

# Android™ Release Notes

## Contents

1	<a href="#">Release Description.....</a>	1
2	<a href="#">Supported Hardware SoC/Boards.....</a>	2
3	<a href="#">Release Package Contents.....</a>	2
4	<a href="#">Features .....</a>	3
5	<a href="#">Multimedia Codecs.....</a>	7
6	<a href="#">Extended Feature Packages.....</a>	7
7	<a href="#">Change Logs.....</a>	7
8	<a href="#">Known Issues and Limitations.....</a>	8
9	<a href="#">Revision History.....</a>	8

## 1 Release Description

The i.MX Android™ P9.0.0\_2.3.0 is a release for the Android Pie 9.0 (P) on NXP's i.MX 8M Mini, i.MX 8M Quad, i.MX 8M Nano, and i.MX 8QuadXPlus applications processors.

i.MX Android P9.0.0\_2.3.0 release includes all necessary code, documents, and tools to assist users in building and running the Android Pie 9.0 on the i.MX 8M Mini, i.MX 8M Quad, i.MX 8M Nano, and i.MX 8QuadXPlus Board. Their corresponding release quality can be found in the following table.

**Table 1. Release quality of different platforms**

Platform name	Release quality
i.MX 8M Mini EVK	Post-GA (RFP)
i.MX 8M Quad AIY	GA (RFP)
i.MX 8QuadXPlus MEK	Post-GA (RFP)
i.MX 8M Nano EVK	Alpha (EAR)

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

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



## Supported Hardware SoC/Boards

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 Rev. B/C Board and Platform
- i.MX 8QuadXPlus MEK Rev. B0 Board and Platform
- i.MX 8M Quad AIY Board and Platform
- i.MX 8M Nano EVK Board and Platform

The i.MX 8M Quad AIY Board is identical with the Google Coral Dev Board. The Mendel Linux system is released by Google for this board. To have a trial with the Mendel Linux system for this board, visit [coral.withgoogle.com/docs/dev-board/get-started/](https://coral.withgoogle.com/docs/dev-board/get-started/).

## 3 Release Package Contents

The P9.0.0\_2.3.0 release package includes the following software and documents.

**Table 2. Release package contents**

i.MX Android proprietary source code package	<ul style="list-style-type: none"><li>• <code>imx-p9.0.0_2.3.0.tar.gz</code>: i.MX Android proprietary source code package to enable Android on i.MX boards. For example, Hardware Abstraction Layer implementation, hardware codec acceleration, etc.</li></ul>
Documents	<p>The following documents are included in <code>android_p9.0.0_2.3.0_docs.tar.gz</code>:</p> <ul style="list-style-type: none"><li>• <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.</li><li>• <i>Android™ User's Guide (AUG)</i>: A document describing procedures for configuring and building this release package.</li><li>• <i>Android™ Release Notes (ARN)</i>: A document that introduces key updates and known issues in this release.</li><li>• <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.</li><li>• <i>i.MX Android™ Extended Codec Release Notes (IMXACRN)</i>: A document that provides the extended codec information.</li><li>• <i>i.MX Graphics User's Guide (IMXGRAPHICUG)</i>: A document that describes GPU 2D API, Tools, Memory, and Application programming guidelines.</li></ul>
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"><li>• <code>android_p9.0.0_2.3.0_image_8mmevk.tar.gz</code>: Prebuilt images with NXP extended features for the i.MX 8M Mini EVK board. The extended features include additional multimedia format support.</li><li>• <code>android_p9.0.0_2.3.0_image_8mqaiy.tar.gz</code>: Prebuilt images with NXP extended features for the i.MX 8M Quad AIY board. The extended features include more multimedia format support.</li><li>• <code>android_p9.0.0_2.3.0_image_8qmek.tar.gz</code>: Prebuilt images with NXP extended features for the i.MX 8QuadXPlus MEK board. The extended features include more multimedia format support.</li><li>• <code>android_p9.0.0_2.3.0_image_8mnevk.tar.gz</code>: Prebuilt images with NXP extended features for the i.MX 8M Nano EVK board. The extended features include more multimedia format support.</li></ul>

**Table 2. Release package contents**

All prebuilt images are in a separate package. See the <i>Android™ Quick Start Guide</i> (AQSUG) and <i>Android™ User's Guide</i> (AUG) to choose the appropriate image.
--

**NOTE**

VivanteVTK tool is no longer provided in the Android release package. It is available on <https://www.nxp.com/imx6tools> (for example: Tools -> Vivante VTK -> VivanteVTK-v6.2.4.p4.1.7.8).

## 4 Features

This section contains features in this package.

**Table 3. Features**

Feature	i.MX 8M Mini EVK	i.MX 8M Quad AIY	i.MX 8M Nano EVK	i.MX 8QuadXPlus MEK	Remarks
Google Pie 9.0 release	Y	Y	Y	Y	Based on android-9.0.0_r35 release
Linux 4.14.98 kernel (merged with the AOSP kernel)	Y	Y	Y	Y	Based on Linux® OS BSP L4.14.98-2.1.0_ga release.
U-Boot	Y	Y	Y	Y	v2018.03.
Trusty OS	Y	Y	Y	N	-
SCFW	N	N	N	Y	Version 1.2.2
SECO Firmware	N	N	N	Y	Version 2.3.1
Graphic-HW	Y	Y	Y	Y	VeriSilicon GC7000NanoUltra GPU with the 6.2.4.p4 driver for i.MX 8M Mini. VeriSilicon GC7000L GPU with 6.2.4.p4 driver for i.MX 8M Quad. VeriSilicon GC7000UL GPU with 6.2.4.p4 driver for i.MX 8M Nano. VeriSilicon GC7000L GPU with 6.2.4.p4 driver for i.MX 8QuadXPlus.
Graphic-HW 3D acceleration	Y	Y	Y	Y	OpenGL ES1.1/2.0 through GC7000NanoUltra for i.MX 8M Mini. OpenGL ES1.1/2.0/3.1 through GC7000L for i.MX 8M Quad. OpenGL ES1.1/2.0/3.1 through GC7000UL for i.MX 8M Nano. OpenGL ES 1.1/2.0/3.1 through GC7000L for i.MX 8QuadXPlus.

Table continues on the next page...

Table 3. Features (continued)

Feature	i.MX 8M Mini EVK	i.MX 8M Quad AIY	i.MX 8M Nano EVK	i.MX 8QuadXPlus MEK	Remarks
Graphic-HW accelerated UI surface composition	Y	Y	Y	Y	OpenGL ES2.0 through GC7000NanoUltra for i.MX 8M Mini. OpenGL ES3.1 through GC7000L for i.MX 8M Quad, OpenGL ES3.1 through GC7000UL for i.MX 8M Nano. OpenGL ES 3.1 through GC7000L for i.MX 8QuadXPlus.
Boot source	SD/eMMC	eMMC	SD/eMMC	SD/eMMC	-
Splash Screen	Y	Y	Y	Y	-
UI (input)	Y	Y	Y	Y	-
UI (display)	MIPI-to-HDMI/MIPI panel display	HDMI display	MIPI-to-HDMI/MIPI Panel Display	HDMI display	i.MX 8M Mini EVK and i.MX 8M Nano EVK support MIPI-DSI to HDMI display and MIPI Panel display. i.MX 8M Quad AIY supports physical HDMI display. i.MX 8QuadXPlus supports LVDS-to-HDMI/MIPI-to-HDMI display.
UI (dual display, HDMI+HDMI, UI mirror displayed on second device)	N	N	N	Y	Supports dual LVDS-to-HDMI display.
UI (brightness control)	N	N	N	N	-
Storage - External Media	Y	Y	Y	Y	For 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	-
Connectivity - Bluetooth® wireless technology	Y	Y	Y	Y	Hardware: <ul style="list-style-type: none"> <li>Qualcomm 1PJ QCA9377 for i.MX 8M Mini EVK Rev. B</li> <li>Qualcomm 1CQ QCA6174A for i.MX 8M Quad AIY and i.MX 8QuadXPlus MEK</li> <li>Broadcom 1MW BCM43455 for i.MX 8M Mini EVK Rev. C and i.MX 8M Nano EVK</li> </ul> Profiles: <ul style="list-style-type: none"> <li>A2DP Source</li> <li>AVRCP</li> <li>BLE Host</li> <li>HSP</li> <li>HID Host</li> <li>HID Device</li> <li>PAN</li> <li>OPP</li> </ul>

Table continues on the next page...

Table 3. Features (continued)

Feature	i.MX 8M Mini EVK	i.MX 8M Quad AIY	i.MX 8M Nano EVK	i.MX 8QuadXPlus MEK	Remarks
Connectivity - Wi-Fi	Y	Y	Y	Y	Hardware: <ul style="list-style-type: none"> <li>Qualcomm 1PJ QCA9377 for i.MX 8M Mini EVK Rev. B</li> <li>Qualcomm 1CQ QCA6174A for i.MX 8M Quad AIY and i.MX 8QuadXPlus MEK</li> </ul> Features: <ul style="list-style-type: none"> <li>STA mode</li> <li>AP mode</li> <li>Wi-Fi Direct</li> <li>AP/STA Concurrency</li> </ul> Hardware: <ul style="list-style-type: none"> <li>Broadcom 1MW BCM43455 for i.MX 8M Mini EVK Rev. C and i.MX 8M Nano EVK</li> </ul> Features: <ul style="list-style-type: none"> <li>STA mode</li> <li>AP mode</li> <li>Wi-Fi Direct</li> </ul>
Connectivity - USB Tethering	Y	Y	Y	Y	Supports Wi-Fi and Ethernet as upstream.
Power - CPU Freq	Y	Y	Y	Y	-
Power - Bus Freq	Y	Y	Y	Y	-
Media - Music Play	Y	Y	Y	Y	SSI + WM8524 for i.MX 8M Mini EVK and i.MX 8M Nano EVK. ESAI+CS42888 for i.MX 8QuadXPlus (supports multichannel).
Media-Sound Record	Y	Y	Y	Y	-
Media - Video Play	Y	Y	Y	Y	-
Media - Camera	Y	Y	Y	Y	OV5640CSI for i.MX 8M Mini EVK and i.MX 8M Nano EVK. OV5645 for i.MX 8M Quad AIY. 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	-
Media - Dual Camera	Y	Y	Y	Y	OV5640MIPI and OV5640CSI for i.MX 8QuadXPlus.
Media - Camcorder	Y	Y	Y	Y	-
Media - USB Camera	Y	Y	Y	N	USB camera supports C920, C270, and C525.
Media - USB Mic	Y	Y	Y	Y	-

Table continues on the next page...

Table 3. Features (continued)

Feature	i.MX 8M Mini EVK	i.MX 8M Quad AIY	i.MX 8M Nano EVK	i.MX 8QuadXPlus MEK	Remarks
Media - HDMI audio output	N	Y	N	N	-
Media-DSD Playback	Y	N	N	N	DSD stream output from Audio Expansion Board.
Media-PlayReady DRM	N	N	N	N	-
Media-WideVine DRM	Y	N	N	N	Supports WideVine DRM Level-3 on i.MX 8M Mini EVK.
Media-M4 Playback/ Media-M7 Playback	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	N	High resolution audio output from Audio Expansion Board for i.MX 8M Mini. <ul style="list-style-type: none"> <li>• 2 channel: 384000, 768000 sampling rate</li> <li>• 4 channel: 48000, 96000, 192000, 384000, 768000 sampling rate</li> <li>• 6 channel: 48000, 96000, 192000, 384000 sampling rate</li> <li>• 8 channel: 48000, 96000, 192000, 384000 sampling rate</li> </ul>
Misc - ADB over USB	Y	Y	Y	Y	-
Misc - Fastboot utility	Y	Y	Y	Y	-
Misc - SW update and factory reset	Y	Y	Y	Y	-
Sensor - Magnetometer	N	N	N	Y	FXOS8700
Sensor - Accelerometer	N	N	N	Y	FXOS8700
Sensor - Gyroscope	N	N	N	Y	FXAS2100
Sensor - Light	N	N	N	Y	ISL29023
Sensor - Pressure	N	N	N	Y	MPL3115
Sensor - Temperature	N	N	N	Y	MPL3115
File Based Encryption	Y	Y	Y	Y	-
USB Accessory	Y	Y	Y	Y	Google AOA v2.0
Ethernet APK	Y	Y	Y	Y	-
webGL	Y	Y	Y	Y	-
Vulkan	N	Y	N	Y	-
OTA for A/B	Y	Y	Y	Y	-
USB Type-C PD	Y	N	Y	Y	Supports power role switch with devices that support USB power delivery

Table continues on the next page...

**Table 3. Features (continued)**

Feature	i.MX 8M Mini EVK	i.MX 8M Quad AIY	i.MX 8M Nano EVK	i.MX 8QuadXPlus MEK	Remarks
DM Verity	Y	Y	Y	Y	-
TEE backed Keymaster HAL	Y	Y	Y	N	This is based on i.MX Trusty OS TEE firmware.
TEE backed AVB	Y	Y	Y	N	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 Section 5 in the [Google Pie 9.0 Compatibility Definition Document \(CDD\)](#).

## 6 Extended Feature Packages

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 more information about the features below, contact "L2manager-android@nxp.com". For detailed extended and additional features, see *i.MX Android™ Extended Codec Release Notes (IMXACRN)*.

## 7 Change Logs

P9.0.0\_2.3.0 is the first release for i.MX 8M Nano EVK.

Compared to the P9.0.0\_2.0.0-ga release, P9.0.0\_2.3.0 for i.MX 8M Mini has the following major changes:

- Upgraded the Android code base from android-9.0.0\_r30 to android-9.0.0\_r35.
- Enabled Trusty OS.
- Fixed test case failures in Android Pie 9.0 CTS/VTS/STS/GTS related to certification.

Compared to the P9.0.0\_2.0.0-ga release, P9.0.0\_2.3.0 for i.MX 8QuadXPlus MEK has the following major change:

- Upgraded the Android code base from android-9.0.0\_r30 to android-9.0.0\_r35.
- Upgraded the SECO firmware version from 2.3.0 to 2.3.1.
- Upgraded the SCFW version from 1.2 to 1.2.2.

Compared to the P9.0.0\_2.0.0-ga release, P9.0.0\_2.3.0 for i.MX 8M Quad AIY has the following major change:

- Upgraded the Android code base from android-9.0.0\_r30 to android-9.0.0\_r35.

## 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 4. 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, 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"> <li>• Download flash.bin in the eMMC Boot Partition + 0KB offset + eMMC fastboot enabled in fuse.</li> <li>• Download flash.bin in the eMMC User Partition + 32KB offset (eMMC fastboot can be either enabled or disabled in fuse).</li> </ul> <p>For more information, see <a href="https://community.nxp.com/docs/DOC-342285">https://community.nxp.com/docs/DOC-342285</a>.</p>
For i.MX 8M Nano, the Vulkan hanging issue blocks the DEQP CTS test.	Skip the Vulkan CTS test using the command <code>--exclude-filter "CtsDeqpTestCases dEQP-VK*"</code> .

## 9 Revision History

**Table 5. 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, and i.MX 8QuadXPlus GA release.
P9.0.0_2.0.0-ga	04/2019	i.MX 8M, i.MX 8QuadMax, and i.MX 8QuadXPlus GA release.
P9.0.0_2.3.0	08/2019	i.MX 8M Mini, i.MX 8M Quad, i.MX 8M Nano, and i.MX 8QuadXPlus Alpha release.



**How to Reach Us:****Home Page:**[nxp.com](http://nxp.com)**Web Support:**[nxp.com/support](http://nxp.com/support)

Information in this document is provided solely to enable system and software implementers to use NXP products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits based on the information in this document. NXP reserves the right to make changes without further notice to any products herein.

NXP makes no warranty, representation, or guarantee regarding the suitability of its products for any particular purpose, nor does NXP assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters that may be provided in NXP data sheets and/or specifications can and do vary in different applications, and actual performance may vary over time. All operating parameters, including "typicals," must be validated for each customer application by customer's technical experts. NXP does not convey any license under its patent rights nor the rights of others. NXP sells products pursuant to standard terms and conditions of sale, which can be found at the following address: [nxp.com/SalesTermsandConditions](http://nxp.com/SalesTermsandConditions).

While NXP has implemented advanced security features, all products may be subject to unidentified vulnerabilities. Customers are responsible for the design and operation of their applications and products to reduce the effect of these vulnerabilities on customer's applications and products, and NXP accepts no liability for any vulnerability that is discovered. Customers should implement appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP, the NXP logo, NXP SECURE CONNECTIONS FOR A SMARTER WORLD, COOLFLUX, EMBRACE, GREENCHIP, HITAG, I2C BUS, ICODE, JCOP, LIFE VIBES, MIFARE, MIFARE CLASSIC, MIFARE DESFire, MIFARE PLUS, MIFARE FLEX, MANTIS, MIFARE ULTRALIGHT, MIFARE4MOBILE, MIGLO, NTAG, ROADLINK, SMARTLX, SMARTMX, STARPLUG, TOPFET, TRENCHMOS, UCODE, Freescale, the Freescale logo, AltiVec, C-5, CodeTEST, CodeWarrior, ColdFire, ColdFire+, C-Ware, the Energy Efficient Solutions logo, Kinetis, Layerscape, MagniV, mobileGT, PEG, PowerQUICC, Processor Expert, QorIQ, QorIQ Qonverge, Ready Play, SafeAssure, the SafeAssure logo, StarCore, Symphony, VortiQa, Vybrid, Airfast, BeeKit, BeeStack, CoreNet, Flexis, MXC, Platform in a Package, QUICC Engine, SMARTMOS, Tower, TurboLink, and UMEMS are trademarks of NXP B.V. All other product or service names are the property of their respective owners. AMBA, Arm, Arm7, Arm7TDMI, Arm9, Arm11, Artisan, big.LITTLE, Cordio, CoreLink, CoreSight, Cortex, DesignStart, DynamIQ, Jazelle, Keil, Mali, Mbed, Mbed Enabled, NEON, POP, RealView, SecurCore, Socrates, Thumb, TrustZone, ULINK, ULINK2, ULINK-ME, ULINK-PLUS, ULINKpro,  $\mu$ Vision, Versatile are trademarks or registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere. The related technology may be protected by any or all of patents, copyrights, designs and trade secrets. All rights reserved. Oracle and Java are registered trademarks of Oracle and/or its affiliates. The Power Architecture and Power.org word marks and the Power and Power.org logos and related marks are trademarks and service marks licensed by Power.org.

© 2019 NXP B.V.

