



# STM32MP15 distribution for Android release note



# STM32MP15 distribution for Android release note

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This article describes the content of STM32MPU distribution for Android **software** release v1.1.0 **st-android-10.0.0-2020-02-21** (tag), which is part of STM32MP15 ecosystem release note - v1.2.0.

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## 1 Intended audience

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The targeted audience is STM32MP15 customers or partners.

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## 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 10.0.0**.

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

This delivery of STM32MP15 distribution for Android™ v1.1.0 is part of STM32MP15-Ecosystem-v1.2.0 (see the [STM32MP15 ecosystem release note - v1.2.0](#)).

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## 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](#).

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## 4 Supported hardware

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This software delivery is compatible with the following boards:

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

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## 5 Delivered features

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### 5.1 Main software components

- Android version v10.0.0 (AOSP android-10.0.0\_r22 tag)
- Kernel version v4.19.94 (AOSP common kernel) + updates for STM32MP1 and associated boards (waiting upstream finalization)
- TF-A version v2.0 + updates for STM32MP1 and associated boards (waiting upstream finalization)



- U-Boot version v2018.11 + updates for STM32MP1 and associated boards (waiting upstream finalization)
- OP-TEE version v3.3.0 + updates for STM32MP1 and associated boards (waiting upstream finalization)
- STM32CubeMP1 FW v1.2.0
- GCC version v8.2
- openOCD version v0.10.0
- GCnano version v6.2.4

## 5.2 Detailed features

### 5.2.1 BSP features

The *STM32MP15 distribution for Android™* v1.1.0 is based on the OpenSTLinux BSP v1.2.0 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	✗	
Multimedia	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 digital micro	✓	Limited to one microphone (mono).
	Audio USB	✗	
	Camera	✓	
	Camera USB	✗	
	Video SW decode	✓	Maximum 480p30 without audio.
	SELinux	✓	



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Domain	Feature	STM32MP15 Evaluation board	Comment
Security	Runtime verification	✘	
	Disk encryption	✔	
	Trusted environment	✔	OP-TEE
	Keystore	✘	Only software backup is used.
	Gatekeeper	✘	
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.
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	✘	
Sensors	Accelerometer	✘	
	Gyroscope	✘	
	Magnetometer	✘	
	Proximity	✘	
	Pressure	✘	
	Temperature	✘	
	Hub	✘	
Debug	ADB (USB)	✔	
	ADB (Ethernet)	✔	
	ADEB	✔	Only for SELinux trace.
	Perfetto	✔	
	Metrics	✔	Boot time.



Domain	Feature	STM32MP15 Evaluation board	Comment
Storage	USB Key	☑	
	microSD card	☑	
	eMMC	☑	
Others	Lights	☑	
	Touchscreen	☑	

## 6 Recommendations for use

### 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

- STM32CubeMX configuration panels propose a few internal peripheral modes that are not supported by the TF-A or OP-TEE drivers running in Arm™ Cortex™-A7 secure context.
- The following table lists all the known restrictions.

IP	Information/Restriction usage in Cortex-A7 secure context
I2C4 /I2C6	The proposed SMBus two-wire Interface mode is not supported for Arm Cortex-A7 secure context (TF-A , OP-TEE) as no use case foreseen.
PWR	TF-A and OP-TEE implementation do not support wakeup events for secure IPs assigned to Arm Cortex-A7 secure context.
RCC	The proposed master clock output1 and 2 as well as Audio clock input modes are not applicable to Arm Cortex-A7 secure context (TF-A, OP-TEE)



IP	Information/Restriction usage in Cortex-A7 secure context
SPI6	The SPI software driver is not available in OP-TEE implementation for Arm Cortex-A7 secure context.
TAMP P	OP-TEE implementation does not support TAMP_IN inputs and TAMP_OUT outputs in Arm Cortex-A7 secure context.
USA RT1	OP-TEE implementation does not support USART Synchronous mode in Arm Cortex-A7 secure context.

## 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).
- Security HAL (Keystore, Gatekeeper, Oemlock) are not available (removed from manifest) or stubbed.
- 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.

## 8 Minor release updates

STMicroelectronics can deliver corrections on purpose through github® components.

## 9 How to get started with st-android-10.0.0-2020-02-21

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

## 10 Associated tools

Refer to the [Referenced tools release notes](#) .



## 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.

### 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 System Workbench IDE): [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.

### 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).





## 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).

## 11.7 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.

# 12 Main changes compared to v1.0.0

The main differences between v1.1.0 and previous delivery v1.0.0 (see [STM32MP15 distribution for Android release note - v1.0.0](#)):

- Switch from Android 9.0.0 (android-9.0.0\_r49) to Android 10.0.0 (android-10.0.0\_r22)
- Switch from Linux kernel 4.19.49 to 4.19.94
- Switch from STM32MP1 OpenSTLinux BSP V1.1.0 to V1.2.0
- Added CPU@800MHz capability

## 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/stm/	Primary (Trusted Firmware-A) and secondary (Universal bootloader)



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Module name			Path of module	Description
			stm32mp1-bootloader	for embedded devices) bootloaders for STM32MP
Name	Version	License		
tf-a-stm32mp1	2.0	BSD-3-Clause		
Name	Version	License		
u-boot-stm32mp1	2018.11	GPLv2+		
stm32mp1-kernel			device/stm32mp1	Linux STM32MP Kernel
Name	Version	License		
linux-stm32mp1	4.19	GPLv2		
stm32mp1-tee			device/stm32mp1-tee	OPTEE OS for STM32MP
Name	Version	License		
optee_os-stm32mp1	3.3.0	BSD-2-Clause & BSD-3-Clause		
stm32mp1-openocd			device/stm32mp1-openocd	Free and open on-chip debugging, in-system programming and boundary-scan testing
Name	Version	License		
stm32mp1-openocd	0.10.0	GPLv2		



13.1.2 Common and peripherals modules

Module name	Path of module	Description						
stm32mp1	device/stm32mp1	Configuration of the STM32MP1 distribution for Android						
<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>stm32mp1</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	stm32mp1	NA	Apache v2.0		
Name	Version	License						
stm32mp1	NA	Apache v2.0						
allocator	device/stm32mp1/peripheral/allocator	STMicroelectronics allocator HAL public header files useful for composer						
<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>allocator</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	allocator	NA	Apache v2.0		
Name	Version	License						
allocator	NA	Apache v2.0						
audio	device/stm32mp1/peripheral	STMicroelectronics Audio HAL source code						
<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>audio</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	audio	NA	Apache v2.0		
Name	Version	License						
audio	NA	Apache v2.0						
bootctrl	device/stm32mp1/	STMicroelectronics Boot Control HAL source code and						



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Module name			Path of module	Description
			peripheral/bootctrl	the dedicated misc partition image generator
Name	Version	License		
bootctrl	NA	Apache v2.0		
camera			device/stm32mp1/peripheral	STMicroelectronics Camera HAL source code
Name	Version	License		
camera	NA	Apache v2.0		
composer			device/stm32mp1/peripheral	STMicroelectronics composer HAL source code
Name	Version	License		
composer	NA	Apache v2.0		
copro			device/stm32mp1/peripheral	STMicroelectronics Copro HAL source code
Name	Version	License		
copro	NA	Apache v2.0		
health			device/stm32mp1/peripheral	STMicroelectronics Health hardware



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Module name			Path of module	Description
			32mp1/peripheral/health	service source code
<b>Name</b>	<b>Version</b>	<b>License</b>		
health	NA	Apache v2.0		
lights			device/stm32mp1/peripheral	STMicroelectronics Lights HAL source code
<b>Name</b>	<b>Version</b>	<b>License</b>		
lights	NA	Apache v2.0		
memtrack			device/stm32mp1/peripheral	STMicroelectronics Memtrack HAL source code
<b>Name</b>	<b>Version</b>	<b>License</b>		
memtrack	NA	Apache v2.0		
oemlock			device/stm32mp1/peripheral	STMicroelectronics OemLock HAL source code (stub version)
<b>Name</b>	<b>Version</b>	<b>License</b>		
oemlock	NA	Apache v2.0		
thermal			/oemdevice/stm32mp1/	STMicroelectronics Thermal hardware service source



Module name			Path of module	Description
			peripheral	code
<b>Name</b>	<b>Version</b>	<b>License</b>	/thermal	
thermal	NA	Apache v2.0	device	STMicroelectronics
usb			/stm32mp1/peripheral	Usb hardware service source code
<b>Name</b>	<b>Version</b>	<b>License</b>	/usb	
usb	NA	Apache v2.0	device	STMicroelectronics
wifi			/stm32mp1/peripheral	libwifi HAL source code
<b>Name</b>	<b>Version</b>	<b>License</b>	/wifi	
wifi	NA	Apache v2.0	device	STMicroelectronics

**13.1.3 Board modules**

Module name			Path of module	Description
eval			device	STMicroelectronics configuration for Android used to generate images
			/stm32mp1/eval	



Module name			Path of module	Description
				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/apps/coproprocessors/	STMicroelectronics coprocessor service
Name	Version	License	CoproService	
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



Module name			Path of module	Description
<b>Name</b>	<b>Version</b>	<b>License</b>		
app	NA	Apache v2.0		

## 14 Archives

STM32MP15 release	Distribution for Android release note
STM32MP15-Ecosystem-v1.1.0	<a href="#">STM32MP15 distribution for Android release note - v1.0.0</a>

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

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.

Central processing unit

Graphics Processing Units

Android debug bridge (Android specific)

former spelling for eMMC ('e' in italic)

System Management Bus

Reset and Clock Control

Serial Peripheral Interface

Tamper

Universal Synchronous/Asynchronous Receiver/Transmitter

Vendor Test Suite (Android specific)

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

Hardware Abstraction Layer





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(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>)

Operating System

Non Applicable