

# 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 8MQuad Board

#### NOTE

In this document, the following notation is used:

- 8MQuad stands for the i.MX 8MQuad EVK Platform.

## 1.1 Release contents

This release consists of the following package files:

- L4.9.51-ga\_images\_mx8mq.tar.gz
- fsl-yocto-L4.9.51\_imx8mq-ga.tar.gz

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## Overview

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 with a selection of packages and libraries needed for the common tests.
Manufacturing Tools for i.MX 8MQuad.	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.	imx8mqevk

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 8MQuad kernel is built using defconfig in <code>arch/arm64/configs/</code> .  Kernel image: Image  Board DTB files: <ul style="list-style-type: none"><li>• <code>fsl-imx8mq-evk.dts</code>: for HDMI output</li><li>• <code>fsl-imx8mq-evk-lcdif-adv7535.dts</code>: for MIPI-DSI output with the MIPI-to-HDMI adapter by using the LCDIF display controller</li><li>• <code>fsl-imx8mq-evk-dcss-adv7535.dtb</code>: for MIPI-DSI output with the MIPI-to-HDMI adapter by using the DCSS display controller</li><li>• <code>fsl-imx8mq-evk-dcss-rm67191.dtb</code>: for MIPI-DSI output with the MIPI panel by using the DCSS display controller</li><li>• <code>fsl-imx8mq-evk-dual-display.dtb</code>: for dual-display-to-HDMI and MIPI-to-HDMI adapter</li><li>• <code>fsl-imx8mq-ddr4-arm2.dtb</code>: for DDR4 validation board booting from SD</li><li>• <code>fsl-imx8mq-ddr4-arm2-gpmi-nand.dtb</code>: for DDR4 validation board booting from NAND</li><li>• <code>fsl-imx8mq-ddr3l-arm2.dtb</code>: for DDR3L validation board</li></ul>

*Table continues on the next page...*

**Table 3. Kernel and device tree configurations (continued)**

Kernel and device tree configuration	Description
Default DTB	Each reference board has a standard device tree as follows: <ul style="list-style-type: none"> <li>Image-fsl-imx8mq-evk.dtb</li> </ul>

The release package contains the following pre-built images.

**Table 4. Pre-built images**

Package	Description
XWayland SD Card	This release provides the following SD card images for the XWayland backend with the Weston compositor: <ul style="list-style-type: none"> <li>fsl-image-qt5-validation-imx-xwayland-imx8mqevk.sdcard.bz2</li> <li>fsl-image-validation-imx-xwayland-imx8mqevk.sdcard.bz2</li> <li>fsl-image-validation-imx-xwayland-optee-imx8mqevk.sdcard.bz2</li> </ul>
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	<ul style="list-style-type: none"> <li>imx8mq_m4_hello_world.bin</li> <li>imx8mq_m4_TCM_hello_world.bin</li> <li>imx8mq_m4_TCM_rpmsg_lite_pingpong_rtos_linux_remote.bin</li> <li>imx8mq_m4_TCM_rpmsg_lite_str_echo_rtos.bin</li> </ul>
Combined Boot Image	Boot image that combines HDMI Firmware, DDR Firmware, U-Boot, and Arm Trusted Firmware.

**Table 5. fsl-yocto-L4.9.51\_mx8mq-ga.tar.gz content**

File name	Description
README	README for L4.9.51_imx8mq-ga.
/doc	The following docs are provided: i.MX Linux® Release Notes, User's Guide, Porting Guide, Graphics Guide, Yocto Project User's Guide, and Reference Manual.

**Table 6. Multimedia standard packages**

File name	Description	Comment
imx-gst1.0-plugins-4.3.4.tar.gz	GStreamer plugins	i.MX GStreamer plugins
imx-codec-4.3.4.bin	i.MX codecs	i.MX optimized A/V core codec
imx-parser-4.3.4.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-4.3.4.bin	AACplus decoder	i.MX optimized AACplus decoder
imx-mscodec-4.3.4.bin	Microsoft codecs	i.MX optimized Microsoft codecs
imx-msparser-4.3.4.bin	Microsoft parser	i.MX optimized Microsoft ASF parser
imx-ac3codec-4.3.4.bin	AC3 decoder	i.MX optimized Dolby audio AC3 decoder
imx-ddpcodec-4.3.4.bin	DDplus decoder	i.MX optimized Dolby audio DDplus decoder
imx-real-4.3.4.bin	Real Networks codecs and parser	i.MX optimized Real Networks real audio decoder, real media parser.

## 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](http://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-4.3.4.bin	i.MX AACplus core decoder
Microsoft Codec	imx-mscodec-4.3.4.bin	i.MX optimized MS codec
Microsoft Parser	imx-msparser-4.3.4.bin	i.MX optimized ASF parser
AC3 Decoder	imx-ac3codec-4.3.4.bin	i.MX AC3 core decoder
DDplus Decoder	imx-ddpcodec-4.3.4.bin	i.MX DD-plus decoder
RMVB Decoders and Parser	imx-real-4.3.4.bin	i.MX Real Networks

## 1.4 References

This release includes the following references and additional information.

- *i.MX Linux<sup>®</sup> Release Notes* (IMXLXRN) - Provides the release information.
- *i.MX Linux<sup>®</sup> 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* (IMXLXOCTOUG) - 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 features.
- *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.

- Supports HDR10 video playback.
- Supports HDMI EDID.
- Supports HDMI CEC and ARC.
- Supports MIPI-DSI panel and MIPI-HDMI adapter.
- Supports dual-display.
- Supports graphic framebuffer compression with DEC400.
- Supports video framebuffer compression with DTRC.
- Supports Audio expansion board for:
  - Multiple-channel audio receiver and transmitter.
  - SPDIF receiver and transmitter.
- Supports DDR4 and DDR3L validation board with minimum system.
- Supports OP-TEE.
- No X11 backend is supported in i.MX 8MQuad.
- No Frame Buffer backend is supported in i.MX 8MQuad.

### 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
<b>Kernel</b>		
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.
<b>Bootloader</b>		
U-Boot	All i.MX	U-Boot delivery is based on U-Boot version v2017.03. Clock, Anapop regulator, ENET, UART, MMC/SD, eMMC4.3/4.4/4.5. High-Assurance Boot, 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: <code>dd if=flash.bin of=/dev/sd&lt;x&gt; seek=33 bs=1K</code> . 8MQuad, 8QuadMax, and 8QuadXPlus use seek=33 bs=1k.
<b>Machine-specific layer</b>		
Arm® Core	All i.MX	i.MX 8MQuad supports four Cortex-A53 cores.
Memory	All i.MX	On i.MX 8 with 64-bit configuration, the memory is not split.
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.
<b>Character device drivers</b>		
MXC UART	All i.MX	i.MX 8 supports through UART0.
<b>Networking drivers</b>		
ENET	8MQuad	i.MX 8 supports Atheros AR8031 PHY with 10/100/1000 bps mode and AVB features.
IEEE® 1588		Supports Linuxptp stack. Features: <ul style="list-style-type: none"> <li>• Supports IPv4, IPv6, and IEEE 802.3 transport.</li> <li>• Supports E2E, and P2P transparent clock.</li> <li>• Supports IEEE802.1AS-2011 in the role of end station.</li> </ul> Note: Linuxptp stack is open source.

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Table 9. Supported features (continued)

Feature	Supported board	Comment
		Command instance:  ptp4l -A -4 -H -m -i eth0
PCIe	All i.MX	With the platform that supports the PCIe module.
<b>Sound drivers</b>		
SAI	8MQuad	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.
<b>Input device drivers</b>		
USB devices	All i.MX	Supports USB mouse and USB keypad through USB ports.
<b>MTD driver</b>		
<b>USB drivers</b>		
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.
<b>Graphics drivers</b>		
HDMI	8MQuad	i.MX DCSS is used for i.MX 8MQuad.
MIPI Display	8MQuad	Supports MIPI display driven by LCDIF with up to 720p60. Supports MIPI display driven by DCSS with up to 1080p60.
Framebuffer compression	8MQuad	Supports graphic framebuffer compression with DEC400. Supports video framebuffer compression with DTRC.
<b>Multimedia Drivers</b>		
VPU	8MQuad	i.MX 8MQuad Decoder: HEVC, VP9, H.264, MPEG-2, MPEG-4p2, VC-1, VP8, RV9, AVS, MJPEG, H.263.
MIPI Camera	8MQuad	Supports MIPI camera OV5640 with 720p30, 1080p30, 2592x1944@15.
<b>General drivers</b>		
uSDHC	All i.MX	Supports SD2.0 and SDXC. Supports SD3.0 on all i.MX except 6SABRE-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 through PWM.
Temperature monitor	All i.MX	Pre-calibrated. See the "Thermal Driver" chapter in <i>i.MX Linux® Reference Manual (IMXLXRM)</i> for more information.

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Table 9. Supported features (continued)

Feature	Supported board	Comment
Wi-Fi/Bluetooth wireless technology	8MQuad	Supports Murata 1CQ (QCA6174A) Wi-Fi/Bluetooth.

## 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=ttyMXC0, 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/mmcbk0p2	Used in "boot from tftp/NFS" (that is, root=/dev/nfs); Used in "boot from SD" (that is, root=/dev/mmcbk0p2).
rootfstype	Indicates the file system type of the root file system.	rootfstype=ext4	Used in "boot from SD" together with "root=/dev/mmcbkXpY" (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	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
GPU	Software	GL ES multiple-conformance test meets galcore down after running for more than 20 hours. OpenCL 1.2FP and ES31 conformance test random fails.	No workaround.
DTRC	Software	The display turns to green sometimes when playback video with DTRC enabled.	Disable the playback video with DTRC.
NAND Boot	Hardware	Fails to boot up from NAND when the boot file is integrated with the HDMI firmware.	Boot up from NAND with the boot file that does not have the HDMI firmware.
MIPI CSI	Hardware	MIPI CSI: prompts lots of "Rx fifo overflow" when running capture and video playback simultaneously.	Use different DDR and NoC configuration from Errata.
MIPI DSI	Software	When using DCSS to drive the MIPI display, after resuming from system suspending, the display is black.	Do not perform system suspending or resuming.
DCSS	Software	The display brightness is low in some small HDMI displays.	No workaround

## 6 Multimedia

This chapter contains the information on the 4.3.4 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

*Table continues on the next page...*

**Table 12. i.MX GStreamer 1.0 plugins (continued)**

Plugin	Features
Video render	<ul style="list-style-type: none"> <li>• kmssink: video sink based on the DCSS KMS driver</li> <li>• glimagesink: video sink based on EGL</li> </ul>
Video source	<ul style="list-style-type: none"> <li>• v4l2src: V4L2 based camera source plugin</li> </ul>
OpenGL (ES) Plugins	<ul style="list-style-type: none"> <li>• glimagesink: OpenGL (ES)-based video sink plugin, supported in Wayland and FB backends</li> <li>• gleffects: GL Shading Language effects plugin</li> <li>• gldeinterlace: video deinterlacing based on shaders</li> <li>• glvideomixer: compositing multiple videos together</li> <li>• glcolorconvert: video color space convert based on shaders</li> <li>• glcolorbalance: adjusting brightness, contrast, hue, and saturation on a video stream</li> </ul>

**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.
- Enable video framebuffer compression (DTRC) by using: kmssink force-hantrotile=true.

## 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	<ul style="list-style-type: none"> <li>• Play, Stop</li> <li>• Pause, Resume</li> <li>• Fast seek, Accurate seek</li> <li>• Playback rate control (fast forward, fast rewind, slow forward)</li> </ul>
Media Info	<ul style="list-style-type: none"> <li>• Media meta data (artist, year, etc.)</li> <li>• Video Thumbnail</li> <li>• Audio Album Art</li> </ul>
Subtitle	<ul style="list-style-type: none"> <li>• Supports internal and external subtitle</li> </ul>
Track Selection	<ul style="list-style-type: none"> <li>• Audio Track Selection</li> <li>• Video Track Selection</li> <li>• Subtitle Selection</li> </ul>
Display Control	<ul style="list-style-type: none"> <li>• Resize</li> </ul>

## 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
	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 .

**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	-

*Table continues on the next page...*

**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
	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	-
	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.	-

*Table continues on the next page...*

Table 16. Audio codec specification (continued)

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

None.

## 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
L4.9.51_imx8mq-ga	03/2018	Added i.MX 8MQuad GA

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