i.MX Linux® Release Notes

1   Overview

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

For information on changes in this release, see the manifest Readme at index: imx-manifest.git and the Change Logs at index: imx-manifest.git.

Supported hardware SoC/board

- i.MX 8QuadMax MEK Board

- i.MX 8QuadXPlus MEK Board

> **NOTE**
>
> In this document, the following notation is used:
>
> - 8QM stands for the i.MX 8QuadMax MEK Platform.
> - 8QXP stands for the i.MX 8QuadXPlus MEK Platform.

1.1   Release contents

This release consists of the following package files:

Contents

- L4.9.51-beta_images_mx8qxp.tar.gz
- L4.9.51-beta2_images_mx8qmmek.tar.gz
- fsl-yocto-L4.9.51-mx8_beta2.tar.gz

The GA releases are named "L<Kernel_version>_<x.y.z>".

"<Kernel_version>": BSP Kernel version. (For example, "L4.9.51 indicates that this BSP release is based on the kernel version 4.9.51)

"<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	4.9.51
U-Boot	v2017.03
SD Card images	Pre-built images for download, and image files gathering a suggestion of packages and libraries needed for the common tests.
Manufacturing Tools for 8QuadMax and 8QuadXPlus.	MFGtools is a program used to burn a production image into the board using a set of predefined parameters, such as the target memory to be used. USB recognition may fail in serial download mode. You can use SD boot mode without an SD card in socket to force ROM to enter serial download mode, and then the MFGtools can work.

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-freescale 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.	imx8qmmek imx8qxpmek
flexspi	This supports FlexSPI boot.	imx8qmmek imx8qxpmek

The following table describes the kernel and device trees included 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
Kernel image for i.MX 8	Binary kernel image for i.MX 8 kernel is built using defconfig in arch/arm64/configs/. Kernel image: Image Board DTB files: • Image-fsl-imx8qxp-mek-dom0.dtb: Xen Linux guest Linux DTB file.

Table continues on the next page...

i.MX Linux® Release Notes, Rev. L4.9.51_8qm-beta2/8qxp-beta, 02/2018

Table 3. Kernel and device tree configurations (continued)

Kernel and device tree configuration	Description
	• Image-fsl-imx8qxp-mek-dsi-adv7535.dtb: Supports MIPI-HDMI ADV7535 adapter card. • Image-fsl-imx8qxp-mek-dsi-rm67191.dtb: Supports RM67191 MIPI OLED display panel. • Image-fsl-imx8qxp-mek-enet2.dtb: Supports ENET port on base boards. • Image-fsl-imx8qxp-mek-lvds0-it6263.dtb: IT6263 LVDS-HDMI adapter card connected LVDS port 0. • Image-fsl-imx8qxp-mek-lvds0-lvds1-it6263.dtb: One IT6263 LVDS-HDMI adapter card connected LVDS port 1. • Image-fsl-imx8qxp-mek-lvds0-lvds2-it6464: Two IT6263 LVDS-HDMI adapter card connected LVDS port 0 and port 1. • Image-fsl-imx8qxp-mek.dtb: Default DTB for MEK boards. • fsl-imx8qm-mek.dtb: Supports one LVDS-HDMI through the LVDS0-CH0 on the LVDS-HDMI daughter card. This is the default DTB. • fsl-imx8qm-mek-hdmi.dtb: Supports Nativie HDMI interface on the CPU board. Currently the HDMI FW loading is not ready yet. • fsl-imx8qm-mek-jdi-wuxga-lvds1-panel.dtb: Supports the dual-channel LVDS panel, connecting the two miniSAS ports with the LVDS1 CH0 and LVDS1 CH1. • fsl-imx8qm-mek-dsi-rm67191.dtb: Supports up to two RM67191 OLED display panels through the MIPI DSI0/1 on the daughter card. • fsl-imx8qm-mek-it6263.dtb: Supports two HDMI displays connected with two LVDS-HDMI converts. You must connect two LVDS-HDMI converts with the boards before booting up systems to get the display working. • fsl-imx8qm-mek-dsi-adv7535.dtb: Supports up to two HDMI displays connected with two MIPI-HDMI converts. • fsl-imx8qm-mek-it6263-adv7535.dtb: Supports up to four HDMI displays (two LVDS-HDMI and two MIPI-HDMI). You must connect at least two LVDS-HDMI converts with the board before booting up systems to get the display working. • fsl-imx8qm-mek_ca53.dtb: Supports four CortexA53 cores only. • fsl-imx8qm-mek_ca72.dtb: Supports two Cortex-A72 cores only. You need to build the special boot image through the imx-mkimage tools, and select the flash_ca72 build target.
Default DTB	Each reference board has a standard device tree as follows: • Image-fsl-imx8qm-mek.dtb: Supports one LVDS-HDMI through the LVDS0-CH0 on the LVDS-HDMI daughter card. • Image-fsl-imx8qxp-mek.dtb: Supports one LVDS-HDMI through the LVDS0-CH0 on the LVDS-HDMI daughter card.

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 for the X11 backend: • fsl-image-qt5-validation-imx-x11-imx8qxpmek.tar.bz2 • fsl-image-validation-imx-x11-imx8qxpmek.tar.bz2

Table continues on the next page...

i.MX Linux® Release Notes, Rev. L4.9.51_8qm-beta2/8qxp-beta, 02/2018

Table 4.   Pre-built images (continued)

Package	Description
	• fsl-image-qt5-validation-imx-x11-imx8qmmek.tar.bz2 • fsl-image-validation-imx-x11-imx8qmmek.tar.bz2
XWayland SD Card	This release provides the following SD card images for the XWayland backend with the Weston compositor: • fsl-image-qt5-validation-imx-xwayland-imx8qxpmek.sdcard.bz2 • fsl-image-validation-imx-xwayland-imx8qxpmek.sdcard.bz2 • fsl-image-qt5-validation-imx-xwayland-imx8qmmek.sdcard.bz2 • fsl-image-validation-imx-xwayland-imx8qmmek.sdcard.bz2
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 with the rootfs support.
M4-Demo	i.MX 8QuadXPlus demo. • imx8qx_m4_TCM_hello_world.bin • imx8qx_m4_TCM_rpmsg_lite_pingpong_rtos_linux_remote.bin • imx8qx_m4_TCM_rpmsg_lite_str_echo_rtos.bin i.MX 8QuadMax demo: • imx8qm_m4_0_TCM_hello_world.bin • imx8qm_m4_0_TCM_rpmsg_lite_pingpong_rtos_linux_remote.bin • imx8qm_m4_0_TCM_rpmsg_lite_str_echo_rtos.bin • imx8qm_m4_1_TCM_hello_world.bin • imx8qm_m4_1_TCM_rpmsg_lite_pingpong_rtos_linux_remote.bin • imx8qm_m4_1_TCM_rpmsg_lite_str_echo_rtos.bin
Combined Boot Image	• imx-boot-imx8qxpmek-fspi.bin-flash_flexspi • imx-boot-imx8qxpmek-sd.bin-flash • imx-boot-imx8qxpmek-sd.bin-flash_dcd • imx-boot-imx8qxpmek-sd.bin-flash_multi_cores • imx-boot-imx8qmmek-fspi.bin-flash_flexspi • imx-boot-imx8qmmek-sd.bin-flash • imx-boot-imx8qmmek-sd.bin-flash_dcd • imx-boot-imx8qmmek-sd.bin-flash_multi_cores

Table 5.   fsl-yocto-L4.9.51-mx8_beta2.tar.gz content

File name	Description
README	README for L4.9.51_imx8qm-beta2 and L4.9.51_imx8qxp-beta.
/doc	The following docs are provided: i.MX Linux® Release Notes, User's Guide, Porting Guide, Graphics Guide,VPU API Reference Manual, Yocto Project User's Guide, and Reference Manual. For standalone release, a limited set of docs are provided, the i.MX Linux® Release Notes and User's Guide.

Table 6.   Multimedia standard packages

File name	Description	Comment
imx-gst1.0-plugins-4.3.3.tar.gz	GStreamer plugins	i.MX GStreamer plugins

Table continues on the next page...

i.MX Linux® Release Notes, Rev. L4.9.51_8qm-beta2/8qxp-beta, 02/2018

Table 6.   Multimedia standard packages (continued)

File name	Description	Comment
imx-codec-4.3.3.bin	i.MX codecs	i.MX optimized A/V core codec
imx-parser-4.3.3.bin	i.MX parser	i.MX optimized core parser

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

Table 7.   Controlled access packages

File name	Description	Comment
imx-aacpcodec-4.3.3.bin	AACplus decoder	i.MX optimized AACplus decoder
imx-mscodec-4.3.3.bin	Microsoft codecs	i.MX optimized Microsoft codecs
imx-msparser-4.3.3.bin	Microsoft parser	i.MX optimized Microsoft ASF parser
imx-ac3codec-4.3.3.bin	AC3 decoder	i.MX optimized Dolby audio AC3 decoder
imx-ddpcodec-4.3.3.bin	DDplus decoder	i.MX optimized Dolby audio DDplus decoder
imx-real-4.3.3.bin	Real Networks codecs and parser	i.MX optimized Real Networks real audio decoder, real media parser.
imx-hifi4-4.3.3.bin	HiFi4 codec, wrapper and firmware	Codec (MP3, MP2, BSAC, DABPlus, DRM, SBC) libraries are from Cadence.
imx-hifi4-aacp-4.3.3.bin	HiFi4 AACPlus decoder	AACPlus decoder library is from Cadence.

1.2   License

The Board Support Package (BSP) is composed of a set of packages and metadata (for Yocto Project Recipes) and each one has its own licensing. Verify the license of the target package before developing. The license can be found at the top of a recipe or a source file (such as *.c or *.h). For details, contact your NXP representative.

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

1.3   Proprietary Licensing Packages

i.MX packages can be found in two locations:

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

- Limited Access packages listed in the following table are provided on nxp.com with controlled access. Contact your sales representative for access. These include codecs to support WMA, WMV, RMVB, AAC+, AC3, DD+ decoding, encoding, WMA, Broadcom firmware, and E Ink firmware. 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	imx-aacpcodec-4.3.3.bin	i.MX AACplus core decoder
Microsoft Codec	imx-mscodec-4.3.3.bin	i.MX optimized MS codec
Microsoft Parser	imx-msparser-4.3.3.bin	i.MX optimized ASF parser
AC3 Decoder	imx-ac3codec-4.3.3.bin	i.MX AC3 core decoder
DDplus Decoder	imx-ddpcodec-4.3.3.bin	i.MX DD-plus decoder
RMVB Decoders and Parser	imx-real-4.3.3.bin	i.MX Real Networks
Broadcom Firmware	firmware-bcmd-1.363.22.bin	Broadcom Bluetooth wireless technology and Wi-Fi firmware
HiFi4 codec	imx-hifi4-4.3.3.bin	HiFi4 codec (MP2, MP3, BSAC, DRM, DABPlus,SBC)
HiFi4 AACPlus Decoder	imx-hifi4-aacp-4.3.3.bin	HiFi4 AACPlus decoder

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.
- *i.MX Yocto Project User's Guide* (IMXLXYOCTOUG) - Contains the instructions for setting up and building Linux OS in the Yocto Project.
- *i.MX Reference Manual* (IMXLXRM) - Contains the information on Linux drivers for i.MX.
- *i.MX Graphics User's Guide* (IMXGRAPHICUG) - Describes the graphics used.
- *i.MX BSP Porting Guide* (IMXXBSPPG) - Contains the instructions on porting the BSP to a new board.

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:

- Upgraded the kernel to 4.9.51.
- Updated EULA to v20 June 2017.
- New location at Code Aurora Forum at https://source.codeaurora.org/external/imx/ :
  - New manifest imx-manifest for distributions
  - New repos at Code Aurora Forum repo site
- Upgraded the Yocto Project to version 2.2 Morty.
- Upgraded U-Boot to 2017.03.
- Supports the GCC 6.2.0 toolchain.

- Graphics updates for i.MX 8QuadMax Beta2 and i.MX 8QuadXPlus Beta:
  - Upgraded to 6.2.4.p0
  - For i.MX 8 support for Vulkan and OpenVX
  - GPU SDK upgraded to 4.0.2
- Chromium browser upgraded to v53.0.2785.143 for XWayland.
- New sound features: Audio Mixer (AMIX) support.
- New multimedia features and changes for 8QuadMax Beta2 and 8QuadXPlus Beta:
  - GStreamer upgraded to 1.12.2
  - Qt upgraded to 5.8
  - Supports 64-bit audio codecs and parsers.
  - Supports video rendering with OpenGL-ES, AV playback to multiple displays and cameras preview.
  - Supports hardware audio decoder for AAC/HE-AAC/MP3.
- Supports Qualcomm Wi-Fi and Bluetooth.
- Supports CAN FD mode in FlexCAN.
- Supports suspending and resuming.
- Supports MIPI DSI panel.
- Supports USB3.0 device mode.
- Bootloader features for i.MX 8QuadMax and 8QuadXPlus:
  - The System Controller Firmware (SCFW) and U-Boot are contained in imx-boot as the bootloader for i.MX 8QuadMax and i.MX 8QuadXPlus.
  - The SCFW provides an abstraction to many of the underlying features of the hardware. This feature runs on an Arm® Cortex®-M processor that executes SCFW. Features include:
    - System initialization and boot
    - Power management
    - Resource management
    - System counter
    - Pad configuration
    - One-Time-Programmable (OTP) storage
    - Temperature monitoring
    - Watchdog

Features on i.MX 8QuadMax:

- Supports the i.MX 8QuadMax with the Arm v8 architecture:
  - 4x Cortex-A53 SMP enabled.
  - 2x Cortex-A72 SMP enabled.
- Supports the SMMU-500 for the IOMMU functionality.
- Supports the pin/pad, clock/power/resource management through the System Controller Unit (SCU).
- Supports LVDS-HDMI through the LVDS-HDMI MiniSAS daughter card.
- Supports display and audio through the HDMI interface.
- Supports the RM67191 OLED display panel through the MIPI DSI interface.
- Supports the CAAM security driver.
- Supports the SAI and Audio-codec.
- Supports the 2x GC7000XSVX GPU Graphics Processing Unit (GPU).
- Supports the SD/MMC/eMMC, FlexSPI, and LPSPI storage devices.
- Supports the ENET, USB, PCIe, CAN, and I2C connectivity (PCIe enabled based on the v4.6 kernel).
- Supports connectivity using RPMsg with MS support to FreeRTOS.
- Supports display with triple-buffer support in PAN display API for the frame buffer.
- Supports Camera V4L TV-In through ADV7180 and V4L Camera support through Quad Camera board (3 cameras per board and parallel-in).

Features on i.MX 8QuadXPlus MEK:

- Supports the i.MX 8QuadXPlus MEK with the Arm v8 architecture:
  - 4x Cortex-A35 SMP enabled.
- Supports the pin/pad, clock/power/resource management through the System Controller Unit (SCU).
- Supports the SAI/ESAI and Audio-codec.

i.MX Linux® Release Notes, Rev. L4.9.51_8qm-beta2/8qxp-beta, 02/2018

- Supports the GC7000Lite GPU Graphics Processing Unit (GPU).
- Supports the SD/MMC, QSPI-NOR storage devices.
- Supports the ENET, USB, PCIe, CAN, and I2C connectivity.
- Supports connectivity using RPMsg with MS support to FreeRTOS.
- Supports display with triple-buffer support in PAN display API for the frame buffer.
- Supports HIFI DSP.
- Supports MIPI CSI.

2.2   Graphics

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

Graphics Changes are now available in the following locations
- Changes for i.MX with GPU are documented on https://source.codeaurora.org/external/imx/imx-manifest.git/tree/ GraphicsChangeLogv6?h=imx-linux-morty.

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, the feature is only supported on the boards listed.

Table 9.   Supported features

Feature	Supported board	Comment
Kernel		
Kernel	All i.MX	Kernel version: 4.9.51
File System	All i.MX	EXT2/EXT3/EXT4 are used as the file system in MMC/eMMC/SD card.
Bootloader		
U-Boot	All i.MX	U-Boot delivery is based on U-Boot version v2017.03.
		Clock, Anatop regulator, ENET, UART, MMC/SD, eMMC4.3/4.4/4.5.
		ROM Plug-in Mode.
		SPI-NOR, NAND, FlexSPI-NOR, USB Mass Storage.
		See Table 2 in Section 1.1 for U-Boot configurations supported on each board for SPI_NOR, NAND, Parallel NOR, FlexSPI-NOR. These are not supported on all boards.
		i.MX 8 uses imx-mkimage to produce the flash.bin file that contains the i.MX 8 system controller firmware and U-Boot, and the flash.bin file that can be flashed to the SD cards with the command: dd if=flash.bin of=/dev/sd<x> seek=33 bs=1K.
		8MQuad, 8QuadMax, and 8QuadXPlus use seek=33 bs=1k.
Machine-specific layer		
Arm® Core	All i.MX	i.MX 8QuadXPlus processor consists of five cores:
		• Four Arm Cortex-A35
		• One Arm Cortex-M4F

Table continues on the next page...

i.MX Linux® Release Notes, Rev. L4.9.51_8qm-beta2/8qxp-beta, 02/2018

Table 9.   Supported features (continued)

Feature	Supported board	Comment
		i.MX 8QuadMax processor consists of eight cores: • Four Arm Cortex-A53 cores • Two Arm Cortex-A72 cores • Two Arm Cortex-M4F cores Innovative multicore architecture provides four Cortex-A53 cores, two Cortex-A72 cores, and two Cortex-M4 cores.
DSP	8QuadXPlus	One HiFi 4 DSP
Memory	All i.MX	On i.MX 8 with 64-bit configuration, the memory is not split. 8QuadMax supports two 32-bit LPDDR4 channels @1600 MHz. 8QuadXPlus supports one 32-bit LPDDR4 channel @1200 MHz.
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 and broadcast timer support.
GPIO/EDIO	All i.MX	GPIO is initialized in earlier phase according to hardware design.
Character device drivers		
MXC UART	All i.MX	i.MX 8 supports through LPUART0.
Networking drivers		
ENET	8QuadMax 8QuadXPlus	i.MX 8 supports Atheros AR8031 PHY with 10/100/1000 bps mode and AVB features.
IEEE® 1588	8QuadMax 8QuadXPlus	Supports Linuxptp stack. Features: • Supports IPv4, IPv6, and IEEE 802.3 transport. • Supports E2E, and 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	All i.MX	With the platform that supports the PCIe module.
FlexCAN	8QuadMax 8QuadXPlus	With the platform that supports the FlexCAN module. FlexCAN supports CANFD mode.
Wi-Fi/Bluetooth wireless technology	8QuadMax 8QuadXPlus	Supports Murata 1CQ (Qca6174A) Wi-Fi/Bluetooth. Note: Yocto release requires one specific Wi-Fi firmware file "board.bin", which can be obtained from Murata github: https://github.com/murata-wireless/qca-linux-calibration.git, branch: i.MX8x-1cq-morty Replace "board.bin" with /lib/firmware/ath10k/QCA6174/hw3.0/board.bin.
Security drivers		
CAAM	All i.MX	Cryptographic Acceleration and Assurance Module.
Sound drivers		

Table continues on the next page...

Table 9.   Supported features (continued)

Feature	Supported board	Comment
SAI/MQS	8QuadMax	Supports playback.
S/PDIF	8QuadMax	Supports 16 bit and 24 bit stereo playback from 32 KHz to 48 KHz sample rate.
	8QuadXPlus	Supports 24 bit stereo record from 16 KHz to 96 KHz.
ASRC	8QuadMax	Supports sample rates conversion from 5 KHz to 192 KHz and output sample rates from 32 KHz to 192 KHz.
	8QuadXPlus	Supports ALSA plug-in library playback.
ESAI/CS42888	8QuadMax	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.
	8QuadXPlus	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/WM8962	8QuadMax	Supports 16 bit, 24 bit, and 32 bit PCM format.
	8QuadXPlus	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.
AMIX	8QuadMax	Supports 16 bit, 18 bit, 20 bit, 24 bit, and 32 bit PCM format.
	8QuadXPlus	Supports sample rate from 8 KHz to 96 KHz for record and playback .
		Supports amixer alsamixer control from user space.
DP Audio	8QuadMax	Supported on the i.MX 8QuadMax Validation board.
Input device drivers		
USB devices	All i.MX	Supports USB mouse and USB keypad through USB ports.
MTD driver		
FlexSPI-NOR	8QuadMax	8QuadXPlus support FlexSPI1.
	8QuadXPlus	
NAND	8QuadXPlus	Normal NAND and ONFI NAND asynchronous mode with BCH40/BCH62.
SATA	8QuadMax	Serial ATA 2.0 supports only i.MX 6DualQuad SABRE-SD and SABRE-AI and i.MX 6 QuadPlus SABRE_SD and SABRE-AI and 8QuadMax.
USB drivers		
USB Host	8QuadMax	Supports USB HOST1 and USB OTG host.
	8QuadXPlus	i.MX 8QuadMax and 8QuadXPlus support USB 3.0 ports
USB Device	All i.MX	Supports USB OTG device mode.
USB	All i.MX	Supports USB OTG2.0, USB Host2.0, USB 3.0, and Type-C ports. USB 3.0 is only supported by i.MX 8.
		USB Host mode: MSC, HID, UVC, and USB audio.
		USB device mode: MSC, Ethernet, and Serial.
		USB OTG pin detect support for Dual-role switch at USB2.
Graphics drivers		

Table continues on the next page...

Table 9.   Supported features (continued)

Feature	Supported board	Comment
GPU	8QuadMax 8QuadXPlus	Graphics Chips Details Two GC7000SXVX on 8QuadMax. One GC7000-Lite on 8QuadXPlus. The GPU on the chips listed above supports these features that include 2D and 3D hardware acceleration: • Supports EGL 1.5 for fbdev, X11, XWayland • Supports OpenGL ES1.1 • Supports OpenGL ES2.0 (WebGL 1.0.1 compatible on X11) • Supports OpenGL ES3.0 • Supports ESS 3.1 and ESS 3.2 on i.MX 8QuadMax and 8QuadXPlus • Supports Vulkan and OpenVX on i.MX 8QuadMax • Supports OpenVG1.1 • Supports OpenCL1.1 on GC7000SXVX, GC2000 and GC2000+. • Supports OpenGL2.1
Direct Rendering Manager (DRM)	All i.MX	i.MX DPU DRM is used for i.MX 8QuadMax and 8QuadXPlus.
DP	8QuadMax	i.MX 8QuadMax supports DP audio.
LVDS to HDMI	8QuadMax 8QuadXPlus	Uses ITE Driver IT6263
MIPI to HDMI	8QuadMax 8QuadXPlus	Uses adv7535
MIPI display panel	8QuadMax 8QuadXPlus	Supports RM67191 OLED display panel through the MIPI DSI.
Multimedia Drivers		
Display Subsystem	8QuadXPlus 8QuadMax	Supports DPU and LVDS connector based on the DRM/KMS framework.
ISI/MIPI-CSI2 image Subsystem	8QuadXPlus 8QuadMax	Supports mipi-csi2 virtual channel with four cameras input.
General drivers		
uSDHC	All i.MX	Supports SD2.0 and SDXC. Supports SD3.0 on all i.MX except 6SABRE-SD. Supports eMMC5.1 on i.MX 8QuadMax and 8QuadXPlus.
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 through PWM.
ADC	8QuadMax	Supports the ADC driver.
Temperature monitor	All i.MX	Pre-calibrated. See the "Thermal Driver" chapter in *i.MX Linux® Reference Manual* (IMXLXRM) for more information.
Accelerometer	8QuadXPlus	Supports the FXOS8700CQR1 sensor on the i.MX 8.

Table continues on the next page...

Table 9. Supported features (continued)

Feature	Supported board	Comment
Wi-Fi/Bluetooth wireless technology	8QuadMax 8QuadXPlus	Supports Murata 1CQ (QCA6174A) Wi-Fi/Bluetooth. Note: Yocto release requires one specific Wi-Fi firmware file "board.bin", which can be obtained from Murata github: https://github.com/murata-wireless/qca-linux-calibration.git, branch: i.MX8x-1cq-morty. Replace "board.bin" with /lib/firmware/ath10k/QCA6174/hw3.0/board.bin.
GPIO Expander	8QuadMax 8QuadXPlus	Supports PCA9557 on i.MX 8.
Ambient Light Sensor	8QuadMax 8QuadXPlus	Supports the ISL29023 sensor on i.MX 8 boards
Magnetometer Sensor	8QuadMax 8QuadXPlus	Supports MPL3115A2 sensors on the i.MX 8 boards

4 Kernel Boot Parameters

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

The following table describes different boot parameters.

Table 10. Common kernel boot parameters

Kernel parameter	Description	Typical value	Used when
console	Where to output the kernel logging by printk.	console=ttyLP0,115200	All use cases
nosmp	A command-line option of 'nosmp' disables SMP activation entirely.	nosmp	CONFIG_SMP is defined. Use this to disable SMP activation. SMP is activated by default through the CONFIG_SMP configuration.
ip	Tells the 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."
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).
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.)

Table continues on the next page...

i.MX Linux® Release Notes, Rev. L4.9.51_8qm-beta2/8qxp-beta, 02/2018

Table 10.   Common kernel boot parameters (continued)

Kernel parameter	Description	Typical value	Used when
rootwait	Waits (indefinitely) for the root device to show up.	rootwait	Used when mounting SD root file system.
mem	Tells the kernel how much memory can be used.	None or mem=864M	Note: MemTotal-\<mem\> - \<gpu_memory\> is reserved.
fec.macaddr	Tells the Ethernet MAC address.	fec.macaddr=0x00,0x04,0x9f, 0x01,0x30,0x05	Changes the FEC MAC address.

NOTE

For full command line list, see kernel source tree Documentation/Kernel-parameter.txt.

5   Known Issues/Limitations

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

The following tables list some key known issues.

Table 11.   Known issues and workarounds for i.MX 8

Module	Source	Description	Workaround
Yocto rootfs	8QuadMax software	The armhf 32-bit application cannot run in rootfs and some rebuild applications with aarch64 toolchain cannot run well.	No workaround.
Native HDMI	8QuadMax software/ hardware	Sometimes, on i.MX 8QuadMax, the HDMI display cannot show correctly, which can be observed that the Wayland GUI is abnormal. Restarting Weston cannot improve the situation.	Under investigation.
Wayland	8QuadMax software	ES32 CTS on 8QuadMax Wayland backend, meets some items failure and core dumping.	Under investigation.
USB Type-C	8QuadXPlus software	The system cannot boot up succesfully if the power supply is only from type-c port on the 8QuadXPlus MEK board in the Alpha and Beta relase.	No workaround.
ESAI	8QuadXPlus hardware	i.MX 8QuadXPlus ESAI only supports two channels.	No workaround.
Display	8QuadMax and 8QuadXPlus hardware	The display flicker was observed during the stress test under high system loading or high temperature. The display interfaces using the DPLL as the clock source are impacted.	No workaround.
VPU	8QuadXPlus software	Video playback has frame dropping and tearing.	Contact FAEs to get the latest workaround patch.

Table continues on the next page...

i.MX Linux® Release Notes, Rev. L4.9.51_8qm-beta2/8qxp-beta, 02/2018

Table 11. Known issues and workarounds for i.MX 8 (continued)

Module	Source	Description	Workaround
Display	8QuadXPlus software	DPU: When running video playback and GPU test simultaneously, the system displays the log of "imx-dpu-crtc imx-dpu-crtc. 0: flush - wait for content shdld done timeout" and turns to no display any more.	No workaround.
Security	8QuadXPlus software	CAAM: sha384-caam, sha512-caam, and sha224-caam algorithm tcrypt test fails with "caam_jr 31440000.jr3: swiotlb buffer is full".	No workaround.
Security	8QuadXPlus software	CAAM: CAAM initialization fails sometimes on some boards and always fails on some other boards.	No workaround.
Display	8QuadXPlus software	LVDS-HDMI/MIPI DSI DRM: Mode test and modesetting test fail. There is no display any more, with the logs of "imx-dpu-crtc imx-dpu-crtc. 0: enable - wait for safety shdld done timeout" and "dpu-core 56180000.dpu: failed to wait for FrameGen0 done".	No workaround.
VPU	8QuadXPlus software	Video: VPU is not stable and may cause system down when performing the playback operation.	Demo quality only.
Security	8QuadXPlus software	Crypto: System is down during the crypto manager test.	No workaround.
Security	8QuadXPlus software	CAAM: No caam_sm test or black key generation/clear test during booting.	No workaround.
GPU	8QuadXPlus software	KPA come acorss that the GPU is down.	No workaround.
GPU	8QuadXPlus software	8QuadXPlus ES31 CTS meets "Assertion failed" when doing multiple CTS test in XWayland rootfs.	The fixing patch will be provided in next release..
Display	8QuadXPlus software	MIPI-DSI: MIPI panel fails to display normally after mem mode resuming.	The fixing patch will be provided in next release.
VPU	8QuadXPlus software	VPU: Kernel dumps when decodeing 1920x1080_24_qp37 HEVC stream with mxc_vpu_malone.	The fixing patch will be provided in next release.
Audio	8QuadXPlus software	ASRC PM: Kernel panic occurs during suspend test after ASRC converting.	The fixing patch will be provided in next release.
Camera	8QuadXPlus software	Camera: Capture content has some shift/overlap when displayed to HDMI. Capture content has some redundant pieces when dumped to file.	The fixing patch will be provided in next release.
Display	8QuadXPlus software	PM: Kernel panic (connected with MIPI panel) occurs during the power state devices test.	The fixing patch will be provided in next release.
Display	8QuadXPlus software	Video playback has no display with the primary plane "--video-sink="kmssink plane-id=xx"" setting.	The fixing patch will be provided in next release.

Table continues on the next page...

Table 11.   Known issues and workarounds for i.MX 8 (continued)

Module	Source	Description	Workaround
GPU	8QuadXPlus software	GPU dump occurs during the GPU top tool counter test.	The fixing patch will be provided in next release.

6   Multimedia

This chapter contains the information on the 4.3.3 multimedia component of the BSP.

The GStreamer version in this release is 1.12.2.

6.1   i.MX GStreamer plugins

Table 12.   i.MX GStreamer 1.0 plugins

Plugin	Features
Audio decoder	beepdec: unified audio decoder plugin Supports MP3, AAC, AAC+, WMA, AC3, Vorbis, DD+, AMR, RA
Demux	aiurdemux: aiur universal demuxer plugin supporting Supports AVI, MKV, MP4, MPEG2, ASF, OGG, FLV, WebM, RMVB
Video Decoder	vpudec: video decoder plugin based on the hardware video decoder
Video render	• kmssink: DRM/KMS-based video sink plugin • glimagesink: OpenGL (ES)-based video sink plugin
Video source	• v4l2src: V4L2 based camera source plugin
OpenGL (ES) Plugins	• glimagesink: OpenGL (ES)-based video sink plugin, supported in Wayland and FB backends • gleffects: GL Shading Language effects plugin • gldeinterlace: video deinterlacing based on shaders • glvideomixer: compositing multiple videos together • glcolorconvert: video color space convert based on shaders • glcolorbalance: adjusting brightness, contrast, hue, and saturation on a video stream

NOTE
- To support WMA, AAC+, AC3, DD+, and RA decoding, install separate packages.
- OpenGL (ES) plugins are from the gst-plugins-bad package, accelerated with Vivante private APIs.

6.2   i.MX playback example

i.MX provides an example gplay-1.0 application based on GStreamer's high-level API GstPlayer. The example provides the following functions.

Table 13.   i.MX playback engine example

Function	Feature
Playback	• Play, Stop • Pause, Resume • Fast seek, Accurate seek • Playback rate control (fast forward, fast rewind, slow forward)
Media Info	• Media meta data (artist, year, etc.) • Video Thumbnail • Audio Album Art
Subtitle	• Supports internal and external subtitle
Track Selection	• Audio Track Selection • Video Track Selection • Subtitle Selection
Display Control	• Resize

6.3   Multimedia feature matrix

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

6.3.1   Parser/Demuxer specifications

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

Table 14.   Parser/Demuxer supported audio/video

	Demuxer feature	ASF	AVI	MP4	OGG	FLV	MPG2	MKV	RMVB
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

Table continues on the next page...

i.MX Linux® Release Notes, Rev. L4.9.51_8qm-beta2/8qxp-beta, 02/2018

Table 14.   Parser/Demuxer supported audio/video (continued)

	Demuxer feature	ASF	AVI	MP4	OGG	FLV	MPG2	MKV	RMVB
	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

6.3.2   Video codec specifications

The tables in this section show the video codec specifications with softwaare decoder.

VPU is not supported in the Alpha release.

Table 15.   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	3840 * 2160	64 * 64	30 fps	H/W	50 Mbps	-
	H.264	MP	3840 * 2160	64 * 64	30 fps	H/W	50 Mbps	-
	H.264	HP	3840 * 2160	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	-

Table continues on the next page...

i.MX Linux® Release Notes, Rev. L4.9.51_8qm-beta2/8qxp-beta, 02/2018

Table 15.   Video codec specification for hardware with VPU acceleration (continued)

	Feature	Profile	Max. resolution	Min. resolution	Max. framerate	H/W or S/W	Bitrate	Comment
	VP8	-	1920 * 1080	64 * 64	30 fps	H/W	20 Mbps	-
	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	-
	HEVC	main, main 10	3840 * 2160	64 * 64	60 fps	H/W	160 Mbps	-
	VP9	profile 0, 2	3840 * 2160	64 * 64	60 fps	H/W	160 Mbps	-

6.3.3   Audio codec specification

Table 16.   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	8QuadXPlus supports H/W. 8QuadMax does not support H/W audio decoder.	-
AACLC	MPEG-2 AACLC MPEG-4 AACLC	<= 5.1	8 - 96	8 - 256	8QuadXPlus supports H/W. 8QuadMax does not support H/W audio decoder.	For H/W, it only supports mono and stereo channels.
HE-AAC	HE-AAC V1 HE-AAC V2	stereo/mono	8 - 96	Mono: 8 - 384 stereo: 16 - 768	S/W	-
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	-

Table continues on the next page...

i.MX Linux® Release Notes, Rev. L4.9.51_8qm-beta2/8qxp-beta, 02/2018

Table 16.   Audio codec specification (continued)

Decoder	Feature/Profile	Channel	Sample rate (KHz)	Bit rate (kbps)	H/W or S/W	Comment
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

6.3.4   Speech codec specification

Table 17.   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

6.3.5   Streaming protocol specification

Table 18.   Streaming protocol specification

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

6.3.6   Subtitle specification

Table 19.   Subtitle specification

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

6.4   Known issues and limitations for multimedia

Issues seen on GStreamer 1.x:

- As the maximum buffer size of the playbin multiqueue 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.
- The accurate seek mode may have a longer time delay.
- Because the stream container does not have an index table, seeking is not supported.
- Fast rewind of audio does not support audio-only streams.
- Pulseaudio is only available for the X11 backend.
- Rewind may report an EOS when using libav for video decoding.

- For the clips with long audio/video interleaved streams, it requires to enlarge the multiqueue maximum buffer size.
- AAC clips with ADIF format do not support seek/trick (FB/FF) mode.
- Accurate seek mode may take a longer time delay.
- For clips with no index table in containers (or video with only very few key frames), seeking is not supported.
- Audio-only clips do not support FB.
- For pulseaudio, it automatically starts with X11 backend. For others, users need to manually start the daemon.

7 Revision History

This table provides the revision history.

Table 20. Revision history

Revision number	Date	Substantive changes
L4.9.51_imx8qxp-alpha	11/2017	Initial release
L4.9.51_imx8qm-beta1	12/2017	Added i.MX 8QuadMax
L4.9.51_imx8mq-beta	12/2017	Added i.MX 8MQuad
L4.9.51_8qm-beta2/8qxp-beta	02/2018	Added i.MX 8QuadMax Beta2 and i.MX 8QuadXPlus Beta

Document Number: IMXLXRN
Rev. L4.9.51_8qm-beta2/8qxp-beta
02/2018

arm

NXP