

ARN

Android™ Release Notes

Rev. android-10.0.0_2.3.0 — 15 July 2020

Release Notes

1 Release Description

i.MX android-10.0.0_2.3.0 is the GA (RFP) release for Android 10 on NXP's i.MX 8M Mini, i.MX 8M Nano, i.MX 8M Quad, i.MX 8QuadMax, and i.MX 8QuadXPlus applications processors, and Beta1 release for Android 10 on i.MX 8M Plus.

i.MX android-10.0.0_2.3.0 release includes all necessary codes, documents, and tools to assist users in building and running Android 10 on the i.MX 8M Mini EVK, i.MX 8M Nano, i.MX 8M Plus, i.MX 8M Quad EVK, i.MX 8QuadMax MEK, and i.MX 8QuadXPlus MEK Board.

The prebuilt images are also included for a quick trial on NXP i.MX 8M Mini EVK, i.MX 8M Nano, i.MX 8M Plus EVK, i.MX 8M Quad EVK, i.MX 8QuadMax MEK, and i.MX 8QuadXPlus MEK Board and Platforms.

This release includes all porting and enhancements based on the Android open source code.

Most of the deliveries in this release are provided in source code with the exception of some proprietary modules/libraries from third parties.

2 Supported Hardware SoC/Boards

The supported hardware system-on-chip (SoCs)/boards are listed as follows:

- i.MX 8M Mini EVK DDR4/LPDDR4 REV C Board and Platform
- i.MX 8M Nano EVK DDR4/LPDDR4 Board and Platform
- i.MX 8M Plus EVK Board and Platform
- i.MX 8M Quad EVK Rev. A Board and Platform
- i.MX 8QuadMax (Silicon Revision B0) MEK Board and Platform
- i.MX 8QuadXPlus (Silicon Revision B0 and C0) MEK Board and Platform

3 Release Package Contents

The android10.0.0_2.3.0 release package includes the following software and documents.

Table 1. Release package contents

i.MX Android proprietary source code package	<ul style="list-style-type: none">• imx-android-10.0.0_2.3.0.tar.gz: i.MX Android proprietary source code package to enable Android on i.MX boards. For example, Hardware Abstraction Layer implementation, hardware codec acceleration, etc.
Documents	The following documents are included in android-10.0.0_2.3.0_docs.zip:

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Table 1. Release package contents (continued)

	<ul style="list-style-type: none"> • <i>Android™ Quick Start Guide (AQSUG)</i>: A document that explains how to run the Android platform on an i.MX board using prebuilt images. • <i>Android™ User's Guide (AUG)</i>: A document describing procedures for configuring and building this release package. • <i>Android™ Release Notes (ARN)</i>: A document that introduces key updates and known issues in this release. • <i>i.MX Android™ Security User's Guide (ASUG)</i>: A document that describes how to do customization work on security features supported by i.MX Android software. • <i>i.MX Graphics User's Guide (IMXGRAPHICUG)</i>: A document that describes GPU 2D API, Tools, Memory, and Application programming guidelines.
Prebuilt images	<p>You can test the Android platform with a prebuilt image on i.MX reference board before building any code:</p> <ul style="list-style-type: none"> • android-10.0.0_2.3.0_image_8mmevk.tar.gz: Prebuilt images with NXP extended features for the i.MX 8M Mini EVK board. • android-10.0.0_2.3.0_image_8mnevk.tar.gz: Prebuilt images with NXP extended features for the i.MX 8M Mini EVK DDR4 board. • android-10.0.0_2.3.0_image_8mpevk.tar.gz: Prebuilt images with NXP extended features for the i.MX 8M Plus EVK board. • android-10.0.0_2.3.0_image_8mqevk.tar.gz: Prebuilt images with NXP extended features for the i.MX 8M Quad EVK board. • android-10.0.0_2.3.0_image_8qmek.tar.gz: Prebuilt images with NXP extended features for the i.MX 8QuadMax/8QuadXPlus MEK board. <p>All prebuilt images are in a separate package. See the <i>Android™ Quick Start Guide (AQSUG)</i> and <i>Android™ User's Guide (AUG)</i> to choose the appropriate image.</p>

4 Features

Table 2. Features

Feature	i.MX 8M Mini EVK	i.MX 8M Nano EVK	i.MX 8M Plus EVK	i.MX 8M Quad EVK	i.MX 8QuadMax MEK	i.MX 8QuadXPlus MEK	Remarks
Google Android 10 release	Y	Y	Y	Y	Y	Y	Based on android-10.0.0_r35 release
Linux 5.4.3 kernel (merge with AOSP kernel)	Y	Y	Y	Y	Y	Y	Based on Linux® OS BSP L5.4.24_2.1.0 release.
U-Boot	Y	Y	Y	Y	Y	Y	v2020.04.
Trusty OS	Y	Y	Y	Y	Y	Y	-

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Table 2. Features (continued)

Feature	i.MX 8M Mini EVK	i.MX 8M Nano EVK	i.MX 8M Plus EVK	i.MX 8M Quad EVK	i.MX 8QuadMax MEK	i.MX 8QuadXPlus MEK	Remarks
Graphic-HW	Y	Y	Y	Y	Y	Y	<p>VeriSilicon GC7000NanoUltr GPU with the 6.4.0.p2 driver for i.MX 8M Mini.</p> <p>VeriSilicon GC7000UL GPU with 6.4.0.p2 driver for i.MX 8M Nano EVK and i.MX 8M Plus EVK.</p> <p>VeriSilicon GC7000L GPU with 6.4.0.p2 driver for i.MX 8M Quad.</p> <p>VeriSilicon GC7000XSVX GPU with 6.4.0.p2 driver for i.MX 8QuadMax.</p> <p>VeriSilicon GC7000L GPU with 6.4.0.p2 driver for i.MX 8QuadXPlus.</p>
Graphic-HW 3D acceleration	Y	Y	Y	Y	Y	Y	<p>OpenGL ES1.1/2.0 through GC7000NanoUltra for i.MX 8M Mini.</p> <p>OpenGL ES1.1/2.0/3.1 through GC7000UL for i.MX 8M Nano EVK and i.MX 8M Plus EVK.</p> <p>OpenGL ES1.1/2.0/3.1 through GC7000L for i.MX 8M Quad.</p> <p>OpenGL ES 1.1/2.0/3.1/3.2 through GC7000XSVX for i.MX 8QuadMax.</p> <p>OpenGL ES 1.1/2.0/3.1 via GC7000L for i.MX 8QuadXPlus.</p>
Android Neural Network API acceleration	N	Y	Y	Y	Y	Y	<p>Android Neural Network API 1.2 accelerated through GC7000UL for i.MX 8M Nano EVK.</p> <p>Android Neural Network API 1.2 accelerated through GC7000L for i.MX 8M Quad.</p> <p>Android Neural Network API 1.2 accelerated</p>

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Table 2. Features (continued)

Feature	i.MX 8M Mini EVK	i.MX 8M Nano EVK	i.MX 8M Plus EVK	i.MX 8M Quad EVK	i.MX 8QuadMax MEK	i.MX 8QuadXPlus MEK	Remarks
							<p>through GC7000XSVX for i.MX 8QuadMax.</p> <p>Android Neural Network API 1.2 accelerated through GC7000L for i.MX 8QuadXPlus.</p> <p>Android Neural Network API 1.2 accelerated through NPU for i.MX 8M Plus.</p>
Graphic-HW accelerated UI surface composition	Y	Y	Y	Y	Y	Y	<p>OpenGL ES2.0 through GC7000NanoUltra for i.MX 8M Mini.</p> <p>OpenGL ES3.1 through GC7000UL for i.MX 8M Nano EVK and i.MX 8M Plus EVK.</p> <p>OpenGL ES3.1 through GC7000L for i.MX 8M Quad.</p> <p>OpenGL ES 3.2 through GC7000XSVX for i.MX 8QuadMax.</p> <p>OpenGL ES 3.1 through GC7000L for i.MX 8QuadXPlus.</p>
Boot source	SD/eMMC	SD/eMMC	SD/eMMC	SD/eMMC	SD/eMMC	SD/eMMC	-
SCFW	N	N	N	N	Y	Y	Version 1.5.0
SECO firmware	N	N	N	N	Y	Y	Version 3.6.2
Splash Screen	Y	Y	Y	Y	Y	Y	-
UI (input)	Y	Y	Y	Y	Y	Y	<p>i.MX 8M Mini EVK, i.MX 8M Nano EVK, i.MX 8M Plus EVK, and i.MX 8M Quad EVK support USB Mouse and Multi-touch on the MIPI panel display.</p> <p>i.MX 8QuadMax MEK and i.MX 8QuadXPlus MEK support USB Mouse.</p>

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Table 2. Features (continued)

Feature	i.MX 8M Mini EVK	i.MX 8M Nano EVK	i.MX 8M Plus EVK	i.MX 8M Quad EVK	i.MX 8QuadMax MEK	i.MX 8QuadXPlus MEK	Remarks
UI (display)	MIPI-DSI-to-HDMI/ MIPI panel display	MIPI-DSI-to-HDMI/ MIPI panel display	HDMI/ MIPI-to-HDMI/ MIPI panel/ LVDS-to-HDMI/ LVDS panel display	HDMI/ MIPI-DSI-to-HDMI/ MIPI panel display	HDMI/ MIPI-to-HDMI/ MIPI-panel/ LVDS-to-HDMI	HDMI display	<p>i.MX 8M Mini supports MIPI-DSI to HDMI display and MIPI Panel display.</p> <p>i.MX 8M Nano EVK supports MIPI-DSI-to-HDMI display and MIPI panel display.</p> <p>i.MX 8M Plus EVK supports physical HDMI display, MIPI-to-HDMI display, MIPI panel Display, LVDS-to-HDMI display, and LVDS panel display.</p> <p>i.MX 8M Quad supports physical HDMI display, MIPI-DSI to HDMI display, and MIPI panel display.</p> <p>i.MX 8QuadMax supports LVDS-to-HDMI/MIPI-DSI-to-HDMI and physical HDMI display.</p>
UI (dual displays, UI mirror displayed on second device)	N	N	Y	Y	Y	Y	<p>i.MX 8M Quad EVK supports on MIPI-DSI-to-HDMI and HDMI dual displays.</p> <p>i.MX 8QuadMax MEK and i.MX 8QuadXPlus MEK support dual LVDS-to-HDMI displays.</p>
UI (brightness control)	N	N	N	N	N	N	-
Storage - External Media	Y	Y	Y	Y	Y	Y	For i.MX 8QuadMax MEK and i.MX 8QuadXPlus MEK, USB 2.0 port supports udisk, but USB 3.0 port does not support udisk.
Connectivity - Ethernet	Y	Y	Y	Y	Y	Y	-
Connectivity - Bluetooth® wireless technology	Y	Y	Y	Y	Y	Y	Hardware:

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Table 2. Features (continued)

Feature	i.MX 8M Mini EVK	i.MX 8M Nano EVK	i.MX 8M Plus EVK	i.MX 8M Quad EVK	i.MX 8QuadMax MEK	i.MX 8QuadXPlus MEK	Remarks
							<ul style="list-style-type: none"> Qualcomm 1PJ QCA9377 for i.MX 8M Mini EVK LPDDR4 board NXP 88W8987 for i.MX 8M Nano EVK LPDDR4 board NXP 88W8997 for i.MX 8M Plus EVK, i.MX 8MQuad EVK Rev. A, i.MX 8QuadMax MEK and i.MX 8QuadXPlus MEK Profiles: <ul style="list-style-type: none"> A2DP Source AVRCP BLE Host HSP HID Host HID Device PAN OPP
Connectivity - Wi-Fi	Y	Y	Y	Y	Y	Y	Hardware: <ul style="list-style-type: none"> NXP 88W8987 for i.MX 8M Mini EVK LPDDR4 board, i.MX 8M Nano EVK LPDDR4 board NXP 88W8997 for i.MX 8M Plus EVK, i.MX 8MQuad EVK Rev. A, i.MX 8QuadMax MEK, i.MX 8QuadXPlus MEK Features: <ul style="list-style-type: none"> STA mode AP mode Wi-Fi Direct AP/STA Concurrency MAC randomization

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Table 2. Features (continued)

Feature	i.MX 8M Mini EVK	i.MX 8M Nano EVK	i.MX 8M Plus EVK	i.MX 8M Quad EVK	i.MX 8QuadMax MEK	i.MX 8QuadXPlus MEK	Remarks
Connectivity - USB Tethering	Y	Y	Y	Y	Y	Y	Supports Wi-Fi and Ethernet as upstream.
Power - CPU Freq	Y	Y	Y	Y	Y	Y	-
Power - Bus Freq	Y	Y	Y	Y	Y	Y	-
Media - Music Play	Y	Y	Y	Y	Y	Y	SSI+WM8524 for i.MX 8M Mini, i.MX 8M Nano EVK, and i.MX 8M Quad. SSI+WM8960 for i.MX 8M Plus EVK. WM8960+CS42888+HDMI for i.MX 8QuadMax (not support multichannel). ESAI+CS42888 for i.MX 8QuadXPlus (supports multichannel).
Media - Sound Record	Y	Y	Y	Y	Y	Y	SSI+WM8524 for i.MX 8M Mini EVK, i.MX 8M Nano EVK, and i.MX 8M Quad EVK. SSI+WM8960+PDM for i.MX 8M Plus EVK. ESAI+CS42888 for i.MX 8QuadMax MEK and i.MX 8QuadXPlus MEK.
Media - Video Play	Y	Y	Y	Y	Y	Y	-
Media - Camera	Y	Y	Y	Y	Y	Y	OV5640CSI for i.MX 8M Mini, i.MX 8M Nano EVK, i.MX 8M Plus EVK, and i.MX 8M Quad. OV5640MIPI for i.MX 8QuadXPlus. For i.MX 8M Quad, the camera cannot co-work with MIPI Display due to the I2C address conflict.
Media - TVIN	N	N	N	N	N	N	-

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Table 2. Features (continued)

Feature	i.MX 8M Mini EVK	i.MX 8M Nano EVK	i.MX 8M Plus EVK	i.MX 8M Quad EVK	i.MX 8QuadMax MEK	i.MX 8QuadXPlus MEK	Remarks
Media - Dual Camera	Y	Y	Y	Y	Y	Y	Dual OV5640MIPI for i.MX 8QuadMax OV5640MIPI and OV5640CSI for i.MX 8QuadXPlus.
Media - Camcorder	Y	Y	Y	Y	Y	Y	-
Media - USB Camera	Y	Y	Y	Y	N	N	USB camera supports C920, C270, and C525.
Media - USB Mic	Y	Y	Y	Y	Y	Y	-
Media - HDMI audio output	N	N	Y	Y	Y	N	-
Media-DSD Playback	N	N	N	N	N	N	-
Media-PlayReady DRM	N	N	N	Y	N	N	Moderated download for licensees
Media-WideVine DRM	Y	N	N	Y	N	N	Supports WideVine DRM Level 3.
Media-M4 Playback	Y	N	Y	N	N	N	Audio playback based on FreeRTOS on the Cortex-M4 core for i.MX 8M Mini.
Media-Hi-Res audio output	Y	N	N	Y	Y	Y	High resolution audio output from Audio Expansion Board for i.MX 8M Mini EVK and i.MX 8M Quad EVK. <ul style="list-style-type: none"> • 2 channel: 384000, 768000 sampling rate • 4 channel: 48000, 96000, 192000, 384000, 768000 sampling rate • 6 channel: 48000, 96000, 192000, 384000 sampling rate • 8 channel: 48000, 96000, 192000, 384000 sampling rate High resolution audio output from Audio Expansion Board

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Table 2. Features (continued)

Feature	i.MX 8M Mini EVK	i.MX 8M Nano EVK	i.MX 8M Plus EVK	i.MX 8M Quad EVK	i.MX 8QuadMax MEK	i.MX 8QuadXPlus MEK	Remarks
							for i.MX 8QuadMax MEK and i.MX 8QuadXPlus MEK: <ul style="list-style-type: none"> • 4 channel: 48000, 96000, 192000 sampling rate • 6 channel: 48000, 96000, 192000 sampling rate • 8 channel: 48000, 96000, 192000 sampling rate
Misc - ADB over USB	Y	Y	Y	Y	Y	Y	-
Misc - Fastboot utility	Y	Y	Y	Y	Y	Y	-
Misc - SW update and factory reset	Y	Y	Y	Y	Y	Y	-
Sensor - Magnetometer	N	N	N	N	Y	Y	FXOS8700
Sensor - Accelerometer	N	N	N	N	Y	Y	FXOS8700
Sensor - Gyroscope	N	N	N	N	Y	Y	FXAS2100
Sensor - Light	N	N	N	N	Y	Y	ISL29023
Sensor - Pressure	N	N	N	N	Y	Y	MPL3115
Sensor - Temperature	N	N	N	N	Y	Y	MPL3115
File Based Encryption	Y	Y	Y	Y	Y	Y	-
USB Accessory	Y	Y	Y	Y	Y	Y	Google AOA v2.0
Ethernet APK	Y	Y	Y	Y	Y	Y	-
webGL	Y	Y	Y	Y	Y	Y	-
Vulkan	N	Y	Y	Y	Y	Y	-
OTA for A/B	Y	Y	Y	Y	Y	Y	-
USB Type-C PD	Y	Y	Y	Y	Y	Y	Supports power role switch with devices that support USB power delivery

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Table 2. Features (continued)

Feature	i.MX 8M Mini EVK	i.MX 8M Nano EVK	i.MX 8M Plus EVK	i.MX 8M Quad EVK	i.MX 8QuadMax MEK	i.MX 8QuadXPlus MEK	Remarks
DM Verity	Y	Y	Y	Y	Y	Y	-
TEE backed Keymaster HAL	Y	Y	Y	Y	Y	Y	This is based on i.MX Trusty OS TEE firmware.
TEE backed AVB	Y	Y	Y	Y	Y	Y	This is based on i.MX Trusty OS TEE firmware and secure storage of eMMC chip. In this release, users need to initialize the RPMB part manually.

5 Multimedia Codecs

For multimedia codecs and features, see *i.MX Android™ Extended Codec Release Notes* (IMXACRN).

6 Extended Features

An enhanced multimedia experience is available for the Android platform. This release delivers an error-resilient, feature-rich multimedia solution by extending the existing multimedia features of the Android platform and introduces additional features.

For detailed extended and additional features, see *i.MX Android™ Extended Codec Release Notes* (IMXACRN).

For more information and details, contact "L2manager-android@nxp.com".

7 Change Logs

Compared to the android-10.0.0_2.0.0 release, android-10.0.0_2.3.0 for i.MX 8M Mini EVK, i.MX 8M Nano EVK, i.MX 8MQuad EVK, i.MX 8QuadMax MEK, and i.MX 8QuadXPlus MEK have the following major changes:

- Upgraded the Android code base from android-10.0.0_r32 to android-10.0.0_r35.
- Upgraded the kernel from v5.4.3 to v5.4.24.
- Upgraded the U-Boot from v2019.04 to v2020.04.
- Wi-Fi function support changes:
 - i.MX 8M Mini EVK LPDDR4 board and i.MX 8M Nano EVK LPDDR4 board are changed to support NXP 88W8987.
 - i.MX 8M Quad EVK Rev. A board, i.MX 8QuadMax MEK, and i.MX 8QuadXPlus MEK are changed to support NXP 88W8997.
- BT function support changes:
 - i.MX 8M Nano EVK LPDDR4 board is changed to support NXP 88W8987.
 - i.MX 8M Quad EVK Rev A board and i.MX 8QuadMax MEK and i.MX 8QuadXPlus MEK are changed to support NXP 88W8997.

Compared to the android-10.0.0_2.1.0 release, android-10.0.0_2.3.0 for i.MX 8M Plus EVK has the following major changes:

- Upgraded the Android code base from android-10.0.0_r32 to android-10.0.0_r35.
- Upgraded the kernel from v5.4.3 to v5.4.24.
- Upgraded the U-Boot from v2019.04 to v2020.04.

8 Known Issues and Limitations

The known issues about the hardware and hardware rework instructions are not included in this document. There may be hardware-related reference materials for some reference boards. Make sure to check the link [i.MX Application Processors](#) to see if it is applicable.

Table 3. Known issues and limitations

Issue description	Remarks
The Google USB driver must be installed multiple times for the MTP, PTP, MTP&ADB, PTP&ADB, and ADB function settings.	Some Windows XP environments may display MTP and PTP windows even with only PTP enabled in the device.
U-Boot will hang when erasing Kingston SD card.	U-Boot will hang when sending the erase command on some Kingston SD cards.
For i.MX 8QuadXPlus silicon revision B0, it fails to boot from some types of eMMC.	<p>In the default settings, the UUU script burns the boot image into the eMMC Boot Partition with 32KB offset. Although it works properly on the MEK board, it fails to read the boot image on some types of eMMC.</p> <p>There are two possible solutions:</p> <ul style="list-style-type: none"> • Download flash.bin in the eMMC Boot Partition + 0KB offset + eMMC fastboot enabled in fuse. • Download flash.bin in the eMMC User Partition + 32KB offset (eMMC fastboot can be either enabled or disabled in fuse). <p>For more information, see https://community.nxp.com/docs/DOC-342877.</p>
The udisk function on i.MX 8M Quad EVK board does not work.	The mount device path is not correct in the fstab file. It should be <code>/devices/platform/soc@0/38200000.usb/xhci-hcd.1.auto/*</code> .
"rcu stall" issue occurs when running CTS on i.MX 8M Plus EVK.	The system gets stuck when this issue occurs.
The swiotlb buffer gets full when running CTS on i.MX 8QuadXPlus MEK.	The ADB connection is disconnected when this issue occurs.
No audio output for BT HSP on i.MX 8QuadXPlus MEK.	-
After connecting to a Wi-Fi access point, on i.MX 8M Plus EVK, i.MX 8MQuad EVK, and i.MX 8QuadXPlus MEK, suspend-resume may cause to system to reboot or the system cannot detect access points any more.	-
Bluetooth A2DP connection gets disconnected automatically with crash log on i.MX 8M Plus EVK, i.MX 8M Quad EVK, i.MX 8QuadMax MEK, and i.MX 8QuadXPlus MEK.	-

9 Revision History

Table 4. Revision history

Revision number	Date	Substantive changes
P9.0.0_1.0.0-beta	11/2018	Initial release
P9.0.0_1.0.0-ga	01/2019	i.MX 8M, i.MX 8QuadMax, i.MX 8QuadXPlus GA release.
P9.0.0_2.0.0-ga	04/2019	i.MX 8M, i.MX 8QuadMax, i.MX 8QuadXPlus GA release.
P9.0.0_2.0.0-ga	08/2019	Updated the location of the SCFW porting kit.
android-10.0.0_1.0.0	02/2020	i.MX 8M Mini, i.MX 8M Quad, i.MX 8QuadMax, and i.MX 8QuadXPlus GA release.
android-10.0.0_1.0.0	03/2020	Deleted the Android 10 image.
android-10.0.0_2.1.0	04/2020	i.MX 8M Plus Alpha and i.MX 8QuadXPlus Beta release.
android-10.0.0_2.0.0	05/2020	i.MX 8M Mini, i.MX 8M Nano, i.MX 8M Quad, i.MX 8QuadMax, and i.MX 8QuadXPlus GA release.
android-10.0.0_2.3.0	07/2020	i.MX 8M Plus EVK Beta1 release, and all the other i.MX 8 GA release.

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