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## STM32MP15 distribution for Android release note



This article describes the content of STM32MPU distribution for Android **software** release v2.0.0 **st-android-11.0.0-2021-01-29** (tag), which is part of STM32MP15 ecosystem release note - v2.1.0.

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## 1 Intended audience

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The targeted audience is STM32MP15 customers or partners.



## 2 Delivery scope and purpose

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The STM32MPU distribution for Android™ provides all the components required for running, developing and/or making your own platform based on Android™ framework. It runs on the Arm®Cortex®-A7 processors, and is a fundamental part of the STM32MPU Embedded Software distribution for Android.

It is compatible with **Android 11.0.0**.

It is provided as an **example**. The Android certifications are not guaranteed.

This delivery of STM32MP15 distribution for Android™ v2.0.0 is part of STM32MP15-Ecosystem-v2.1.0 (see the STM32MP15 ecosystem release note - v2.1.0).



### 3 Licensing

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This software package is licensed under a SOFTWARE LICENSE AGREEMENT (SLA). Customers may not use this package except in compliance with the [software license agreement \(SLA\)](#).

All packages use the same source components. All components and their respective licenses are listed [here](#).



## 4 Supported hardware

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This software delivery is compatible with the following boards:

- STM32MP157C-EV1 and STM32MP157F-EV1 Evaluation boards. For more information on this board family, please read the article [STM32MP157x-EV1 - hardware description](#)



## 5 Delivered features

### 5.1 Main software components

- Android version v11.0.0 (AOSP android-11.0.0\_r27 tag)
- Kernel version v5.4.56 (AOSP common kernel) + updates for STM32MP1 and associated boards (waiting upstream finalization)
- TF-A version v2.2 + updates for STM32MP1 and associated boards (waiting upstream finalization)
- U-Boot version v2020.01 + updates for STM32MP1 and associated boards (waiting upstream finalization)
- OP-TEE version v3.9.0 + updates for STM32MP1 and associated boards (waiting upstream finalization)
- STM32CubeMP1 FW v1.5.0
- GCC version v9.2
- openOCD version v0.10.0
- GCnano version v6.4.3

### 5.2 Detailed features

#### 5.2.1 BSP features

The *STM32MP15 distribution for Android™* v2.0.0 is based on the OpenSTLinux BSP v2.1.0 described in the following chapters:

- Linux Kernel
- U-Boot secondary bootloader
- TF-A primary bootloader
- OP-TEE trusted environment

#### 5.2.2 Android features

Domain	Feature	STM32MP15 Evaluation board	Comment
Boot	Fastboot	✓	This mode can be entered by connecting an ST-Link console to the UART interface or by hardware control.
	Verified boot	✗	
	A/B mechanism	✗	Boot A and B images are available (boot from A is selected by default).
	Recovery	✗	
	Audio speaker	✓	Audio speaker output can be used only to connect a headset.
	Audio headset	✓	Not selected by default (no headset detection)
	Audio built-in		



Domain	Feature	STM32MP15 Evaluation board	Comment
Multimedia	digital micro	✓	Limited to one microphone (mono).
	Audio USB	✗	
	Camera	✓	
	Camera USB	✗	
	Video SW decode	✓	Maximum 480p30 without audio.
Security	SELinux	✓	
	Runtime verification	✗	
	Disk encryption	✓	
	Trusted environment	✓	OP-TEE
	Keystore	✓	OP-TEE solution based on kmgk <sup>[1]</sup> implementation
	Gatekeeper	✓	OP-TEE solution based on kmgk <sup>[2]</sup> implementation
Network and connectivity	Ethernet	✓	
	Wifi	✓	TP-LINK dongle (TL-WN722N) is used for test purposes.
	Wifi hotspot	✓	TP-LINK dongle (TL-WN722N) is used for test purposes.
	BT / BLE	✗	
	USB	✓	Mass storage / MTP / PTP / RNDIS.
Systems	Boot control	<i>Partially</i>	Available but not enabled.
	Power control	✓	
	Thermal control	✓	Only one temperature is managed for CPU/GPU (others are stubbed).
	Update engine	✗	
	Accelerometer	✗	
	Gyroscope	✗	
	Magnetometer	✗	
	Proximity	✗	





Domain	Feature	STM32MP15 Evaluation board	Comment
Sensors	Pressure	✘	
	Temperature	✘	
	Hub	✘	
Debug	ADB (USB)	✔	
	ADB (Ethernet)	✔	
	Perfetto	✔	
	Metrics	✔	Boot time.
Storage	USB Key	✔	
	microSD card	✔	
	eMMC	✔	
Others	Lights	✔	
	Touchscreen	✔	



## 6 Recommendations for use

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### 6.1 Safe use

- Flash load and boot from a supported Flash device: SDCard or eMMC Flash memories
- Develop Android™ applications, libraries and kernel modules
- Prototype applications based on ST boards
- Develop your own board based on an STM32MP15x

### 6.2 Non-recommended use

- None



## 7 Main restrictions

### 7.1 BSP restrictions

- M-CAN Bus is not functional if power management is activated ("sleep" state defined in pinctrl): the issue is corrected thanks to this patch.

### 7.2 Android restrictions

**STM32P15 distribution for Android™ is provided as example.**

In this context:

- Compliance tests (VTS/CTS) are not ensured (but they are executed and treated as much as possible).
- Verified boot and A/B boot mechanism are not available or are partially available.

The following functions are available on STM32MP15 Evaluation board but are not integrated in STM32P15 distribution for Android™:

- Audio headset detection is not available (its usage has to be forced).
- Audio RCA is not available (SPDIF input / SPDIF output).
- Audio digital microphone is limited to mono mode (record usage) without any gain.
- Joystick is not available.



In this delivery, the OP-TEE secure storage<sup>[3]</sup> is using the eMMC RPMB partition with the TESTKEY fused (irreversible) if not already done. If you want to use your own key, you have to rebuild the OP-TEE sources using the distribution package



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## 8 Minor release updates

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STMicroelectronics can deliver corrections and some light changes on purpose through github<sup>®</sup> components.

### 8.1 v2.0.1

Tag: **st-android-11.0.0-2021-06-01**

Main updates (distribution package only):

- switch to AOSP android-11.0.0\_r37 tag
- switch to OpenSTLinux BSP v2.1.1
- change the kernel build config structure

### 8.2 v2.0.2

Tag: **st-android-11.0.0-2021-08-31**

Main updates (distribution package only):

- change graphics libraries (gcnano 6.4.6) and enable overlay plane usage (warning: display must be switched to BGR mode for color format compatibility)
- enable AVB for boot partition (eMMC configuration only)
- add small screen support (MB1166) instead of default one (MB1230)
- several minor corrections on ST applications



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## 9 How to get started with st-android-11.0.0-2021-01-29

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Refer to [How to download the software and start with this release.](#)



## 10 Associated tools

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Refer to the Referenced tools release notes .



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## 11 Demonstration applications

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The STM32MP15 distribution for Android™ is delivered with several applications provided as example.

### 11.1 STLauncher

Simple launcher application example.

The associated application project is available on GitHub® (compatible with Android Studio IDE): [STLauncher application](#).

### 11.2 STCopro M4Echo application

Example of application using the proprietary coprocessor service. It allows a direct interaction with the firmware launched on the embedded Arm®Cortex®M4 core.

The firmware just returns the received character via the open serial port.

The associated application project is available on GitHub® (compatible with Android Studio IDE): [STCoproM4Echo application](#).

### 11.3 STCopro M4Example application

Example of application using the proprietary coprocessor service. It allows direct interaction with the firmware started on the embedded Arm®Cortex®M4 core.

The firmware generates a signal on the DAC and gets back a signal from the ADC. A wire can be added to loop back the DAC on the ADC. The firmware also shows a simple usage of several blocks available on Arm®Cortex®M4 side.

The associated application project is available on GitHub® (compatible with Android Studio IDE): [STCoproM4Example application](#).

The associated firmware project is available on GitHub® (compatible with STM32CubeIDE): [STCoproM4Example firmware](#).

### 11.4 STCamera

Simple camera application (preview) showing a way to manage the built-in camera. It is compatible only with the MB1379 camera extension board. An external storage configured as portable device must be available to allow taking pictures.

The associated application project is available on GitHub® (compatible with Android Studio IDE): [STCamera application](#).

### 11.5 STAudio

Simple audio application demonstrating how to play and record audio data. The audio files must be stored in the *Music* directory on an external storage device (such as a USB key) or anywhere on a primary storage (such as an SD card in case of eMMC configuration).

The associated application project is available on GitHub® (compatible with Android Studio IDE): [STAudio application](#).



## 11.6 STVideo

Simple video application illustrating how to play a video. The video files must be stored in the *Movies* directory on an external storage (such as a USB key) or anywhere on a primary storage (such as an SD card in case of eMMC configuration).

The associated application project is available on GitHub® (compatible with Android Studio IDE): [STVideo application](#).

## 11.7 STGraphics

Simple 2D and 3D graphics application illustrating usage of OpenGL ES v2.0.

The associated application project is available on GitHub® (compatible with Android Studio IDE): [STGraphics application](#).

## 11.8 STPerf

Performance overlay application used to demonstrate in foreground the device performance (CPU usage, GPU usage, frame rate). The application can be configured and stopped via a notification system interface.

Limitation: this application is available only in debug build.

The associated application project is available on GitHub® (compatible with Android Studio IDE): [STPerf application](#).





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## 12 Main changes compared to v1.1.0

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The main differences between v2.0.0 and previous delivery v1.1.0 (see [STM32MP15 distribution for Android release note - v1.1.0](#) page for the v1 ecosystem releases (in archived wiki)):

- Switch from Android 10.0.0 (android-10.0.0\_r22) to Android 11.0.0 (android-11.0.0\_r27)
- Switch from Linux kernel 4.19.94 to 5.4.56
- Switch from STM32MP1 OpenSTLinux BSP V1.2.0 to V2.1.0
- Added OP-TEE keystore and gatekeeper as example



## 13 Detailed delivery content

### 13.1 Detailed description of STMicroelectronics modules

#### 13.1.1 BSP modules

Module name	Path of module	Description						
stm32mp1-bootloader	device/stm32mp1-bootloader	Primary (Trusted Firmware-A) and secondary (Universal bootloader for embedded devices) bootloaders for STM32MP						
<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>tf-a-stm32mp1</td> <td>2.2</td> <td>BSD-3-Clause</td> </tr> </tbody> </table>	Name	Version	License	tf-a-stm32mp1	2.2	BSD-3-Clause		
Name	Version	License						
tf-a-stm32mp1	2.2	BSD-3-Clause						
<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>u-boot-stm32mp1</td> <td>2020.01</td> <td>GPLv2+</td> </tr> </tbody> </table>	Name	Version	License	u-boot-stm32mp1	2020.01	GPLv2+		
Name	Version	License						
u-boot-stm32mp1	2020.01	GPLv2+						
stm32mp1-kernel	device/stm32mp1-kernel	Linux STM32MP Kernel						
<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>linux-stm32mp1</td> <td>5.4</td> <td>GPLv2</td> </tr> </tbody> </table>	Name	Version	License	linux-stm32mp1	5.4	GPLv2		
Name	Version	License						
linux-stm32mp1	5.4	GPLv2						
stm32mp1-tee	device	OPTEE OS						



Module name			Path of module	Description
			ce	for
			/stm	STM32MP
			/	
			stm3	
			2mp1	
			-tee	
<b>Name</b>	<b>Version</b>	<b>License</b>		
optee_os-stm32mp1	3.9.0	BSD-2-Clause & BSD-3-Clause		
<b>stm32mp1-openocd</b>			devi	Free and
			ce	open on-
			/stm	chip
			/	debugging,
			stm3	in-system
			2mp1	programmin
			-	g and
			open	boundary-
			ocd	scan
				testing
<b>Name</b>	<b>Version</b>	<b>License</b>		
stm32mp1-openocd	0.10.0	GPLv2		

### 13.1.2 Common and peripherals modules

Module name			Path of module	Description
<b>stm32mp1</b>			devi	Configuratio
			ce	n of the
			/stm	STM32MP1
			/	distribution
			stm3	for Android
			2mp1	
<b>Name</b>	<b>Version</b>	<b>License</b>		
stm32mp1	NA	Apache v2.0		
<b>allocator</b>			devi	STMicroele
			ce	ctronics



Module name			Path of module	Description
			/stm /stm 32mp 1/ peri pher al /all ocat or	allocator H AL public header files useful for composer
Name	Version	License		
allocator	NA	Apache v2.0		
audio			devi ce /stm /stm 32mp 1/ peri pher al	STMicroele ctronics Audio HAL source code
Name	Version	License		
audio	NA	Apache v2.0		
camera			/aud devi ce /stm /stm 32mp 1/ peri pher al	STMicroele ctronics Camera HA L source code
Name	Version	License		
camera	NA	Apache v2.0		
composer			/cam devi ce /stm /stm 32mp 1/ peri pher al	STMicroele ctronics composer H AL source code
Name	Version	License		
composer	NA	Apache v2.0		



Module name			Path of module	Description
copro			deviceer/stm/stm32mp1/peripheral	STMicroelectronics Copro HAL source code
<b>Name</b>	<b>Version</b>	<b>License</b>		
copro	NA	Apache v2.0	/copro	
health			device/stm/stm32mp1/peripheral	STMicroelectronics Health hardware service source code
<b>Name</b>	<b>Version</b>	<b>License</b>		
health	NA	Apache v2.0	/health	
lights			device/stm/stm32mp1/peripheral	STMicroelectronics Lights HAL source code
<b>Name</b>	<b>Version</b>	<b>License</b>		
lights	NA	Apache v2.0	/lights	
memtrack			device/stm/stm32mp1/	STMicroelectronics Memtrack HAL source code



Module name			Path of module	Description
<b>Name</b>	<b>Version</b>	<b>License</b>	peripheral /memtrack	
memtrack	NA	Apache v2.0		
<b>oemlock</b>			device /stm32mp1/ peripheral /oemlock	STMicroelectronics OemLock HAL source code (stub version)
<b>Name</b>	<b>Version</b>	<b>License</b>		
oemlock	NA	Apache v2.0		
<b>thermal</b>			device /stm32mp1/ peripheral /thermal	STMicroelectronics Thermal hardware service source code
<b>Name</b>	<b>Version</b>	<b>License</b>		
thermal	NA	Apache v2.0		
<b>usb</b>			device /stm32mp1/ peripheral /usb	STMicroelectronics Usb hardware service source code
<b>Name</b>	<b>Version</b>	<b>License</b>		
usb	NA	Apache v2.0		



Module name			Path of module	Description
wifi			device /stm /stm 32mp 1/ peripheral /wifi	STMicroelectronics libwifi HAL source code
Name	Version	License		
wifi	NA	Apache v2.0		

13.1.3 Board modules

Module name			Path of module	Description
eval			device /stm /stm 32mp 1/ eval	STMicroelectronics configuration for Android used to generate images adapted to the STM32MP15 Evaluation boards
Name	Version	License		
eval	NA	Apache v2.0		



### 13.1.4 Coprocessor service module

Module name			Path of module	Description
CoproService			packages/service/s/CoproService	STMicroelectronics coprocessor service
Name	Version	License		
CoproService	NA	Apache v2.0		

### 13.1.5 ST application modules

Module name			Path of module	Description
app			vendor/stm/app	STMicroelectronics applications that can be associated, if need be, to their respective coprocessor firmware
Name	Version	License		
app	NA	Apache v2.0		





## 14 Archives

STM32MP15 release	Distribution for Android release note
STM32MP15 distribution for Android v1.1.0	<a href="#">STM32MP15 distribution for Android release note - v1.1.0</a> page for the v1 ecosystem releases (in archived wiki)

- <https://github.com/linaro-swg/kmgk>
- <https://github.com/linaro-swg/kmgk>
- [https://optee.readthedocs.io/en/latest/architecture/secure\\_storage.html#rpmb-secure-storage](https://optee.readthedocs.io/en/latest/architecture/secure_storage.html#rpmb-secure-storage)

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Cortex®

Android Open Source Project

Trusted Firmware for Arm Cortex-A

Das U-Boot -- the Universal Boot Loader (see [U-Boot\\_overview](#))

Open Portable Trusted Execution Environment

Board support package

spelling for older versions of STLink, ST in-circuit debugger and programmer for the STM8 and STM32 microcontroller families

Universal Asynchronous Receiver/Transmitter

BlueTooth

Bluetooth Low Energy. Bluetooth LE, marketed as Bluetooth Smart is a wireless personal area network technology designed and marketed by the Bluetooth Special Interest Group aimed at novel applications in the healthcare, fitness, beacons, security, and home entertainment industries.

Compared to Classic Bluetooth, Bluetooth Smart is intended to provide considerably reduced power consumption and cost while maintaining a similar communication range. (source [https://en.wikipedia.org/wiki/Bluetooth\\_Low\\_Energy](https://en.wikipedia.org/wiki/Bluetooth_Low_Energy))

Central processing unit

Graphics Processing Units

Android debug bridge (Android specific)

former spelling for e•MMC ('e' in italic)

Controller Area Network (robust bus mainly used for automotive applications)

Vendor Test Suite (Android specific)

Compatibility Test Suite (Android specific) or Clear to send (in UART context)

Audio Video Bridging over Ethernet (set of IEEE standards for transporting audio and other real-time content over Ethernet)

(Software)Integrated development/design/debugging environment

Digital-to-analog converter (Electronic circuit that converts a binary number into a continuously varying value.)

Analog-to-digital converter. The process of converting a sampled analog signal to a digital code that represents the amplitude of the original signal sample.

SD memory card (<https://www.sdcard.org>)



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Open Graphics Library for Embedded System (See <http://www.khronos.org/opengles/> for more details)

Linux<sup>®</sup> is a registered trademark of Linus Torvalds.

Operating System

Non Applicable

Hardware Abstraction Layer