



STM32MP15 distribution for Android release note - v1.0.0



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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	✗	
Multimedia	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)
	Audio USB	✗	
	Camera	✓	
	Camera USB	✗	
	Video SW decode	✓	480p30 max. without audio
	SELinux	✓	
	Runtime verification	✗	
	Disk encryption	✗	
	Trusted environment	✓	OP-TEE
	Keystore	✗	only software backup used



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Security	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	✘	
Debug	ADB (USB)	✔	
	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



USART1

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 delivers 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/stm/ 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> </tr> </thead> <tbody> <tr> <td>tf-a-stm32mp1</td> <td>2.0</td> </tr> </tbody> </table>	Name	Version	tf-a-stm32mp1	2.0
		Name	Version			
		tf-a-stm32mp1	2.0			
<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td>u-boot-stm32mp1</td> <td>2018.11</td> </tr> </tbody> </table>	Name	Version	u-boot-stm32mp1	2018.11		
Name	Version					
u-boot-stm32mp1	2018.11					
stm32mp1-kernel	device/stm/ stm32mp1-kernel	Linux STM32MP Kernel				
		<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td>linux-stm32mp1</td> <td>4.19</td> </tr> </tbody> </table>	Name	Version	linux-stm32mp1	4.19
Name	Version					
linux-stm32mp1	4.19					
stm32mp1-tee	device/stm/ stm32mp1-tee	OPTEE OS for STM32MP				
		<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td>optee_os-stm32mp1</td> <td>3.3.0</td> </tr> </tbody> </table>	Name	Version	optee_os-stm32mp1	3.3.0
Name	Version					
optee_os-stm32mp1	3.3.0					
stm32mp1-openocd	device/stm/ stm32mp1-openocd	Free and Open On-Chip Debugging, In-System Programming and Boundary-Scan Testing				
		<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td>stm32mp1-openocd</td> <td>0.10.0</td> </tr> </tbody> </table>	Name	Version	stm32mp1-openocd	0.10.0
Name	Version					
stm32mp1-openocd	0.10.0					

13.1.2 Common and peripherals modules

Module name	Path of module	Description
stm32mp1	device/stm/ stm32mp1	Configuration of the STM32MP1 distribution for Android



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		<table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td>stm32mp1</td> <td>NA</td> </tr> </tbody> </table>	Name	Version	stm32mp1	NA
Name	Version					
stm32mp1	NA					
allocator	device/stm /stm32mp1/ peripheral /allocator	<p>STMicroelectronics allocator HAL public header files useful for composer</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td>allocator</td> <td>NA</td> </tr> </tbody> </table>	Name	Version	allocator	NA
Name	Version					
allocator	NA					
audio	device/stm /stm32mp1/ peripheral/audio	<p>STMicroelectronics Audio HAL source code</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td>audio</td> <td>NA</td> </tr> </tbody> </table>	Name	Version	audio	NA
Name	Version					
audio	NA					
bootctrl	device/stm /stm32mp1/ 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> </tr> </thead> <tbody> <tr> <td>bootctrl</td> <td>NA</td> </tr> </tbody> </table>	Name	Version	bootctrl	NA
Name	Version					
bootctrl	NA					
camera	device/stm /stm32mp1/ peripheral/camera	<p>STMicroelectronics Camera HAL source code</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td>camera</td> <td>NA</td> </tr> </tbody> </table>	Name	Version	camera	NA
Name	Version					
camera	NA					
composer	device/stm /stm32mp1/ peripheral /composer	<p>STMicroelectronics composer HAL source code</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td>composer</td> <td>NA</td> </tr> </tbody> </table>	Name	Version	composer	NA
Name	Version					
composer	NA					
copro	device/stm /stm32mp1/ peripheral/copro	<p>STMicroelectronics Copro HAL source code</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td>copro</td> <td>NA</td> </tr> </tbody> </table>	Name	Version	copro	NA
Name	Version					
copro	NA					
health	device/stm /stm32mp1/ peripheral/health	<p>STMicroelectronics Health hardware service source code</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Version</th> </tr> </thead> <tbody> <tr> <td>health</td> <td>NA</td> </tr> </tbody> </table>	Name	Version	health	NA
Name	Version					
health	NA					
	device/stm	STMicroelectronics Lights HAL source code				



lights	/stm32mp1/ peripheral/lights	Name		Version	
		lights		NA	
memtrack	device/stm /stm32mp1/ peripheral /memtrack	STMicroelectronics Memtrack HAL source code			
		Name		Version	
		memtrack		NA	
oemlock	device/stm /stm32mp1/ peripheral /oemlock	STMicroelectronics OemLock HAL source code (stub version)			
		Name		Version	
		oemlock		NA	
thermal	device/stm /stm32mp1/ peripheral /thermal	STMicroelectronics Thermal hardware service source code			
		Name		Version	
		thermal		NA	
usb	device/stm /stm32mp1/ peripheral/usb	STMicroelectronics Usb hardware service source code			
		Name		Version	
		usb		NA	
wifi	device/stm /stm32mp1/ peripheral/wifi	STMicroelectronics libwifi HAL source code			
		Name		Version	
		wifi		NA	

13.1.3 Board modules

Module name	Path of module	Description	
eval	device/stm /stm32mp1/ eval	STMicroelectronics configuration for Android used to generate images adapted to the STM32MP15 Evaluation boards	
		Name	
		eval	Version
			NA



13.1.4 Coprocessor service module

Module name	Path of module	Description	
CoproService	packages/apps/ CoproService	STMicroelectronics coprocessor service	
		Name	Version
		CoproService	NA

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	
		Name	Version
		app	NA

Android Open Source Project

Trusted Firmware for Arm Cortex-A

Open Portable Trusted Execution Environment

Board support package

spelling for older versions of STLink

BlueTooth

Bluetooth Low Energy .

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) - NEW

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

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