



STM32MP15 distribution for Android release note - v1.0.0



A quality version of this page, approved on 2 April 2020, was based off this revision.

This article describes the content of STM32MPU distribution for Android **software** release version **st-android-9.0.0-2019-09-27** (tag), which is part of STM32MP15 ecosystem release note - v1.1.0.

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1 Intended audience

The targeted audience is STM32MP15 customers or partners.



2 Delivery scope and purpose

The STM32MPU distribution for Android™ provides all necessary components 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 9.0.0 (Pie)**.

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

This delivery of STM32MP15 distribution for Android™ v1.0.0 is part of STM32MP15-Ecosystem-v1.1.0 (see the STM32MP15 ecosystem release note - v1.1.0).



3 Licensing

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



4 Supported hardware

This software delivery is compatible with the following boards:

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



5 Delivered features

5.1 Main software components

- Android version v9.0.0 (AOSP android-9.0.0_r46 tag)
- Kernel version v4.19.49 (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 v1.1.0
- 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™* v1.0.0 is based on the OpenSTLinux BSP v1.1.0 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	✓	Entering this mode through connect ST-Link console (uart) or by HW control
	Verified boot	✗	
	A/B mechanism	✗	A/B images available but boot on A by default
	Recovery	✗	
	Audio speaker	✓	audio speaker output can be used only to connect headset
	Audio headset	✓	not selected by default (no headset detection)
	Audio built-in digital micro	✓	limited to one microphone (mono)



Domain	Feature	STM32MP15 Evaluation board	Comment
Multimedia	Audio USB	✘	
	Camera	✔	
	Camera USB	✘	
	Video SW decode	✔	480p30 max. without audio
Security	SELinux	✔	
	Runtime verification	✘	
	Disk encryption	✘	
	Trusted environment	✔	OP-TEE
	Keystore	✘	only software backup used
	Gatekeeper	✘	
Network and connectivity	Ethernet	✔	
	Wifi	✔	Using TP-LINK dongle (TL-WN722N) for test purpose
	Wifi hotspot	✘	
	BT / BLE	✘	
	USB	✔	Mass storage / MTP / PTP
Systems	Boot control	<i>Partially</i>	Available but not enable
	Power control	✔	
	Thermal control	✔	Only one temperature managed for CPU/GPU (others are stubbed)
	Update engine	✘	
Sensors	Accelerometer	✘	
	Gyroscope	✘	
	Magnetometer	✘	
	Proximity	✘	
	Pressure	✘	
	Temperature	✘	
	Hub	✘	
	ADB (USB)	✔	



Domain	Feature	STM32MP15 Evaluation board	Comment
Debug	ADB (Ethernet)	✓	
	ADEB	✓	Only for SELinux trace
	Perfetto	✓	Several limitations with Android 9.0.0
	SYSTRACE	✓	
	Metrics	✗	
Storage	USB Key	✓	
	microSD card	✓	
	eMMC	✓	
Others	Lights	✓	
	Touchscreen	✓	



6 Recommendations for use

6.1 Safe use

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

6.2 Non-recommended use

- None



7 Main restrictions list

7.1 BSP restrictions list

- CubeMX configuration panels propose some internal peripheral modes not supported by TF-A or OP-TEE drivers running in Cortex-A7 secure context.
- The following table lists all known restrictions.

IP	Information/Restriction usage in Cortex-A7 secure context
I2C4 /I2C6	The SMBus-two-wire-Interface mode proposed is not supported for Cortex-A7 secure context (TF-A , OP-TEE) as no use case foreseen
PWR	TF-A and OP-TEE implementation do not support wake-up events for secure IPs assigned to Cortex-A7 secure context
RCC	The master clock output1 et 2, Audio clock input modes proposed are not applicable for Cortex-A7 secure context (TF-A, OP-TEE)
SPI6	The SPI SW driver is not available in OP-TEE implementation for Cortex-A7 secure context
TAMP	OP-TEE implementation does not support TAMP_IN inputs and TAMP_OUT outputs in Cortex-A7 secure context
USAR T1	OP-TEE implementation does not support USART synchronous mode in Cortex-A7 secure context

7.2 Android restrictions list

STM32P15 distribution for Android™ is provided as example.

In this context:

- Android 9.0.0 with Linux Kernel 4.19 is not an association officially supported by the frameworks (several limitations to be expected)
- Compliance tests (VTS/CTS) are not insured (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 not available (or partially)

Available on STM32MP15 Evaluation Board but not integrated in STM32P15 distribution for Android™:

- Audio headset detection is not available (need to force the usage)
- Audio RCA is not available (SPDIF input / SPDIF output)
- Audio digital microphone is limited to mono (record usage)
- 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-9.0.0-2019-09-27

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



10 Associated tools

Refer to the Referenced tools release notes .



11 Demo applications

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

11.1 STCopro M4Echo application

Example of application using the proprietary coprocessor service (allow direct interaction with the firmware started on the embedded Arm® Cortex®M4).

The firmware just returns the received character on the opened serial port.

The associated application project is available on github® (compatible with Android Studio IDE): STCoproM4Echo application.

11.2 STCopro M4Example application

Example of application using the proprietary coprocessor service (allow direct interaction with the firmware started on the embedded Arm® Cortex®M4).

The firmware generates a signal on the DAC and get back a signal from the ADC. A wire can be added to loop the DAC on ADC . The firmware shows also 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.

11.3 STCamera

Simple Camera application (preview) used to show a way to manage the built-in camera, only compatible with MB1379 camera extension board. An external storage configured as portable device shall be available to allow taking a picture.

11.4 STVideo

Simple Video application used to show a way to play a video. The video files shall be stored in the directory *Movies* of an external storage (ex: USB key) configured as portable device.

11.5 STPerf

Performance overlay application used to show in foreground the device performances (CPU usage, GPU usage, frame rate). The settings and stop commands are available on notifications system interface.



12 Change log / Main changes

Initial version.



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 Boot Loader 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>2.0</td> <td>BSD-3-Clause</td> </tr> </tbody> </table>	Name	Version	License	tf-a-stm32mp1	2.0	BSD-3-Clause
		Name	Version	License				
		tf-a-stm32mp1	2.0	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>2018.11</td> <td>GPLv2+</td> </tr> </tbody> </table>	Name	Version	License	u-boot-stm32mp1	2018.11	GPLv2+		
Name	Version	License						
u-boot-stm32mp1	2018.11	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>4.19</td> <td>GPLv2</td> </tr> </tbody> </table>	Name	Version	License	linux-stm32mp1	4.19	GPLv2
		Name	Version	License				
linux-stm32mp1	4.19	GPLv2						
stm32mp1-tee	device/stm32mp1-tee	OPTEE OS for STM32MP						
		<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>optee_os-stm32mp1</td> <td>3.3.0</td> <td>BSD-2-Clause & BSD-3-Clause</td> </tr> </tbody> </table>	Name	Version	License	optee_os-stm32mp1	3.3.0	BSD-2-Clause & BSD-3-Clause
		Name	Version	License				
optee_os-stm32mp1	3.3.0	BSD-2-Clause & BSD-3-Clause						
	device	Free and Open On-Chip Debugging, In-System Programming and Boundary-Scan Testing						



Module name	Path of module	Description				
stm32mp1-openocd	/stm / stm32mp1- openocd					
		<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>stm32mp1-openocd</td> <td>0.10.0</td> <td>GPLv2</td> </tr> </tbody> </table>	Name	Version	License	stm32mp1-openocd
Name	Version	License				
stm32mp1-openocd	0.10.0	GPLv2				

13.1.2 Common and peripherals modules

Module name	Path of module	Description				
stm32mp1	device /stm / 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
Name	Version	License				
stm32mp1	NA	Apache v2.0				
allocator	device /stm /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
Name	Version	License				
allocator	NA	Apache v2.0				
audio	device /stm /stm32mp1	STMicroelectronics Audio HAL source code				



Module name	Path of module	Description						
	1/ peripheral /audio	<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 /stm /stm 32mp 1/ peripheral /bootctrl	<p>STMicroelectronics Boot Control HAL source code and the dedicated misc partition image generator</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>bootctrl</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	bootctrl	NA	Apache v2.0
Name	Version	License						
bootctrl	NA	Apache v2.0						
camera	device /stm /stm 32mp 1/ peripheral /camera	<p>STMicroelectronics Camera HAL source code</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>camera</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	camera	NA	Apache v2.0
Name	Version	License						
camera	NA	Apache v2.0						
composer	device /stm /stm 32mp 1/	STMicroelectronics composer HAL source code						



Module name	Path of module	Description						
	peripheral/composer	<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>composer</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	composer	NA	Apache v2.0
Name	Version	License						
composer	NA	Apache v2.0						
copro	device/stm32mp1/peripheral/copro	<p>STMicroelectronics Copro HAL source code</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>copro</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	copro	NA	Apache v2.0
Name	Version	License						
copro	NA	Apache v2.0						
health	device/stm32mp1/peripheral/health	<p>STMicroelectronics Health hardware service source code</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>health</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	health	NA	Apache v2.0
Name	Version	License						
health	NA	Apache v2.0						
lights	device/stm32mp	STMicroelectronics Lights HAL source code						



Module name	Path of module	Description						
	1/ peripheral /lights	<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>lights</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	lights	NA	Apache v2.0
Name	Version	License						
lights	NA	Apache v2.0						
memtrack	device /stm /stm 32mp 1/ peripheral /memtrack	<p>STMicroelectronics Memtrack HAL source code</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>memtrack</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	memtrack	NA	Apache v2.0
Name	Version	License						
memtrack	NA	Apache v2.0						
oemlock	device /stm /stm 32mp 1/ peripheral /oemlock	<p>STMicroelectronics OemLock HAL source code (stub version)</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>oemlock</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	oemlock	NA	Apache v2.0
Name	Version	License						
oemlock	NA	Apache v2.0						
thermal	device /stm /stm 32mp	STMicroelectronics Thermal hardware service source code						



Module name	Path of module	Description						
	1/ peripheral /thermal	<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>thermal</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	thermal	NA	Apache v2.0
Name	Version	License						
thermal	NA	Apache v2.0						
usb	device /stm /stm 32mp 1/ peripheral /usb	STMicroelectronics Usb hardware service source code <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>usb</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	usb	NA	Apache v2.0
Name	Version	License						
usb	NA	Apache v2.0						
wifi	device /stm /stm 32mp 1/ peripheral /wifi	STMicroelectronics libwifi HAL source code <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>wifi</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	wifi	NA	Apache v2.0
Name	Version	License						
wifi	NA	Apache v2.0						

13.1.3 Board modules

Module name	Path of module	Description
	device	STMicroelectronics configuration for Android used to generate images adapted to the



Module name	Path of module	Description						
eval	ce /stm /stm 32mp 1/ eval	STM32MP15 Evaluation boards						
		<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>eval</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	eval	NA	Apache v2.0
		Name	Version	License				
eval	NA	Apache v2.0						

13.1.4 Coprocessor service module

Module name	Path of module	Description						
CoproService	packages /apps/ CoproService	STMicroelectronics coprocessor service						
		<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>CoproService</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	CoproService	NA	Apache v2.0
		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 associated if required to their respective coprocessor firmware						
		<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> <th>License</th> </tr> </thead> <tbody> <tr> <td>app</td> <td>NA</td> <td>Apache v2.0</td> </tr> </tbody> </table>	Name	Version	License	app	NA	Apache v2.0
		Name	Version	License				
app	NA	Apache v2.0						

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

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 e•MMC ('e' in italic)

Flash memory shortened to gain space in titles, tables and block diagrams

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

(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.

Operating System

Non Applicable