

# RN00227

## Android Automotive Release Notes

Rev. automotive-14.0.0\_2.1.0 —  
7 November 2024

Release notes

### Document information

Information	Content
Keywords	Android, i.MX, Automotive, automotive-14.0.0_2.1.0, RN00227
Abstract	The i.MX Android automotive-14.0.0_2.1.0 release is an Android Automotive GA (RFP) release on NXP's i.MX 8QuadXPlus/8QuadMax MEK board and platform and Alpha (EAR) release on NXP's i.MX 95 EVK board and platform. The release is based on Android 14.



## 1 Release Description

The i.MX Android automotive-14.0.0\_2.1.0 release is an Android Automotive GA (RFP) release on NXP's i.MX 8QuadXPlus/8QuadMax MEK board and platform and also an Alpha (EAR) release on NXP's i.MX 95 EVK board and platform. The release is based on Android 14. It supports the device type in-vehicle infotainment defined in <https://source.android.com/devices/automotive/>.

i.MX Android automotive-14.0.0\_2.1.0 release includes all necessary code, documents, and tools to assist users in building and running Android Automotive on the i.MX 8QuadXPlus/8QuadMax MEK board and i.MX 95 EVK board from scratch. Pre-built images are also included for a quick trial on the following platforms:

- i.MX 8QuadXPlus/8QuadMax MEK Board and Platform
- i.MX 95 EVK Board and Platform

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

Most of the deliveries in this release are provided in the source code except for 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 8QuadMax (Silicon Revision B0) MEK Board and Platform
- i.MX 8QuadXPlus (Silicon Revision B0, C0) MEK Board and Platform
- i.MX 95 (Silicon 19x19 Revision A1) EVK Board and Platform

## 3 Release Package Contents

The automotive-14.0.0\_2.1.0 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"><li>• <code>imx-automotive-14.0.0_2.1.0.tar.gz</code>: i.MX Android Automotive proprietary source code package to enable Android Automotive on i.MX boards. For example, Hardware Abstraction Layer implementation, and hardware codec acceleration.</li></ul>
Documents	<p>The following documents are included in <code>android_automotive-14.0.0_2.1.0_docs.zip</code>:</p> <ul style="list-style-type: none"><li>• <i>Android Automotive Release Notes</i> (RN00227): A document that introduces key updates and known issues in this release.</li><li>• <i>Android Automotive User's Guide</i> (UG10176): A document describing procedures for configuring and building this release package.</li><li>• <i>Android Automotive Quick Start Guide</i> (UG10177): A document that explains how to run Android Automotive on an i.MX board using prebuilt images.</li><li>• <i>i.MX Android Extended Codec Release Notes</i> (RN00202): A document that provides the extended codec information.</li><li>• <i>i.MX Android Security User's Guide</i> (UG10158): A document that describes how to do customization work on security features supported by i.MX Android software.</li><li>• <i>i.MX Graphics User's Guide</i> (UG10159): A document that describes graphics APIs, Tools, Memory, and Application programming guidelines.</li></ul>
Prebuilt images	<p>You can test Android Automotive with a prebuilt image on the i.MX reference board before building any code:</p> <ul style="list-style-type: none"><li>• <code>automotive-14.0.0_2.1.0_image_8qmek_car.tar.gz</code>: Prebuilt-image for i.MX 8QuadXPlus/8QuadMax MEK board with the Exterior View System (EVS) function enabled in the ARM Cortex-M4 CPU core during Android OS</li></ul>

Table 1. Release package contents...continued

	<p>boot process when the EVS function is switched to the Cortex-A CPU core, which includes NXP extended features.</p> <ul style="list-style-type: none"><li>• automotive-14.0.0_2.1.0_image_8qmek_car2.tar.gz: Prebuilt-image for i.MX 8QuadMax/8QuadXPlus MEK board with the EVS function enabled in the Arm Cortex-A CPU core only (EVS function is available after starting the Android OS from Cortex-A core), which includes NXP extended features.</li><li>• automotive-14.0.0_2.1.0_image_95evk_car.tar.gz, automotive-14.0.0_2.1.0_image_95evk_car2.tar.gz: Prebuilt-image for i.MX 95 EVK board with the EVS function enabled in the Arm Cortex-A CPU core only (EVS function is available after starting Android OS from Cortex-A core), which includes NXP extended features.</li></ul> <p>All prebuilt images are in a separate package. See the <i>Android Automotive User's Guide</i> (UG10176) and <i>Android Automotive Quick Start Guide</i> (UG10177) to choose the appropriate image.</p>
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4 Features

This section describes the features in this package.

Table 2. Features

Feature	i.MX 8QuadXPlus/8QuadMax MEK	i.MX 95 EVK	Remarks
Google Android 14 release	Y	Y	Based on android-14.0.0_r34 release.
Linux 6.6.30 kernel (merged with the AOSP kernel)	Y	Y	Based on Linux OS BSP LF6.6.23_2.0.0 release.
Generic Kernel Image (6.6.30)	Y	Y	Based on AOSP android15-6.6
U-Boot	Y	Y	v2024.04
Trusty OS	Y	Y	-
Graphics-HW	Y	Y	VeriSilicon GC7000L GPU for i.MX 8QuadXPlus, GC7000XSVX GPU for i.MX 8QuadMax with 6.4.11.p2 driver, Mali-G310 GPU with r47p0-01eac0 driver for i.MX 95.
Graphics-HW 3D acceleration	Y	Y	OpenGL ES 1.1/2.0/3.1 through GC7000L for i.MX 8QuadXPlus, OpenGL ES 1.1/2.0/3.1/3.2 through GC7000XSVX for i.MX 8QuadMax, OpenGL ES1.1/2.0/3.2 through Mali-G310 for i.MX 95.
Graphics-HW accelerated UI surface composition	Y	Y	OpenGL ES 3.1 through GC7000L for i.MX 8Quad XPlus, OpenGL ES 3.2 through GC7000XSVX for i.MX 8QuadMax, OpenGL ES3.2 through Mali-G310 for i.MX 95.
SCFW	Y	N	Version 1.16.0
SECO firmware	Y	N	Version 3.8.5 for i.MX 8QuadMax B0, i.MX 8Quad XPlus B0, and i.MX 8QuadXPlus C0.
Boot source	eMMC	eMMC	-
Splash Screen	Y	Y	Supports USB mouse.
UI (input)	Y	Y	-
UI (display)	HDMI display	Y	Supports LVDS-to-HDMI display.

Table 2. Features...continued

Feature	i.MX 8QuadXPlus/ 8QuadMax MEK	i.MX 95 EVK	Remarks
UI (brightness control)	N	N	-
Storage - External Media	Y	Y	-
Connectivity - Ethernet	Y	Y	Atheros AR8031
Connectivity - Bluetooth wireless technology	Y	Y	PCIE9098 (Murata LBEE5ZZ1XL) for i.MX 8QuadMax and 8QuadXPlus. PCIE9098 (U-Blox JODY-W3) for i.MX 95. Profiles: A2DP Sink, AVRCP, BLE Host, HFP, PBAPClient, MAPMCE, PAN.
Connectivity - Wi-Fi	Y	Y	PCIE9098 (Murata LBEE5ZZ1XL) for i.MX 8QuadMax and 8QuadXPlus. PCIE9098 (U-Blox JODY-W3) for i.MX 95. Features: STA mode, AP mode, AP/STA Concurrency.
Connectivity - USB Tethering	Y	Y	Supports Wi-Fi as upstream.
Power - CPU Freq	Y	Y	-
Power - Bus Freq	Y	Y	-
Media - Music Play	Y	Y	i.MX 8/95: SAI+WM8960 or WM8962. i.MX 8: ESAI+CS42888 (no support for multichannel) i.MX 95: SAI+CS42888 (no support for multichannel)
Media - HDMI audio output	N	N	-
Misc - ADB over USB	Y	Y	-
Misc - Fastboot utility	Y	Y	-
Misc - SW update and factory reset	Y	Y	-
File-based Encryption	Y	Y	-
webGL	Y	Y	-
Vulkan	Y	Y	-
USB TYPEC PD	Y	Y	-
OTA for A/B	Y	Y	-
TEE backed Keymaster HAL	Y	Y	This is based on the i.MX Trusty OS TEE firmware.
TEE backed AVB	Y	Y	This is based on the i.MX Trusty OS TEE firmware and secure storage of eMMC chip. In this release, the RPMB part needs to be initialized manually.
Media rearview camera	Y	Y	MAX9286 camera.
Car Audio Policy	Y	Y	All sounds are played from the audio jack on the CPU board. Rear zone audio is played to an extended audio board (CS42888 codec). Rear zone audio is an optional audio path.

## 5 Multimedia Codecs

For multimedia codecs and features, see the *i.MX Android Extended Codec Release Notes* (RN00202).

6 Change Logs

Compared to the automotive-14.0.0\_1.1.0 release, automotive-14.0.0\_2.1.0 has the following major changes:

- Upgraded the Android code base from android-14.0.0\_r17 to android-14.0.0\_r34.
- Upgraded the GKI kernel from android14-6.1-2024-01\_r4 to android15-6.6.
- Upgraded U-Boot from 2023.04 to 2024.04.
- Upgraded ATF from v2.8 to v2.10.

Compared to the automotive-14.0.0\_2.1.0-imx95-er release, automotive-14.0.0\_2.1.0 has the following major changes:

- Upgraded the Android code base from android-14.0.0\_r30 to android-14.0.0\_r34.
- Upgrade of the i.MX kernel from v6.6.23 to v6.6.30.
- Added GKI support based on AOSP android15-6.6.
- Upgraded U-Boot from 2023.04 to 2024.04.
- Upgraded ATF from v2.8 to v2.10.
- Added experimental support of the i.MX 95 Toradex Verdin board.
- Enabled WideVine L1 on i.MX 95 EVK.

7 Known Issues and Limitations

The known issues about the hardware and hardware rework instructions are not included in this document. Read all the hardware-related reference materials and ensure that the necessary hardware modifications have been made before using the software.

Table 3. Known issues and limitations

Issue description	Remarks
For i.MX 8QuadXPlus silicon revision B0 chip, 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 32 KB 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 <code>flash.bin</code> in the eMMC Boot Partition + 0 KB offset + eMMC fastboot enabled in fuse.</li><li>• Download <code>flash.bin</code> in the eMMC User Partition + 32 KB 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-342877">https://community.nxp.com/docs/DOC-342877</a>.</p>
The camera may freeze if only one camera is connected to the MAX9286 board.	<p>This issue will be fixed in a future release.</p>
Sound Open Firmware (SOF) is not working with i.MX 8QuadXPlus.	<p>This issue is related to the image flashed using the <code>-d sof</code> option (<code>dtbo-imx8qxp-sof.img</code>). When the SOF dtbo image is used, the media audio is routed to i.MX 8QuadXPlus DSP (running SOF) but the SOF is crashing during boot (DSP crash observed in kernel log). This affects the media audio, in which case the CS42888 codec audio is not working.</p>
Kernel panic when copying a file through MTP (file transfer mode) with the disabled ADB.	<p>The file is not copied to the target. The copy operation freezes. The issue is caused by "ERR050149: USB3: TRB OUT endpoints transfer blockage and performance delays".</p>

Table 3. Known issues and limitations...continued

Issue description	Remarks
Dual Hotspots cannot be used simultaneously with the Wi-Fi station.	Simultaneous usage of dual hotspots (AP+AP concurrency) with the Wi-Fi station (board connected to the external network) is not supported (STA+AP+AP concurrency is not supported).
Boot animation is not available when starting the Car image type.	Boot animation is terminated earlier than starting the <code>init</code> process.
Multi-display configuration shows nothing on the unused displays.	When using a multi-display configuration, the unused displays are black. Additional tasks can still be launched on them.
No sound can be heard from the CS42888 codec.	On the first boot after installation or after creating and switching to a new driver profile, no sound can be heard from CS42888.
EVS functionality degraded on the Car2 image.	Camera output is available after starting the surface flinger.
Screen recording from the front camera is not available.	ISI.0 channel resource conflict. ISI.0 channel is using the front camera and VPU encoder at the same time.
Changing the HVAC-Auto button value to OFF with the <code>report</code> or <code>echo</code> command does not work by default after boot.	The Auto button has to be interacted on the HVAC UI at least once. Then, the <code>report</code> or <code>echo</code> command works. This issue will be fixed in a future release.
Power consumption increases when running the EVS application.	The current EVS AIDL HAL implementation contains two buffer types, camera and display. EVS AIDL copies bitmaps between the two buffers by the CPU. This issue will be fixed in a future release.
For i.MX 95 EVK, the USB-Type C port vbus is connected to a 3.3v power source. Once it is connected to the host and successfully enumerated by the host, the gadget stage is changed to be configured, and the USB HAL acquires its wakelock. Disconnection from the host does not generate a disconnection interrupt. The gadget state keeps unchanged, and the USB HAL does not release its wakelock.	-
<code>cpuidle</code> is not stable and disabled for i.MX 95.	-
The encrypted boot on i.MX 95 EVK is not enabled due to the ELE limitation.	-
For i.MX 8QuadMax, the 9098 Wi-Fi is plugged in the PCIeB slot (base board). The 9098 Wi-Fi firmware loading failed after the Android Automotive OS reboot.	It is a base board design issue. The M.2 slot on the base board does not connect the <code>#W_DISABLE1</code> and <code>#SDIO_WAKE</code> signals to the i.MX 8QuadMax chip. The Wi-Fi module 9098 requires to configure these PADs during the boot/start process.
For the i.MX 95 EVK Car image type, the display is not working in Android recovery mode.	Display drivers are not available in the vendor RAM disk, and the display output is empty in Andorid recovery mode. This issue will be fixed in a future release.
For i.MX 95 EVK Car/Car2 image types, the Gallery application, top bar menu, is not visible (but still works) after interacting with pictures.	The top bar menu can reappear after reconnecting touch or after reopening the application.
For i.MX 95 EVK Car/Car2 image types, the Android automotive OS cannot be	The System Manager (SM) does not support this feature in the Android automotive-14.0.0_2.1.0 version. This issue will be fixed in a future release.

Table 3. Known issues and limitations...continued

Issue description	Remarks
powered On by the "Power" button on the board after the software power-off.	
For i.MX 8QuadMax, power consumption increases in suspend to RAM mode.	Linux BSP 6.6.23 RC2 has the same <code>VCC_1V8</code> and <code>VCC_MAIN</code> increasement in suspend to RAM mode. This issue will be fixed in a future release.
For i.MX 8QuadMax, the board stays offline (no ADB or fastboot connection) during reboot stress test. The issue is reproducible after 1000 iteration (around 12 hours).	This issue will be fixed in a future release.
Red Box takes place of Google Maps inside the Home Screen.	When switching between menus tabs (Home -> Apps -> Home), the Google Maps View is colored fully red. When the program goes from one tab to another, the Activity of the switched tab vanished. Therefore, when the program goes back from tab Apps to Home, the problem with data synchronization occurs. Then, Google Maps View turns to red as the default color. When restarting the Home tab (by clicking on it), the Maps is restarted properly.
ADB connection lost after "adb kill-server" or switching to USB tethering.	This issue is possible to reproduce under the platform-tools version 35.0.0 and above. The ADB device is available again after disconnecting and connecting the USB cable to the USB host (PC).
For i.MX 95 EVK Car/Car2 image types, NETC Linux driver can crash when the network interfaces of ENETC are frequently up and down.	The network device unicast and multicast address lists should be protected by <code>netif_addr_lock_bh()</code> when reading MACs from these lists. If there is no lock protection, the currently read entry may be released by other threads, which may result in accessing a null pointer. This issue will be fixed in a future release.
The command <code>adb kill-server</code> causes lose of ADB connection.	The connection is recovered only if the <code>sudo</code> is used in <code>sudo adb start-server</code> . This issue is available from the Android build tools version 35 and above. This issue will be fixed in a future release.
For i.MX 95 EVK Car/Car2 image types, the Linux kernel can crash during the reboot of the Android Automotive OS.	The Linux kernel can crash during unmounting the Android file system on the end Android reboot process. This issue will be fixed in a future release.

8 Revision History

This table provides the revision history.

Table 4. Revision history

Document ID	Release date	Description
RN00227 v.automotive-14.0.0_2.1.0	7 November 2024	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release, i.MX 95 EVK (Silicon Revision A1 19x19) Alpha (EAR)
AARN_14.0.0_1.1.0	20 June 2024	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-13.0.0_2.3.0	4 January 2024	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-13.0.0_2.1.0	10/2023	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release

Table 4. Revision history...continued

Document ID	Release date	Description
automotive-13.0.0_1.3.0	07/2023	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-13.0.0_1.1.0	05/2023	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-12.1.0_1.1.0	12/2022	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-12.0.0_2.1.0	09/2022	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-12.0.0_1.1.0	06/2022	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-11.0.0_2.5.0	03/2022	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-11.0.0_2.3.0	12/2021	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0, C0) GA release
automotive-11.0.0_2.1.0	11/2021	Added the examples for i.MX 8QuadXPlus and upgraded the tool version
android-11.0.0_1.1.0-AUTO	01/2021	i.MX 8QuadXPlus/8QuadMax MEK GA release
android-10.0.0_2.4.0	07/2020	i.MX 8QuadMax MEK GA release
android-10.0.0_2.2.0-AUTO	06/2020	i.MX 8QuadXPlus/8QuadMax MEK GA release
automotive-10.0.0_1.1.0	03/2020	i.MX 8QuadXPlus/8QuadMax MEK (Silicon Revision B0) GA release
P9.0.0_2.1.0-AUTO-ga	08/2019	Updated the location of the SCFW porting kit
P9.0.0_2.1.0-AUTO-ga	04/2019	i.MX 8QuadXPlus/8QuadMax Automotive GA release
P9.0.0_1.0.2-AUTO-beta	01/2019	i.MX 8QuadXPlus/8QuadMax Automotive Beta release
P9.0.0_1.0.2-AUTO-alpha	11/2018	i.MX 8QuadXPlus/8QuadMax Automotive Alpha release
O8.1.0_1.1.0_AUTO-beta	05/2018	i.MX 8QuadXPlus/8QuadMax Beta release
O8.1.0_1.1.0_AUTO-EAR	02/2018	Initial release



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