 camera sensor.
TV-IN	6SABRE-AI	Supports TV-IN via ADV7180 on the 6SABRE-AI.
		Supports bt656, NTSC, and PAL.
General drivers		
uSDHC	All i.MX	Supports SD2.0, SD3.0 (except i.MX 7Ddual SABRE-SD) and SDXC.
		Supports eMMC 1bit/4bit/8bit SDR/DDR mode. i.MX 6SABRE-SD is soldered, i.MX 6SABRE-AI uses the daughter card, i.MX 6SoloX-SD is not soldered.
		Supports eMMC4.5 on i.MX 6SoloLite and i.MX 6SoloX-SD.
Watchdog	All i.MX	Supports Watchdog reset.
I2C	All i.MX	Supports I2C master.
SPI	All i.MX	Supports SPI master mode.
PWM	All i.MX	Supports the backlight driver via PWM.
ADC	6SoloX-SD 6SoloX-AI 6UltraLite EVK	Supports ADC driver.
Temperature monitor	All i.MX	Pre-calibrated. See the "Thermal Driver" chapter in *i.MX 6 Linux® Reference Manual* (IMXLXRM) for more information.
Accelerometer	6SABRE-SD 6SoloLite 6SoloX-SD	Supports MMA8451 sensor on i.MX 6SABRE-SD.
		Supports MMA8451 sensor on i.MX 6SoloX-SABRE-SD and SABRE-AI.
		Supports MMA8450 sensor on i.MX 6SoloLite.

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Table 10.   Supported features (continued)

Feature	Supported board	Comment
	6SoloX-AI 6UltraLite EVK	Supports FXLS8471Q sensor on 6UltraLite EVK.
Wi-Fi	All i.MX	i.MX 6 supports AR6003 Wi-Fi. 7D-SABRE-SD supports BroadCom Wi-Fi.
Bluetooth	All i.MX	Bluetooth supported with Atheros and Broadcom Drivers on i.MX 6 boards.
GPIO Expander	6SABRE-SD 6SABRE-AI	Supports MAX7310 GPIO expander on i.MX 6 SABRE-SD and SABRE-AI.
SNVS RTC	All i.MX	Low power section only.
Ambient Light Sensor	6SABRE-SD 6SABRE-AI 6SoloX-SD 6SoloX-AI	Supports ISL29023 sensor on i.MX 6 boards.
Magnetometer Sensor	6SABRE-SD 6SABRE-AI 6SoloX-SD 6SoloX-AI 6UltraLite EVK	Supports MAG3110 sensor on i.MX 6 boards. Supports FXLS8471 sensor on i.MX 6UltraLite EVK board. Supports MPL3115A2, FXOS8700CQR1, and FXAS21002CQR1 sensors on the i.MX 7Dual SDB board.
AM/FM module	6SABRE-AI	Supports SI4763 AM/FM module. Supports FM by using the SSI interface.

4 Kernel Boot Parameters

Depending on the booting/usage scenario, you may need different kernel boot parameters.

The following table describes different boot parameters.

To force the i.MX 6SABRE-AI board to disable SMP to remove overhead, add boot parameters "nosmp". Disabling CONFIG_SMP configuration can remove further overhead for single core.

Table 11.   Common kernel boot parameters

Kernel parameter	Description	Typical value	Used when
console	Where to output the kernel logging by printk.	console=ttymxc0,115200 For 6SABRE-AI, console=ttymxc3,115200 For 6SoloX-AI, console=ttymxc0,115200	All use cases
ip	Tell kernel how or whether to get an IP address.	ip=none ip=dhcp ip=static_ip_address	"ip=dhcp" or "ip=static_ip_address" is mandatory in "boot from TFTP/NFS."
nfsroot	Location of the NFS server/directory.	nfsroot=<ip_address>:<rootfs path>	Used in "boot from tftp/NFS" together with "root=/dev/nfs."

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Table 11.   Common kernel boot parameters (continued)

Kernel parameter	Description	Typical value	Used when
root	Location of the root file system.	root=/dev/nfs or root=/dev/mmcblk0p2	Used in "boot from tftp/NFS" (that is, root=/dev/nfs); Used in "boot from SD" (that is, root=/dev/mmcblk0p2). root is set by default by U-Boot to the SD/MMC slot that U-Boot is booting from.
rootfstype	Indicates the file system type of the root file system.	rootfstype=ext4	Used in "boot from SD" together with "root=/dev/mmcblkXpY" (X is the MMC device number while Y is the rootfs partition number.)
rootwait	Waits (indefinitely) for the root device to show up.	rootwait	Used when mounting SD root file system.
mem	Tell the kernel how much memory can be used.	None or mem=864M	Note: MemTotal-<mem> - <gpu_memory> is reserved.
max17135	Configure the maximum of 17135 EPD PMIC pass number and VCOM voltage.	max17135:pass=[pass_num],vcom=[vcom _uV]	Used when enabling EPDC. pass_num should equal 2 for all IMXEBOOKDC2 cards. vcom_uV, in microvolts, should be equal to the value printed on the cable connector that is attached the E Ink panel being used.
fec.macaddr	Tells the Ethernet MAC address.	fec.macaddr=0x00,0x04,0x9f, 0x01,0x30,0x05	Changes the FEC MAC address.
maxcpus	[SMP] Maximum number of processors that SMP kernel should use.	maxcpus=1	maxcpus=n : n >= 0 limits the kernel to using 'n' processors. n=0 is a special situation. It is equivalent to "nosmp".
epdc	Enables EPDC	epdc video=mxcepdcfb:E060SCM,bpp=16	Adds to kernel options only if E Ink is the primary display panel. If other display panel is primary, this option may result in a pixel clock conflict and improper display function.
video on 6SABRE-SD	Tells the kernel/driver which resolution/ depth and refresh rate should be used for display port 0 or 1. See the parameter information under Documentation/fb/ modedb.txt Tells the kernel/driver which IPU display interface format should be used.	1. video=mxcfb0:dev=hdmi, 1920x1080M@60,if=RGB24 video=mxcfb1:dev=ldb,if=RGB666 2. video=mxcfb0:dev=ldb,if=RGB666 video=mxcfb1:dev=hdmi, 1920x1080M@60,if=RGB24 3. video=mxcfb0:dev=hdmi, 1920x1080M@60,if=RGB24 4. video=mxcfb0:dev=ldb,if=RGB666 5. video=mxcfb0:dev=lcd,CLAA-WVGA,if=RGB656 6. video=mxcfb0:dev=mipi_dsi,TRULY-WVGA,if=RGB24	1. Used when primarily displaying on HDMI with 1080P60 mode. Secondarily displaying on LVDS with XGA mode. 2. Used when primarily displaying on LVDS with XGA mode. Secondarily displaying on HDMI with 1080P60 mode. 3. Used when primary displaying on HDMI with 1080P60 mode. 4. Used when primary displaying on the HannStar LVDS1. 5. Used when primary displaying on the CLAA-WVGA dumb parallel LCD panel.

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Table 11.   Common kernel boot parameters (continued)

Kernel parameter	Description	Typical value	Used when
			6. Used when primary displaying on the TRULY-WVGA MIPI DSI LCD panel. NOTE: GBR24/RGB565/YUV444 represents the display HW interface format. Typical values for certain different display devices are as follows: TVOUT: YUV444 VGA: GBR24 HDMI&DVI: RGB24 CLAA WVGA LCD: RGB565 Typical values for dev= are shown as follows: lcd: LCD interface ldb: LVDS hdmi: HDMI on chip or sii902x dvi: DVI port vga: VGA through TVE tve: TVOUT
video on 6SABRE-AI	Tells the kernel/driver which resolution/ depth and refresh rate should be used for display port 0 or 1. See the parameter information under Documentation/fb/ modedb.txt Tells the kernel/driver which IPU display interface format should be used.	1. video=mxcfb0:dev=hdmi, 1920x1080M@60,if=RGB24video=mxcfb1:dev=ldb,if=RGB666 2. video=mxcfb0:dev=ldb,if=RGB666video=mxcfb1:dev=hdmi, 1920x1080M@60,if=RGB24 3. video=mxcfb0:dev=hdmi, 1920x1080M@60,if=RGB24 4. video=mxcfb0:dev=ldb,if=RGB666 5. video=mxcfb0:dev=hdmi, 1920x1080M@60,if=RGB24	1. Used when primarily displaying on HDMI with 1080P60 mode. Secondarily displaying on LVDS with XGA mode. 2. Used when primarily displaying on LVDS with XGA mode. Secondarily displaying on HDMI with 1080P60 mode. 3. Used when primary displaying on HDMI with 1080P60 mode. 4. Used when primary displaying on the HannStar LVDS0. 5. Used when enabling HDMI 1080P60 mode and LVDS0. To enable second display, run "echo 0 > /sys/class/graphics/fb2/blank" NOTE: GBR24/RGB565/YUV444 represents the display HW interface format. Typical values for certain different display devices are shown as follows: TVOUT: YUV444 VGA: GBR24 HDMI&DVI: RGB24 CLAA WVGA LCD: RGB565

Table continues on the next page...

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Table 11.   Common kernel boot parameters (continued)

Kernel parameter	Description	Typical value	Used when
			Typical values for dev= are shown below: lcd: LCD interface ldb: LVDS hdmi: HDMI on chip or sii902x dvi: DVI port vga: VGA through TVE tve: TVOUT
video on 6SoloLite	Tells the EPDC FB driver which E Ink panel is in use and what bpp should be used for the Frame Buffer.	video=mxcepdcfb:E060SCM,bpp=16	Used when enabling EPDC to select the correct E Ink panel parameters to use. bpp=16 selects RGB565 FB pix format bpp=8 selects Y8 FB pixel format
video on 6SoloLite	Tells the ELCDIF FB driver which LCD panel is in use and which bpp should be used for the Frame Buffer.	video=mxc_elcdif_fb:SEIKO-WVGA,bpp=16	Used when enabling LCDIF to select the correct panel parameters to use. bpp=16 selects RGB565 FB pix format Note: if only use EPDC FB, then turn off ELCDIF FB by "video=mxc_elcdif_fb:off"
dmfc	Tells the kernel/driver how to set the IPU DMFC segment size.	None Or dmfc=3	"dmfc=1" means DMFC_HIGH_RESOLUTION_DC. "dmfc=2" means DMFC_HIGH_RESOLUTION_DP. "dmfc=3" means DMFC_HIGH_RESOLUTION_ONLY_DP. DMFC_HIGH_RESOLUTION_ONLY_DP can only be set by the command line. It is recommended to set this when no IPU connects the two panels. When it is set, each IPU can only connect one panel.
mtdparts on 6SABRE-AI	Tells the kernel mtd partition information.	mtdparts=gpmi-nand:16m(boot), 16m(kernel),1024m(rootfs),-(user)	When to enable NAND. The partition: 16m(boot),16m(kernel),1024m(rootfs) is an example, you can change it according to your needs.
bluetooth	Chooses which bluetooth module is on the board.	bluetooth=ar3001 or, bluetooth=sxsdman	Choose AR3001 on UART2, or choose SXSDMAN on UART4.
uart clock from osc for 6SoloX low power idle and scenario of	Chooses the UART's clock parent.	uart_from_osc	This is necessary for low power idle and all use cases with the FreeRTOS running on ARM Cortex-M4 processor. When setting this parameter, UART

Table 11.   Common kernel boot parameters

Kernel parameter	Description	Typical value	Used when
Linux OS and FreeRTOS running together			sources clock from OSC instead of PLL3_80M, and then all PLLs can be off in low power idle.

5   Known Issues/Limitations

Read through all hardware-related reference material and ensure that the necessary hardware modifications have been made before using the software.

The following tables list some key known issues.

Table 12.   Common known issues and workarounds

Module	Source	Description	Workaround
Thermal	Hardware	The Temperature Monitor should only be enabled for chips that have undergone proper thermal sensor calibration. MC marked devices have undergone temperature calibration.	Ensure proper temperature calibration before using the temperature monitor. See the "Thermal Driver" Chapter in the *i.MX Linux*® *Reference Manual* (IMXLXRM).

Table 13.   Known issues and workarounds for i.MX 6 SABRE-SD and i.MX 6 SABRE-AI

Module	Source	Description	Workaround
ARM core	Software	smp_wmb performance is very low.	This is the common side-effect of SMP. No fix plan.
IPU	Software	The framebuffer driver and v4l2 output driver share the same fb device.For example, /dev/video16 also uses the /dev/fb0 to do video playback.	Frame Buffer operations should be banned during video playback on the same FB device.
IPU	Hardware	Currently, only supports 4-stripe and 2-stripe split mode. When doing large ratio up-scaling from low resolution frames to high resolution frames, for example, 64x64 to 1920x1080, the requirement cannot be covered by the current split mode solution, that is, each stripe would exceed 1024 pixels for width. Therefore, the video cannot display a full screen.	No.
IPU	Hardware	CSI_SMFC_MEM capture channel cannot support 32 pixel IDMAC burst size for non-interleaved and partial-interleaved YUV pixel formats with	The current workaround is to change 32 pixel burst size to 16 pixel burst size, which would bring considerable capture performance penalty.

Table continues on the next page...

Table 13. Known issues and workarounds for i.MX 6 SABRE-SD and i.MX 6 SABRE-AI (continued)

Module	Source	Description	Workaround
		non-16byte-aligned UV stride line. Little horizontal stripes can be seen on the capture frames.	
PCIe	Hardware/ Software	PCIe does not support Hot Plug and Power Management.	No.
Memory Management	Software	The system reports page allocation failure: order:9, mode:0xd0 when the system does not have sufficient physical continuous memory to allocate.	This may be caused by the 3.5.7 kernel page reclaiming issue. One workaround for this: echo 1 > /proc/sys/vm/drop_caches before you run the application.
HDMI	Software	ENGR00290866 HDMI cannot be set to 1080p@60hz with kernel configuration settings.	Use the xrandr application to configure the HDMI resolution from user-space.
MMC	Software	Hynix eMMC: times out when the rootfs automatically mounts the RPMB partition on i.MX 6SABRE-SD.	Rootfs should not automatically mount the RPMB partition, since it is a secure partition.
ASRC	Hardware	Two ASRC M2M instances and one P2P instance conversion simultaneously meet serious noise on 176 K and 192 K sampling rates.	When there are three instances, the total MIPS consumption should not exceed the ASRC master clock (132 M). In this situation, the total MIPS consumption is more than 120 M, and it is close to the threshold (132 M) in theory. Therefore, this is a capability issue of ASRC, and the noise is expected.
SD3.0	Software	It cannot read out partition table sometimes when doing the reboot stress test. The "mmcblk2: unknown partition table" error occurs and no rootfs partition is found, and then the system is down.	No workaround is available now. Will be fixed in next release.

Table 14. Known issues and workarounds for i.MX 6 SABRE-SD

Module	Source	Description	Workaround
SPI NOR boot	Hardware	SPI NOR boot is not supported by the SABRE-SD board.	Current SD board uses KEY relative PINs as SPI interface. However, this set of PINs are not supported by ROM. Therefore, SPI NOR boot is not supported by the SABRE-SD board.
CPU hotplug	Software	System hangs after conducting CPU hot plug many times during heavy interrupt.	Known ARM Linux OS limitation. No workaround as of yet.
VPU	Software	Cannot support the "-x 1" option for unit test program mxc_vpu_test.out, because the IPU library is removed.	To avoid this issue, do not use "-x 1", since "-x 1" means enable for IPU library.
IPU	Hardware	Currently, only supports 4-stripe and 2-stripe split mode. When doing large ratio up-scaling from low resolution frames to high resolution frames, for example, 64x64 to 1920x1080, the	No.

Table 14. Known issues and workarounds for i.MX 6 SABRE-SD

Module	Source	Description	Workaround
		requirement cannot be covered by the current split mode solution, that is, each stripe would exceed 1024 pixels for width. Therefore, the video cannot display a full screen.	

Table 15. Known issues and workarounds specifically for i.MX 6Dual/6Quad SABRE-SD

Module	Source	Description	Workaround
SATA Boot	Hardware	The system cannot boot from SATA on the Rev.B board.	Remove R7.
Boot	Hardware	The system cannot boot sometimes when it ist powered on the Rev. B board for the first time.	Add 2.2M ohm resistor to 24M OSC.
Suspend/ Resume	Hardware/ Software	Suspend/Resume failure if board rework "Add 2.2M ohm resistor to 24M OSC".	Remove rework.

Table 16. Known issues and workarounds specifically for i.MX 6Solo/ 6DualLite SABRE-SD

Module	Source	Description	Workaround
PMIC	Hardware	The i.MX 6DualLite SD board depopulates the resistor R30 and takes away the ability of the processor to turn off the PMIC in hardware.	i.MX 6DualLite uses dumb mode by default.
EPDC	Hardware	The PINs of EPDC are in conflict with other modules.	To enable EPDC, add the "epdc" command option into the boot command line.
EPDC	Software	Enabling E Ink Auto-update mode (Device Drivers > Graphics Support > E Ink Auto-update Mode Support) causes E Ink panel updates to be distorted and flaky.	Disable the E Ink Auto-update Mode feature in the menuconfig.
EPDC	Hardware	The three boards cannot boot with EPDC DC2 attached while they boot normally without DC2 daughter cards.	This occurs when the SW3 (KEYPAD_LOCK) switch on the EBOOK DC2 board is switched "ON", which affects the boot bin "EIM_DA7" (BT_CFG1_7). You need to set the SW3 in DC2 board to "OFF."
uSDHC	Hardware	SD3.0: U-Boot cannot boot with SDR50 and SDR104. This is not an issue with i.MX 6Dual/6Quad.	Fixed in TO1.1.

Table 17. Known issues and workarounds for i.MX 6Dual/6Quad SABRE-AI

Module	Source	Description	Workaround
ARM core	Software	CONFIG_SMP should be disabled for the i.MX 6Solo chip.	To remove overhead caused by SMP for better performance, CONFIG_SMP is expected to be disabled for single core. Complete support with SMP disabled is provided with future Linux BSP release.
IPU	Hardware	Default 24bpp on the second display used by HDMI. IPU keeps printing error for hardware bandwidth limitation as described in CR ENGR00293432.	No.
eCompass	Hardware	eCompass cannot work after EIM-NOR or SPI-NOR are enabled on the kernel.	No.
USB	Software	USB OTG and USB host cannot work after EIM-NOR or SPI-NOR are enabled on kernel.	No.
TV-IN	Software	Error messages may be expected along with bad quality at first frames on the TV-IN interface. This may occur on a hot plug connection.	No.
U-Boot	Hardware	ENGR00236878: eMMC 4.4 fails to boot on SABRE-AI boards.	No.
MLB	Software	The SYNC mode cannot work stably in the test.	No
SDIO3.0	Software	No available device to do the SDIO 3.0 test.	-

Table 18. Known issues and workarounds specifically for i.MX 6Solo/ 6DualLite SABRE-AI

Module	Source	Description	Workaround
Hardware manufacture	Hardware	HDMI, SD3 card detection, and eGalax touch screens are found to fail on some boards.	This is because some PINs are not soldered well. If any basic feature, which is announced to be supported, does not work on your board, check the board.
CPU hotplug	Software	System hangs after conducting CPU hot plug many times during heavy interrupt.	Known ARM Linux OS limitation. No workaround as of yet.
VPU	Software	Cannot support "-x 1" option for unit test program mxc_vpu_test.out, because IPU library is removed.	To avoid this issue, do not use "-x 1", because "-x 1" means enabled for IPU library.
uSDHC	Hardware	SD3.0: U-Boot can't boot with SDR50 and SDR104.	Fixed in TO1.1.

Table 19. Known issues and workarounds for i.MX 6SoloLite

Module	Source	Description	Workaround
EPDC	Software	Enabling E Ink Auto-update mode (Device Drivers > Graphics Support > E Ink Auto-update Mode Support) causes E Ink panel updates to be distorted and flaky.	Disable the E Ink Auto-update Mode feature in the menuconfig.
System	Hardware	Reboot may not work on the EVK board.	Reboot function should be always okay if the hardware can trigger PMIC reset, which ensures RESET key and watchdog reset can control PMIC_ON_REQ pin.
CSI/EPDC	Hardware	Cannot be used simultaneously, because these two modules share the same pins on the EVK board.	The board file in BSP configures these pins for proper function through DTS. Use imx6sl-evk.dts for EPDC, and imx6sl-evk-csi.dts for CSI.
X-Acceleration	Hardware/Software	Out of memory error during the x11perf test.	It is a system limitation since the x11perf needs a lot of memory. No work-around on the EVK board (only with LPDDR2 memory of 512 MB). Users may use a larger memory to work around this issue.
Mfgtool2	Software	Mfgtool2 may fail to execute the `frf` command if there is no `send` or `pipe` command executed prior to it.	Remove the `frf` command from ucl2.xml to fix this issue.
FUSE for RTC	Hardware	SEC_CONFIG[0] fuse bit is not burned, which leads the RTC not to be functional.	In U-Boot prompt, run the command "imxotp blow --force 4 0x2".
SDIO3.0	Software	No available device to do the SDIO 3.0 test.	
HDMI	Software	ENGR00298771, i.MX 6SoloLite EVK: on some special resolutions, such as 1400x1050, the Yocto Project GUI display on HDMI is distorted. This is caused by xrandr and tries to expand the frame buffer size to 1408x1050 to align with 16 bytes. However, i.MX 6SoloLite ELCDIF does not support stride buffer and cannot crop 1400x1050 from the buffer 1408x1050, which then causes distortion.	No. Only found on 1400x1050 mode until now.

Table 20. Known issues and workarounds for i.MX 6SoloX

Module	Source	Description	Workaround
Video	Software	The video display has a green line at bottom during gplay.	No workaround.
CAAM	Software	The system reboots after the CAAM RNG test is suspended and resumed.	There is hardware function conflict between the Mega/Fast mix off feature and CAAM. To use CAAM after kernel bootup, the user should enable the CAAM wakeup function to avoid Mega mix off in DSM. Workaround: echo enabled > /sys/bus/platform/devices/

Table continues on the next page...

Table 20. Known issues and workarounds for i.MX 6SoloX (continued)

Module	Source	Description	Workaround
			2100000.aips-bus/2100000.caam/2101000.jr0/ power/wakeup
VADC	Software	Sometimes VADC cannot correctly detect the video standard. CSI works in NTSC mode but the VADC input is PAL.	The VADC auto standard detect function is not required. VADC input device does not change in product. Hard code VADC input standard in the VADC driver.
MLB	Software	SYNC mode is not stable.	No workaround.
QSPI-NOR	Hardware	PMIC needs to be reset to reset the QSPI-NOR flash on the board to the default 3 bytes mode.	The hardware workaround is required.
PCIe	Hardware/ Software	When the extremely power save mode is enabled on i.MX 6SoloX PCIe, the i.MX 6 SoloX PCIe phy/controller would be powered off completely, all the TLPs on the PCIe link would be discarded, and link would be down in suspend. The i.MX 6 SoloX PCIe and the PCIe link would be re-initialized completely during resume operations. There is one known issue when the pcie2usb device is used during suspend/resume. The development node of the pcie2usb device maybe changed, since the pcie2usb device is reset when the i.MX 6SoloX PCIe is re-initialized during resume.	No.
MMC	Software	Hynix eMMC times out when the rootfs automatically mounts the RPMB partition on i.MX 6SoloX SD.	Rootfs should not automatically mount the RPMB partition, because it is a secure partition.
CSI/LCD	Hardware	CSI and LCD cannot be used simultaneously since the two modules share the same pins on the i.MX 6SoloX SABRE-SD board.	No.
UART	Hardware	UART cannot wake up with the RTS pin programmed with hard flow control enabled. And there is limitation of the framesize to about 16.	No.

Table 21. Known issues and workarounds for i.MX 7Dual SABRE-SD

Module	Source	Description	Workaround
Camera	Software	V4L2 CSI Capture: Snow noise appears when testing 1024x768, 30 fps.	Plan to fix it in next release.
Wi-Fi	Software	Broadcome Wi-Fi driver is not included in the external release package.	Due to the license issues, the Broadcom Wi-Fi driver is not included in the external release package.
EPDC	Software	VideoConversion: The color is wrong when using imxvideoconvert_pxp to do format conversion.	Plan to fix it in next release.

Table continues on the next page...

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Table 21. Known issues and workarounds for i.MX 7Dual SABRE-SD (continued)

Module	Source	Description	Workaround
SD/MMC	Hardware/ Software	SD2.0 U-Boot overnight stress reset test fails at 3040 and 616 times.	Hardware issue. There are multi-pulses on PMIC_PWRON if WDOG_B reset signal is triggered. This abnormal signal may cause system reset failure.
EPDC	Software	EPDC does not function in the release package because the waveform is removed from the release.	Due to the license issues, the EPDC waveform is removed from the release package, so the EPDC does not work.
HDMI	Software	HDMI supports only one startup resolution mode 1280x720 when booting to X backend rootfs.	For i.MX 7Dual, it cannot port Vivante or Freescale EXA driver to it, because the EXA driver depends on Vivante's 2D library and there is no GPU hardware on i.MX 7Dual. Therefore, a default software version driver (FBDEV) is used for i.MX 7Dual. The FB video mode is changed by FB command, but the UI cannot get the video mode changed event, because i.MX 7Dual has no GPU hardware and still draws the UI to original video mode. No workaround.
HDMI	Software	After booting up, it connects to the HDMI cable. The X backend desktop cannot display.	i.MX 7Dual, it cannot port Vivante or Freescale EXA driver to it, because the EXA driver depends on Vivante's 2D library and there is no GPU hardware on i.MX 7Dual. Therefore, a default software version driver (FBDEV) is used for i.MX 7Dual. It is expected, because FB video mode is changed after the DHMI cable is plugged in, and the UI cannot handle the HDMI cable plugin event or change the UI to new video mode. No workaround.
Wi-Fi	Software	Wi-Fi does not support suspend/ resume when doing IPERF.	BroadCom Wi-Fi is not supported.

6 Multimedia

This chapter contains the information on the multimedia component of the BSP.

The versions of the Gstreamer releases are listed below:

GStreamer 1.0:

- gstreamer (version 1.4.5)
- gstreamer-plugins-base (version 1.4.5)
- gstreamer-plugins-good (version 1.4.5)
- gstreamer-plugins-bad (version 1.4.5)

6.1 Freescale GStreamer plugins

Table 22. Freescale Gstreamer 1.0 plugins

Plugin	Features
Audio decoder	beepdec: unified audio decoder plugin Supports MP3, AAC, AAC+, WMA, AC3, Vorbis, DD+, AMR, RA
Audio encoder	imxmp3enc : MP3 encoder plugin
Video decoder	• vpudec: VPU-based video decoder plugin • Software video decoder plugins: use gst-libav plugins
Video encoder	Vpuenc : VPU-base video encoder plugin
Demux	aiurdemux: aiur universal demuxer plugin supporting Supports AVI, MKV, MP4, MPEG2, ASF, OGG, FLV, WebM, RMVB
Video render	• imxv4l2sink: V4L2 based video sink plugin • overlaysink : G2D based video sink plugin
Video source	imxv4l2src: V4L2 based camera/TVin source plugin
Video convert	• imxvideoconvert_g2d: GPU2D based video convert plugin, to perform video color space conversion, resize, rotate • imxvideoconvert_ipu: IPU based video convert plugin, to perform video color space conversion, resize, rotate, deinterlacing. • imxvideoconvert_pxp: PXP based video convert plugin, to perform video color space conversion, resizing, and rotation.
OpenGL (ES) Plugins	• glimagesink: OpenGL (ES) based video sink plugin, supported in X11, Wayland, and FB backends. • gleffects: GL Shading Language effects plugin.

NOTE
- To support WMA, WMV, AAC+, AC3, DD+, rmvb decoding, and WMA encoding, you need to install special and excluded packages.
- vpudec plugins are only for SoCs with the VPU hardware.
- imxvideoconvert_g2d can only perform color space converting to RGB space.
- OpenGL (ES) plugins are from the gst-plugins-bad package, accelerated with Vivantee private APIs.

6.2 Freescale recording engine API

Freescale provides a high-level API set for easier-making camera related applications based on the GStreamer framework. This API set is based on the camerabin, which is from the gst-plugins-bad package.

This API can be found from gst1.0-plugins-fsl/tools/grecorder/recorder_engine.h.

This API set can provide the following functions.

Table 23. Recording engine functions

Function	Feature
Image capture	Captures images from the camera with different resolutions and saves them to JPEG files.
Video recording	Records audi and video into various file formats, supporting the following formats:

Table continues on the next page...

Table 23. Recording engine functions (continued)

Function	Feature
	(MP3) x (H264, MPEG4, H263, MJPEG) x (MP4, MKV, AVI, FLV, TS)
Meta data	Adds the time and date information to the captured image or recorded video.
Endless recording	Records to multiple file segments, specifies the total file segment count and each file's maximum size. It can record a file endlessly, saving to file segments in loop. This function can only work with the TS file format.
Web camera	Records audio and video, and sends them out through RTP. This function can only work with the TS file format.
Graphic effect	Supports adding the graphic effect in the video and record into the file.
Device selection	Supports selecting different camera and audio sources.

NOTE

This recording engine is only available in platforms that have hardware video codec.

6.3 Freescale Qt Applications

Freescale provides the following applications based on Qt to demonstrate the multimedia features.

Table 24. Qt applications

Application	Feature

IMXPlayer	• Playback
	   • Play, Stop
	   • Pause, Resume
	   • Fast seek, Accurate seek
	   • Playback rate control (fast forward, fast rewind, slow forward)
	   • Loop playback
	   • Full screen / Non full screen switching
	• Media information (meta data)
	• Video Thumbnail
	• Audio Album Art
	• Playlist
	• Audio track selection
	• Video track selection
	• Subtitle

IMXCamera	Based on the recording engine, it provides all the features supported in the recording engine.

NOTE

The demo applications are only available in platforms that have hardware video codec on the X11 platform.

6.4 Multimedia feature matrix

This section provides feature matrix details of various codecs used for play back.

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6.4.1 Parser/Demuxer specifications

The demuxer support of a particular audio or video type requires the availability of the codec.

Table 25. Parser/Demuxer supported audio/video

	Demuxer feature	ASF	AVI	MP4	OGG	FLV	MPG2	MKV	RMVB
Video	H264	-	Y	Y	-	Y	Y	Y	-
	MPEG2	-	Y	-	-	-	Y	Y	-
	MPEG4	Y	Y	Y	-	-	-	Y	-
	H263	-	Y	Y	-	Y	-	Y	-
	MJPEG	-	Y	Y	-	-	-	Y	-
	VC1	Y	Y	-	-	-	-	Y	-
	DivX	Y	Y	Y	-	-	-	Y	-
	Xvid	-	Y	-	-	-	-	Y	-
	VP8	-	-	-	-	-	-	Y	-
	VP6	-	-	-	-	Y	-	Y	-
	Theora	-	-	-	Y	-	-	-	-
	RV	-	-	-	-	-	-	Y	Y
Audio	AAC	-	Y	Y	-	Y	Y	Y	Y
	MP3	Y	Y	Y	-	Y	Y	Y	-
	WMA	Y	Y	-	-	-	-	Y	-
	AC3	-	Y	Y	-	-	Y	Y	-
	PCM/ADPCM	Y	Y	Y	-	Y	Y	Y	-
	AMR	-	-	Y	-	-	-	Y	-
	Vorbis	-	Y	Y	Y	-	-	Y	-
	SPEEX	-	-	-	Y	Y	-	Y	-
	DTS	-	-	-	-	-	Y	Y	-
	FLAC	-	-	-	Y	-	-	Y	-
	DD+	Y	-	Y	-	-	Y	Y	-
	RA	-	-	-	-	-	-	-	Y

6.4.2 Video codec specifications

The tables in this section show the video codec specs with and without VPU acceleration. Check Section BSP Supported Features to determine if your board supports VPU.

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Table 26.   Video codec specification for hardware with VPU acceleration

-	Feature	Profile	Max. resolution	Min. resolution	Max. framerate	H/W or S/W	Bitrate	Comment
Video decoder	MPEG2	MP	1920 * 1080	64 * 64	30 fps	H/W	50 Mbps	-
	MPEG4	SP	1920 * 1080	64 * 64	30 fps	H/W	40 Mbps	-
	MPEG4	ASP	1920 * 1080	64 * 64	30 fps	H/W	40 Mbps	-
	H.263	P3	1920 * 1080	64 * 64	30 fps	H/W	20 Mbps	-
	H.264	BP	1920 * 1080	64 * 64	30 fps	H/W	50 Mbps	-
	H.264	MP	1920 * 1080	64 * 64	30 fps	H/W	50 Mbps	-
	H.264	HP	1920 * 1080	64 * 64	30 fps	H/W	50 Mbps	-
	VC-1	SP	1920 * 1080	64 * 64	30 fps	H/W	45 Mbps	-
	VC-1	MP	1920 * 1080	64 * 64	30 fps	H/W	45 Mbps	-
	VC-1	AP	1920 * 1080	64 * 64	30 fps	H/W	45 Mbps	-
	VP8	-	1280 * 720	64 * 64	30 fps	H/W	20 Mbps	i.MX 6DualLite
	VP8	-	1920 * 1080	64 * 64	30 fps	H/W	20 Mbps	i.MX 6Quad
	MJPEG	-	1920 * 1080	64 * 64	30 fps	H/W	120 Mpixl	-
	RV	8/9/10	1920 * 1080	64 * 64	30 fps	H/W	40 Mbps	-

Table 27.   Video codec specification for hardware without VPU acceleration

	Feature	Profile	Max. resolution	Min. resolution	Max. framerate	H/W or S/W	Comment
Video decoder	H.264	BP/MP/HP	720 * 480	64 * 64	30 fps	S/W	-

Gstreamer 1.x uses the gst-libav plugin, which is not included in the release image and needs to be build into the image separately.

6.4.3   Audio codec specification

Table 28.   Audio codec specification

Decoder	Feature/Profile	Channel	Sample rate (KHz)	Bit rate (kbps)	H/W or S/W	Comment
MP3	MPEG-1 (Layer-1/Layer-2/Layer-3) MPEG-2 (Layer-1/Layer-2/Layer-3) MPEG-2.5 (Layer-3)	stereo/mono	<= 48	8 - 448	S/W	-
AACLC	MPEG-2 AACLC MPEG-4 AACLC	<= 5.1	8 - 96	8 - 256	S/W	-
HE-AAC	HE-AAC V1 HE-AAC V2	stereo/mono	8 - 96	Mono: 8 - 384 stereo: 16 - 768	S/W	-

Table continues on the next page...

Table 28. Audio codec specification (continued)

Decoder	Feature/Profile	Channel	Sample rate (KHz)	Bit rate (kbps)	H/W or S/W	Comment
WMA10 Std	L1 @ QL1	stereo/mono	44.1	64 - 161	S/W	-
	L2 @ QL1	stereo/mono	<= 48	<= 161	S/W	-
	L3 @ QL1	stereo/mono	<= 48	<= 385	S/W	-
WMA10 Pro	M0a @ QL2	stereo/mono	<= 48	48 - 192	S/W	-
	M0b @ QL2	stereo/mono	<= 48	<= 192	S/W	-
	M1 @ QL2	<= 5.1	<= 48	<= 384	S/W	-
	M2 @ QL2	<= 5.1	<= 96	<= 768	S/W	-
	M3 @ QL2	<= 7.1	<= 96	<= 1500	S/W	-
WMA 9 Lossless	N1	stereo/mono	<= 48	<= 3000	S/W	-
	N2	<=5.1	<= 96	<= 3000	S/W	-
	N3	<=7.1	<= 96	<= 3000	S/W	-
AC-3	-	<=5.1	<= 48	32 - 640	S/W	-
FLAC	-	<=7.1	8 - 192	-	N/A	-
BSAC	-	<=5.1	<= 48	64 per channel	N/A	Core codec only
Ogg Vorbis	q1 - q10	Stereo	8 - 192	<= 500	S/W	-
DD-plus	-	<=7.1	32, 44.1, 48 64, 88.2, 96	<= 6.144 Mbps	S/W	-
RA	cook	stero/mono	8k, 11.025k, 22.05k, 44.1k	-	S/W	-

NOTE

- The bitrate (bps) supported for MP3 encoder: 32 k, 48 k, 56 k, 64 k, 80 k, 96 k, 112 k, 128 k, 160 k, 192 k, 224 k, 256 k, 320 k
- The sample and supported bitrate (bps) combinations for WMA8 encoder:

    - For mono output:

        - 22050 Hz: 20 k, 16 k, 22 k, 17.6 k
        - 32000 Hz: 20 k, 22 k
        - 44100 Hz: 32 k, 35.2 k, 48 k, 52.8 k
    - For Stereo output:

        - 22050 Hz: 35.2 k, 32 k, 22 k, 20 k
        - 32000 Hz: 52.8 k, 48 k, 44 k, 40 k, 35.2 k, 32 k
        - 44100 Hz: 211.2 k, 192 k, 176 k, 160 k, 140.8 k, 128 k, 105.6 k, 96 k, 88 k, 80 k, 70.4 k, 64 k
        - 48000 Hz: 211.2 k, 192 k, 176 k, 160 k, 140.8 k, 128 k

6.4.4 Image codec specification

Table 29. Image codec specification

	Feature	Profile	Max. resolution	H/W or S/W
Image decoder	JPEG	Baseline	Memory related	S/W
	PNG	N/A	Memory related	S/W
	GIF	N/A	Memory related	S/W
	BMP	N/A	Memory related	S/W
Image encoder	JPEG	Baseline	Memory related	S/W

6.4.5 Speech codec specification

Table 30. Speech codec specification

	Feature	Sample rate	Bit rate (kbps)	H/W or S/W
Speech codec	G.711	8 KHz	64	S/W
	G.723.1	8 KHz	5.3, 6.3	S/W
	G.726	8 KHz	16, 24, 32, 40	S/W
	G.729ab	8 KHz	8	S/W
	AMR_NB	8 KHz	12.2, 10.2, 7.9, 7.4, 6.7, 5.9, 5.15, 4.75	S/W
	AMR_WB	16 KHz	23.85, 23.05, 19.85, 18.25, 15.85, 14.25, 12.65, 8.85, 6.6	S/W

6.4.6 Streaming protocol specification

Table 31. Streaming protocol specification

Protocol	Feature
HTTP	HTTP progressive streaming
RTSP	RTP, SDP
RTP/UDP	RTP/UDP MPEGTS streaming

6.4.7 RTSP streaming server specification

To support the RTSP server, the gst-rtsp-server open source package needs to be installed. See Section "RTSP Streaming Server" in the *i.MX Linux® User's Guide* (IMXLUG) for information on how to build and install it.

Table 32. RTSP streaming server specification

Demux feature		AVI	MP4	FLV	MKV	MP3	AAC
Video	H264	Y	Y	Y	Y	-	-
	MPEG4	Y	Y	-	Y	-	-
Audio	MP3	Y	Y	Y	Y	Y	-
	AAC	Y	Y	Y	Y	-	Y

6.4.8 Subtitle specification

Table 33. Subtitle specification

Internal/External	Subtitle format
Internal	SRT, SSA, ASS
External	SRT

6.5 Known issues and limitations for multimedia

- As the maximum buffer size of the $PLAYBIN multi-queue is 2 MB, problems may be seen with some long audio or video interleaved streams. You can enlarge this buffer size to support these special use cases.
- AAC decoder: The ADIF format does not support seek mode nor FF/FB.
- Playing recorded AVI file (MPEG4(vpu) + AVI(avimux)) fails, because the AVIMUX mark MPEG4 video to DIVX is not supported.
- The accurate seek mode may have a longer time delay.
- Because the stream container does not have an index table, seek is not supported.
- Fast rewind of audio does not support audio-only streams.
- Pulseaudio is only available for the X11 backend.
- Rotation is not supported for interlaced streams whose width or height is larger than 968 x 968 when enabled deinterlacing due to a driver limitation.
- Rewind may report an EOS when using libav for video decoding.

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