STM32MP15 OpenSTLinux release note - v1.1.0

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

This article describes the content of OpenSTLinux distribution **software** release version **openstlinux-4.19-thud-mp1-19-10-09**, which is part of STM32MP15 ecosystem release note - v1.1.0.

Contents

1 Intended audience

The targeted audience is STM32MP15 customers or partners.

2 Delivery scope and purpose

The OpenSTLinux distribution is a Linux® distribution based on the OpenEmbedded build Framework. It runs on the Arm® Cortex®-A7 processors, and is a fundamental part of the STM32MPU Embedded Software distribution.

This delivery of OpenSTLinux distribution 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 FOR ST MATERIALS (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
- STM32MP157X-DK1 and STM32MP157X-DK2 Discovery kit. For more information on these boards, please read the article STM32MP157X-DKX - hardware description

5 Delivered features

5.1 Main software components

- Kernel version LTS v4.19.49
- TF-A version v2.0
- U-Boot version v2018.11
- OP-TEE version v3.3.0
- STM32CubeMP1 FW v1.1.0
- OpenEmbedded Thud (v2.6.3)
- Weston version v5.0.0
- GStreamer version v1.14.4
- GCC version v8.2
- OpenOCD version v0.10.0
- GCnano version v6.2.4

5.2 Detailed features

5.2.1 Kernel part

v4.19-stm32mp-r2 : Linux Kernel LTS v4.19.49 delivery for STMP32MP15x support
For build details see README.HOW_TO.txt.

5.2.1.1 v4.19-stm32mp-r1 original release information

- Adds device tree for the supported boards
  - stm32mp157c-ev1
  - stm32mp157c-ed1
  - stm32mp157a-dk1
  - stm32mp157c-dk2
- Adds/Supports drivers in kernel

Cortex® -A7 Features	Internal peripheral	Linux framework	Available
ADC	ADC	iio	yes
DAC	DAC	iio	yes
DMA	DMA	dmaengine	yes
sigma delta ADC	DFSDM	iio	yes
Audio Playback or Record	SAI	asoc	yes
Audio Playback or Record	I2S	asoc	yes
Audio record, SPDIF	SPDIF	asoc	yes
Audio Record with DFSDM	DFSDM	asoc	yes
Backlight	PWM	video/backlight	yes

Cortex® -A7 Features	Internal peripheral	Linux framework	Available
BT	UART		yes
Camera	DCMI	v4l2	yes
CAN	FDCAN	network	yes
CEC	CEC	v4l2	yes
Coprocessing	IPCC	rpm	yes
Crypto	CRYPTO	crypto	yes
Crypto	HASH	crypto	yes
Crypto	CRC	crypto	yes
Crypto	RNG		yes
DDR	DDR	NA	yes
DSI Backlight	DSI	drm/kms & video/backlight	yes
DSI Display	DSI	drm/kms	yes
eMMC	SDMMC	mmc	yes
Ethernet	ETH	network	yes
GPU	GPU		yes
HDMI Audio	I2S	asoc	yes on DK
HDMI Display	LTDC & I2C	drm/kms	yes
HW spinlock	HSEM	hw_spinlock	yes
I2C	I2C	i2c	yes
RGB display	LTDC	drm/kms	yes
NAND Flash	FMC	mtd	yes
NOR Flash	QUADSPI	mtd	yes
Pin control	GPIO	Pinctrl	yes
Power	PSCI1.0	PSCI1.0	yes
PMIC	PMIC	regulator	yes
RTC	RTC	rtc	yes
SDCard - SDR50	SDMMC	mmc	yes
SDCard - SDR104	SDMMC	mmc	yes
SPI	SPI	spi	yes
Timers	LPTIMER	pwm/iio	yes
Timers	TIMER	pwm/iio	yes
Timers - Capture	TIMER	pwm	yes

Cortex® -A7 Features	Internal peripheral	Linux framework	Available
Touchscreen	I2C	input/touchscreen	yes
UART	U(S)ART	tty	yes
USB Host	USBH	usb	yes
USB OTG	USBOTG	usb	yes
Video (GStreamer)	NA	NA	yes
VREFBUF	VREFBUF	regulator	yes
Watchdog	IWDG	watchdog	yes
Wifi	SDIO		yes

5.2.1.2 *v4.19-stm32mp-r2 update release information*

- GPIO expansion and Arduino connectors pins configuration for PWM, SDMMC3, I2C5 and ADC
- USB OTG and USBH wakeup from CSTOP with a USB device
- USB OTG dynamic role switch on Type-C connector
- Audio improvements
- DDR Performance Monitor linux driver
- EFI Boot Stub support
- Various fixes and improvements, in addition to all the fixes incrementaly delivered on our Github.

5.2.2 U-boot part

v2018.11-stm32mp-r3 : U-Boot v2018.11 delivery for STMP32MP15x support
For build details see board/st/stm32mp1/README or STM32MP15 U-Boot wiki page.

5.2.2.1 *v2018.11-stm32mp-r2 original release information*

- Adds architecture stm32mp (arch/arm/mach-stm32mp) with STMP32MP15x support
- Adds the STMicroelectronics board stm32mp1 (board/st/stm32mp1).

This generic board supports all the bootable devices for all
STM32MP1 boards with generic distribution feature (CONFIG_DISTRO).
The supported bootable devices are:

- SDCard
- eMMC
- NOR (SF)
- NAND devices

- Adds device tree for the supported boards
  - stm32mp157c-ev1
  - stm32mp157c-ed1
  - stm32mp157a-dk1
  - stm32mp157c-dk2
- Adds defconfig for the 2 supported boot chain
  - The "Trusted" boot chain (defconfig_file : stm32mp15_trusted_defconfig)

  ROM code => FSBL = Trusted Firmware-A (TF-A) => SSBL = U-Boot in non-secure world - **The trusted boot chain is the default boot chain solution delivered by STMicroelectronics with full features support**

- The "Basic" boot chain (defconfig_file : stm32mp15_basic_defconfig)

  ROM code => FSBL = U-Boot SPL => SSBL = U-Boot in secure world - STMicroelectronics upstreams the Basic boot chain with a limited number of features, and the U-Boot community is able to extend this.

- Adds/Supports drivers in U-Boot
  - RCC drivers for Clock, Reset, Sysreset
    - drivers/clk/clk_stm32mp1.c
    - drivers/reset/stm32-reset.c
  - GPIO (drivers/gpio/stm32f7_gpio.c)
  - PINCONTROL (drivers/pinctrl/pinctrl_stm32.c)
  - UART/USART (drivers/serial/serial_stm32.c)
  - DDR controller and PHY (drivers/ram/stm32mp1)
  - SDCard/MMC controller = SDMMC (drivers/mmc/stm32_sdmmc2.c)
  - NAND controller FMC (drivers/mtd/nand/raw/stm32_fmc2_nand.c)
  - NOR controller QSPI (drivers/spi/stm32_qspi.c)
  - USB OTG controller (OTG DWC2) and PHY (USBPHYC)
    - drivers/phy/phy-stm32-usbphyc.c
    - drivers/usb/gadget/dwc2_udc_otg.c
    - drivers/usb/gadget/gen_udc_otg_phy.c
    - drivers/usb/host/dwc2.c
  - ETH (drivers/net/dwc_eth_qos.c)
  - I2C (drivers/i2c/stm32f7_i2c.c)
  - PWR regulator (arch/arm/mach-stm32mp/pwr_regulator.c)
  - VREF regulator (drivers/power/regulator/stm32-vrefbuf.c)
  - STPMIC1 (PMIC and regulator)
    - drivers/power/pmic/stpmic1.c
    - drivers/power/regulator/stpmic1.c
  - BSEC for OTP (arch/arm/mach-stm32mp/bsec.c)
  - WATCHDOG (drivers/watchdog/stm32mp_wdt.c)
  - ADC (drivers/adc/stm32-adc.c and stm32-adc-core.c)
  - HWSINLOCK (drivers/hwspinlock/stm32_hwspinlock.c)
  - IPCC mailbox (drivers/mailbox/stm32-ipcc.c)
  - VIDEO drivers for LTDC and DSI
    - drivers/video/stm32/stm32_dsi.c
    - drivers/video/stm32/stm32_ltdc.c
  - Panels drivers
    - drivers/video/dw_mipi_dsi.c
    - drivers/video/mipi_display.c
    - drivers/video/orisetech_otm8009a.c
    - drivers/video/raydium-rm68200.c
  - SYSCFG init (in board: board/st/stm32mp1/stm32mp1.c)
  - STMFX gpio expender (drivers/pinctrl/pinctrl-stmfx.c)
- The added, supported or modified commands are
  - stm32prog for STM32CubeProgrammer tools support (USB or UART) in U-Boot (arch/arm/mach-stm32mp /cmd_stm32prog)

- rproc for M4 firmware load (drivers/remoteproc/stm32_copro.c)
- fuse support with 2 banks for OTP (BSEC) and STMPIC1 non volatile memory (drivers/misc/stm32mp_fuse.c)
- poweroff (arch/arm/mach-stm32mp/cmd_poweroff.c)
- stm32key (arch/arm/mach-stm32mp/cmd_stm32key.c)

- Information
  - savenv is not supported (CONFIG_ENV_IS_NOWHERE is activated by default)
  - boot from NAND is not supported for basic boot
  - STM32Cube programmer is not supported by SPL in basic boot

5.2.2.2 *v2018.11-stm32mp-r3 update release information*

- Add SPI driver
- Add RTC driver for UEFI
- Migrate qspi driver to spi-mem framework
- DDR setting v1.45 / alignment with latest CubeMX generation
- Solve issues of ethernet driver and phy
- Activate UEFI support for EBBR (https://github.com/ARM-software/ebbr)
- Update bootcmd and migrate to Kconfig (CONFIG_BOOTCOMMAND)
- Activate U-Boot ENV support in boot device (NOR/NAND/eMMC or SD card)
- Prepare bootcmd for Android
- Alignment for latest kernel device tree v4.19-stm32mp-r2
- Alignment with up-streamed drivers
- Many other corrections

5.2.3 TF-A part

v2.0-stm32mp-r2 : TF-A v2.0 delivery for STM32MP15 support
For build details see docs/plat/stm32mp1.rst or STM32MP15 TF-A wiki page.

5.2.3.1 *v2.0-stm32mp-r1 original release information*

- Trusted Bootchain support (Monitor or OP-TEE)
  - Bootrom -> TF-A (BL2) -> TF-A(SP_MIN) -> U-BOOT
  - Bootrom -> TF-A (BL2) -> OP-TEE -> U-BOOT
- Add stm32mp1 architecture (plat/st/stm32mp1) with STM32MP15 support
  - Following ARM requirements docs/porting-guide.rst
  - Add a stm32mp common part (plat/st/stm32mp)
- Add stm32 peripherals drivers
- Official board supports all the following bootable devices:
  - SDCard
  - eMMC
  - NOR (SPI Flash, Single and Dual mode)
  - NAND devices (FMC controlled, BCH4/BCH8, ONFI, NON-ONFI)
- Adds device tree for the supported boards
  - stm32mp157c-ev1
  - stm32mp157c-ed1
  - stm32mp157a-dk1
  - stm32mp157c-dk2
- Clock tree configuration based on device tree
  - Platform initialization
  - CSI/HSI Calibration
- DDR initialization (device tree based) v1.41
- Secure Boot authentication and integrity check (ECDSA based) using dedicated STM32 header
- Secure platform configuration over device tree
- Shared resources management
- Early watchdog interrupt management
- Secure interrupt management
- PSCI support for power management
- STM32Programmer support
- Added drivers:
  - BSEC driver for OTP management (drivers/st/bsec/bsec.c)
  - RCC driver for Clock, Reset
    - drivers/st/clk/stm32mp1_clk.c
    - drivers/st/clk/stm32mp1_func.c
    - drivers/st/clk/stm32mp_func.c
    - driver/st/reset/stm32mp1_reset.c
  - DDR controller and PHY
    - drivers/st/ddr/stm32mp1_ddr.c
    - drivers/st/ddr/stm32mp1_ddr_helpers.c
    - drivers/st/ddr/stm32mp1_ram.c
  - ETZPC driver (driver/etzpc/etzpc.c)
  - HASH driver (driver/hash/hash_sec.c)
  - I2C (driver/i2c/stm32_i2c.c)

- IO interface
  - driver/st/io/io_mmc.c
  - driver/st/io/io_stm32image.c
- WATCHDOG (driver/st/stm32_iwdg.c)
- SDCard/MMC controller (driver/st/mmc/stm32_sdmmc.c)
- NAND controller FMC
  - driver/st/nand/io_nand.c
  - driver/st/nand/nand.c
- STPMIC1 support
  - driver/st/pmic/stm32mp_pmic.c
  - driver/st/pmic/stpmic1.c
- NOR controller QSPI (driver/st/qspi/io_qspi.c)
- RNG driver (driver/st/rng/stm32_rng.c)
- RTC driver (driver/st/rtc/stm32_rtc.c)
- TAMPER driver(driver/st/tamper/stm32_tamp.c)
- TIMER driver for clock calibration (driver/st/timer/stm32_timer.c)
- UART driver (Console management)
  - driver/st/uart/aarch32/stm32_console.S
  - driver/st/uart/stm32mp1xx_hal_uart.c
- USB driver (No enumeration)
  - driver/st/usb/usb_dwc2.c

- Others features:
  - STM32CubeProgrammer support
    - driver/st/io/io_programmer_st_usb.c
    - driver/st/uart/ io_programmer_uart.c
  - ARM SiP services:
    - Definition (plat/st/stm32mp1/services/stm32mp1_svc_setup.c)
    - Clock/Reset (plat/st/stm32mp1/services/rcc_svc.c)
    - Power (plat/st/stm32mp1/services/pwr_svc.c)
    - NVMEM (plat/st/stm32mp1/services/bsec_svc.c)
    - Power Domain (plat/st/stm32mp1/services/low_power_svc.c)
  - Dedicated STM32 Header tools (tools/stm32image/stm32image.c)

5.2.3.2 *v2.0-stm32mp-r2 update release information*

- Enable LP/LV Stop on evaluation board
- DDR setting v1.45 / alignment with latest CubeMX generation
- TF-A: Flasher and/or storage support over build flags (BL2)
- Enable digital bypass check inside flash part
- Increase timer precision for calibration
- Update OTP management
- Decrease PLL1 frequency when switching in low power mode
- Many others corrections

5.2.4 OP-TEE part

3.3.0-stm32mp-r2 : OP-TEE 3.3.0 delivery for STMP32MP15x support
Build instructions can be found in STM32MP15 OP-TEE wiki page.

The delivery includes the OP-TEE OS package for STM32MP15x platforms support as well as the several generic OP-TEE packages: OP-TEE client, OP-TEE examples and OP-TEE tests. This release note describes the changes in the OP-TEE OS package. Other OP-TEE packages not do need any modification to support the STM32MP15x platforms.

5.2.4.1 *3.3.0-stm32mp-r1 original release information*

Delivery based on OP-TEE release tag 3.3.0 with the following modifications:

- Add stm32mp1 architecture support for STM32MP15x with OP-TEE core running in internal SYSRAM (OP-TEE pager enabled):
  - core/arch/arm/plat-stm32mp1/*
- Update STM32 UART driver for OP-TEE debug (output) console:
  - core/drivers/stm32_uart.c
- Add generic board configuration through device tree technology and STM32MP15x boards description:
  - stm32mp157c-ev1
  - stm32mp157c-ed1
  - stm32mp157c-dk2
  - stm32mp157a-dk1 available for test only as it does not support suspend/resume mode.
  - core/secure_dt.mk & changes in core/arch/arm/generic_boot.c
  - core/arch/arm/fdts/*
  - core/include/dt-bindings/*
- Add stm32mp1 platform clocks, reset and PWR drivers:

Clock driver excludes clock tree parenthood configuration which is expected from the secure bootloader for consistency considerations.

  - core/arch/arm/plat-stm32mp1/drivers/stm32mp1_clk.c
  - core/arch/arm/plat-stm32mp1/drivers/stm32mp1_rcc.c
  - core/arch/arm/plat-stm32mp1/drivers/stm32mp1_pwr.c
  - core/arch/arm/plat-stm32mp1/drivers/stm32_reset.c
- Add stm32mp1 platform CSI/HSI calibration, using STM32 TIM driver:
  - core/arch/arm/plat-stm32mp1/drivers/stm32mp1_calib.c
  - core/drivers/stm32_timer.c
- Add STPMIC1 driver and stm32mp1 platform driver for STPMIC1:
  - core/drivers/stpmic1.c
  - core/arch/arm/plat-stm32mp1/drivers/stm32mp1_pmic.c
- Add several STM32 drivers:
  - STM32 BSEC (OTP): core/drivers/stm32_i2c.c
  - STM32 ETZPC: core/drivers/stm32_etzpc.c
  - STM32 GPIO and pin muxing: core/drivers/stm32_gpio.c
  - STM32 I2C: core/drivers/stm32_i2c.c
  - STM32 IWDG: core/drivers/stm32_iwdg.c
  - STM32 RNG: core/drivers/stm32_rng.c
  - STM32 RTC: core/drivers/stm32_rtc.c
  - STM32 TIM: core/drivers/stm32_timer.c (support for HSI/CSI calibration only)
- Support assignment of peripheral to secure and/or non-secure world:
  - core/arch/arm/plat-stm32mp1/shared_resources.c
- Add SiP platform services for BSEC, PWR and RCC accesses from non-secure world:
  - core/arch/arm/plat-stm32mp1/service/bsec_svc.c
  - core/arch/arm/plat-stm32mp1/service/pwr_svc.c
  - core/arch/arm/plat-stm32mp1/service/rcc_svc.c

- Add platform suspend/resume for platform low power support over PSCI protocol:

This includes a DDR driver for autorefresh mode and SiP services for power states configuration.

  - core/arm/arch/plat-stm32mp1/pm/*
  - core/arch/arm/plat-stm32mp1/drivers/stm32mp1_ddr.c
  - core/arch/arm/plat-stm32mp1/service/low_power.c
- Update GIC driver for low power state supports:
  - core/drivers/gic.c
  - core/kernel/interrupt.c
- Add generic timeout detection functions:
  - core/arch/arm/kernel/delay.c
- Update generic memory mapping driver to support mapping of secure read-only memory:
  - core/arch/arm/mm/core_mmu.c
- Update generic CPU suspend support to support LPAE mapping:
  - core/arch/arm/sm/pm_a32.S
- Util for pre-formating OP-TEE boot images for verified boot (STM32 Header tool):
  - core/arch/arm/plat-stm32mp1/stm32image.py

5.2.4.2 *3.3.0-stm32mp-r2 update release information*

- Increase timer precision for calibration
- Update OTP management
- DDR setting v1.45 / alignment with latest CubeMX generation
- Decrease PLL1 frequency when switching in low power mode
- Many others corrections

6 Recommendations for use

6.1 Safe use

- Flash-load and boot from all supported Flash devices: SDCard, eMMC, ONFI NAND and NOR Flash memories
- Develop Linux® applications, libraries, kernel modules based on OpenSTLinux delivery
- Develop coprocessor Cube applications based on STM32CubeMP1 delivery
- Develop boards based on STM32MP15
- Prototype applications based on ST boards

6.2 Non-recommended use

- None

7 Main 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

8 Minor release updates

STMicroelectronics regularly delivers corrections through github® components which are u-boot, optee-os, tf-a, Linux kernel. You can decide to incorporate them into your developer package (please refer to STM32MP1 Developer Package) or Distribution package.
For updating Distribution package please proceed as follow:

1. Switch to github® mode your Distribution package
2. Use the command **devtool modify <recipe name>** to have direct access to source code git used by build process
3. In source code just extracted, use git command as **git checkout -b WORK <github® TAG>** to points on new revision of component

More rarely and independently, STMicroelectronics also delivers fixes on layers through github®. These changes can be integrated (via git commands) into your local STM32MP1 Distribution Package environment. Please find below the github® links of the quoted layers :

- meta-st-stm32mp
- meta-st-openstlinux
- meta-st-stm32mp-addons

8.1 v1.1.1

Component	Recipe name	new github® release
tf-a	tf-a-stm32mp	no update
u-boot	u-boot-stm32mp	v2018.11-stm32mp-r3.1
kernel	linux-stm32mp	v4.19-stm32mp-r2.3
optee-os	optee-os-stm32mp	no update

9 How to get started with openstlinux-4.19-thud-mp1-19-10-09

Refer to How to get the software and start with this release.

10 Associated tools

Refer to the Referenced tools release notes .

11 Detailed delivery content

11.1 Detailed description of STMicroelectronics layers

In OpenEmbedded, the build framework which was chosen by the OpenSTLinux distribution, a layer is a collection of recipes and/or configurations that can be used on top of OE-Core.

Typically, each layer is organized around a specific theme, such as adding recipes for building web browser software.

The implemented layers are listed below, together with the list of recipes contained in each layer and the related information.

11.1.1 meta-st-stm32mp

Name of layer	Description
meta-st-stm32mp	BSP Layer for stm32mp

Recipe Name	Path of recipe	Description
alsa-state-stm32mp1	recipes-bsp/alsa/alsa-state-stm32mp1.bb	Alsa scenario files to enable alsa state restoration
gcnano-driver-stm32mp	recipes-bsp/drivers/gcnano-driver-stm32mp_6.2.4.bb	GCNano kernel drivers
sysdig-driver	recipes-bsp/drivers/sysdig-driver_git.bb	A New System Troubleshooting Tool Built for the Way You Work
tf-a-stm32mp	recipes-bsp/trusted-firmware-a/tf-a-stm32mp_2.0.bb	Trusted Firmware-A for STM32MP1
u-boot-stm32mp	recipes-bsp/u-boot/u-boot-stm32mp_2018.11.bb	Universal Boot Loader for embedded devices for stm32mp
u-boot-stm32mp-extlinux	recipes-bsp/u-boot/u-boot-stm32mp-extlinux.bb	Provide 'extlinux.conf' file for U-Boot
u-boot-stm32mp-splash	recipes-bsp/u-boot/u-boot-stm32mp-splash_2018.11.bb	Universal Boot Loader Splash Screen for stm32mp embedded devices
wifi-suspend	recipes-connectivity/wifi/wifi-suspend.bb	Systemd service to suspend/resume correctly the wifi
gcc-arm-none-eabi-native	recipes-devtools/gcc-arm-none-eabi/gcc-arm-none-eabi-native_7.bb	Baremetal GCC for ARM
nativesdk-gcc-arm-none-eabi	recipes-devtools/gcc-arm-none-eabi/nativesdk-gcc-arm-none-eabi_7.bb	Baremetal GCC for ARM
openocd-stm32mp	recipes-devtools/openocd/openocd-stm32mp_0.10.0.bb	Free and Open On-Chip Debugging, In-System Programming and Boundary-Scan Testing
	recipes-devtools/sdcard-raw-tools	Script for creating raw SDCARD image

Recipe Name	Path of recipe	Description
sdcard-raw-tools	/sdcard-raw-tools.bb	ready to flash
linux-examples-stm32mp1	recipes-extended/linux-examples /linux-examples-stm32mp1.bb	ST STM32MP1 projects for Linux examples
m4fwcoredump	recipes-extended/m4coredump /m4fwcoredump.bb	Script to manage coredump of cortexM4
m4projects-stm32mp1	recipes-extended/m4projects /m4projects-stm32mp1.bb	STM32MP1 Firmware examples for CM4
gcnano-userland-multi-binary-debug-stm32mp	recipes-graphics/gcnano-userland /gcnano-userland-multi-binary-debug-stm32mp.bb	[DEBUG] Vivante libraries OpenGL ES, OpenVG and EGL (multi backend)
gcnano-userland-multi-binary-stm32mp	recipes-graphics/gcnano-userland /gcnano-userland-multi-binary-stm32mp.bb	Vivante libraries OpenGL ES, OpenVG and EGL (multi backend)
linux-firmware-bluetooth-bcm4343	recipes-kernel/linux-firmware/linux-firmware-bluetooth-bcm4343.bb	Bluetooth firmware for BCM4343
linux-stm32mp	recipes-kernel/linux/linux-stm32mp_4.19.bb	Linux STM32MP Kernel
optee-os-stm32mp	recipes-security/optee/optee-os-stm32mp_3.3.0.bb	OPTEE TA development kit for stm32mp
st-image-bootfs	recipes-st/images/st-image-bootfs.bb	STM32MP bootfs Image
st-image-userfs	recipes-st/images/st-image-userfs.bb	STM32MP userfs Image
st-image-vendorfs	recipes-st/images/st-image-vendorfs.bb	STM32MP vendorfs Image
hidapi-stm32mp	recipes-support/hidapi/hidapi-stm32mp_0.8.0-rc1.bb	Multi-platform library to interface with USB and Bluetooth HID-Class devices
libopencsd	recipes-support/libopencsd /libopencsd_0.10.0.bb	An open source CoreSight Trace Decode library
libopencsd	recipes-support/libopencsd /libopencsd_0.10.0.bb	CoreSight Trace Decode library

Addons on recipes: configuration, patch, ..

Recipe Name	Path of recipe
alsa-lib	recipes-bsp/alsa/alsa-lib_%.bbappend
base-files	recipes-core/base-files/base-files_%.bbappend
busybox	recipes-core/busybox/busybox_%.bbappend
	recipes-core/meta/target-sdk-provides-dummy.

Addons on recipes: configuration, patch, ..	
Recipe Name	**Path of recipe**
target-sdk-provides-dummy	bbappend
systemd-conf	recipes-core/systemd/systemd-conf.bbappend
gdb-cross	recipes-devtools/gdb/gdb-cross_%.bbappend
gdb-cross-canadian	recipes-devtools/gdb/gdb-cross-canadian_%.bbappend
libdrm	recipes-graphics/drm/libdrm_%.bbappend
weston	recipes-graphics/wayland/weston_5.0.0.bbappend
weston-init	recipes-graphics/wayland/weston-init.bbappend
linux-firmware	recipes-kernel/linux-firmware/linux-firmware_git.bbappend
pulseaudio	recipes-multimedia/pulseaudio/pulseaudio_%.bbappend

11.1.2 meta-st-stm32mp-addons

Name of layer	Description
meta-st-stm32mp-addons	BSP addons layer for stm32mp

Addons on recipes: configuration, patch, ..	
Recipe Name	**Path of recipe**
alsa-state-stm32mp1	recipes-bsp/alsa/alsa-state-stm32mp1.bbappend
tf-a-stm32mp	recipes-bsp/trusted-firmware-a/tf-a-stm32mp_%.bbappend
u-boot-stm32mp	recipes-bsp/u-boot/u-boot-stm32mp_%.bbappend
m4projects-stm32mp1	recipes-extended/m4projects/m4projects-stm32mp1.bbappend
linux-stm32mp	recipes-kernel/linux/linux-stm32mp_%.bbappend
optee-os-stm32mp	recipes-security/optee/optee-os-stm32mp_%.bbappend

11.1.3 meta-st-openstlinux

Name of layer	Description
meta-st-openstlinux	OpenSTLinux layer - framework/image settings

Recipe Name	Path of recipe	Description
resize-helper	recipes-bsp/tools/resize-helper.bb	Tools for resizing the file system
usbotg-gadget-config	recipes-bsp/tools/usbotg-gadget-config.bb	The goal is to enable USB gadget configuration
psplash-drm	recipes-core/psplash/psplash-drm.bb	Basic splash screen which display a picture on DRM/KMS
systemd-mount-partitions	recipes-core/systemd/systemd-mount-partitions.bb	Mount partitions
systemd-networkd-configuration	recipes-core/systemd/systemd-networkd-configuration.bb	Basic networkd configuration
libb64	recipes-extended/libb64/libb64_git.bb	Library for base64 encoding/decoding data
lsb-openstlinux	recipes-extended/lsb/lsb-openstlinux.bb	LSB support to check gpu provider
openstlinux-qt-eglfs	recipes-qt/qt5/openstlinux-qt-eglfs.bb	add script and material to help with eglfs qt configuration
ai-hand-char-reco-launcher	recipes-samples/ai-nn-application/ai-hand-char-reco-launcher.bb	Hand writing character recognition launcher based on HCR Neural Network
demo-launcher	recipes-samples/demo/demo-launcher.bb	Python script which launch several use-cases
qrenc	recipes-samples/demo/qrenc.bb	qrenc which uses libqrencode to generate QR-code
sensors-iks01a2	recipes-samples/demo/sensors-iks01a2.bb	Python script which monitor temperature from sensor on Nucleo extension board iks01a2a
event-gtk-player	recipes-samples/event-gtk-player/event-gtk-player_git.bb	GTK player with touch screen management
demo-hotspot-wifi	recipes-samples/hotspot-wifi/demo-hotspot-wifi.bb	Shell script to enable/disable hotsopt wifi configuration
st-example-image-qt	recipes-samples/images/st-example-image-qt.bb	ST example of image based on QT framework.
st-example-image-x11	recipes-samples/images/st-example-image-x11.bb	ST example of image based on X11.
st-example-image-xfce	recipes-samples/images/st-example-image-xfce.bb	ST example of image based on XFCE framework.
packagegroup-framework-sample-qt	recipes-samples/packagegroups/packagegroup-framework-sample-qt.bb	Framework sample qt components

Recipe Name	Path of recipe	Description
packagegroup-framework-sample-qt-extra	recipes-samples/packagegroups/packagegroup-framework-sample-qt-extra.bb	Framework sample qt extra components
packagegroup-framework-sample-x11	recipes-samples/packagegroups/packagegroup-framework-sample-x11.bb	Framework sample x11 components
packagegroup-framework-sample-xfce	recipes-samples/packagegroups/packagegroup-framework-sample-xfce.bb	Framework sample xfce components
weston-cube	recipes-samples/weston-cube/weston-cube_git.bb	3D cube for wayland/weston windows
optee-client	recipes-security/optee/optee-client.bb	OPTEE Client
optee-examples	recipes-security/optee/optee-examples.bb	OP-TEE examples
optee-test	recipes-security/optee/optee-test_git.bb	OP-TEE sanity testsuite
packagegroup-optee-core	recipes-security/packagegroups/packagegroup-optee-core.bb	OPTEE core packagegroup
packagegroup-optee-test	recipes-security/packagegroups/packagegroup-optee-test.bb	OPTEE test packagegroup
libsmaf	recipes-security/smaf/libsmaf.bb	SMAF library
st-image-core	recipes-st/images/st-image-core.bb	OpenSTLinux core image.
st-image-weston	recipes-st/images/st-image-weston.bb	OpenSTLinux weston image with basic Wayland support (if enable in distro).
packagegroup-framework-core-base	recipes-st/packagegroups/packagegroup-framework-core-base.bb	Framework core base components for display and mutlimedia
packagegroup-framework-core	recipes-st/packagegroups/packagegroup-framework-core.bb	Framework core components for display and mutlimedia
packagegroup-framework-core-extra	recipes-st/packagegroups/packagegroup-framework-core-extra.bb	Framework core extra components for display and mutlimedia
packagegroup-framework-tools-base	recipes-st/packagegroups/packagegroup-framework-tools-base.bb	Framework tools base components (core, kernel,network,audio,ui,python2,python3)
packagegroup-	recipes-st/packagegroups	Framework tools components (core,kernel,

Recipe Name	Path of recipe	Description
framework-tools	/packagegroup-framework-tools.bb	network,audio,ui,python2,python3)
packagegroup-framework-tools-extra	recipes-st/packagegroups /packagegroup-framework-tools-extra.bb	Framework tools extra components (core, kernel,network,audio,ui,python2,python3)
packagegroup-gstreamer1-0	recipes-st/packagegroups /packagegroup-gstreamer1-0.bb	Gstreamer 1.0 components

Recipes addons, such as configurations and patches.

Recipe name	Recipe path
openssh	oe-core/recipes-connectivity/openssh/openssh_%. bbappend
wireless-regdb	oe-core/recipes-connectivity/wireless-regdb/wireless-regdb_%.bbappend
packagegroup-core-ssh-openssh	oe-core/recipes-core/packagegroups/packagegroup-core-ssh-openssh.bbappend
dpkg	oe-core/recipes-devtools/dpkg/dpkg_%.bbappend
mesa	oe-core/recipes-grapics/mesa/mesa_18.1.9.bbappend
ckermit	oe-core/recipes-support/ckermit/ckermit_%.bbappend
libiio	oe-core/recipes-support/libiio/libiio_git.bbappend
glmark2	recipes-benchmark/glmark2/glmark2_%.bbappend
bluez5	recipes-connectivity/bluez5/bluez5_%.bbappend
connman	recipes-connectivity/connman/connman_%.bbappend
busybox	recipes-core/busybox/busybox_%.bbappend
packagegroup-core-eclipse-debug	recipes-core/packagegroups/packagegroup-core-eclipse-debug.bbappend
packagegroup-core-tools-profile	recipes-core/packagegroups/packagegroup-core-tools-profile.bbappend
systemd	recipes-core/systemd/systemd_239.bbappend
systemd-conf	recipes-core/systemd/systemd-conf.bbappend
systemd-serialgetty	recipes-core/systemd/systemd-serialgetty.bbappend
bash	recipes-extended/bash/bash_%.bbappend
sysdig	recipes-extended/sysdig/sysdig_git.bbappend
cairo	recipes-graphics/cairo/cairo_%.bbappend
kmscube	recipes-graphics/kmscube/kmscube_git.bbappend

Recipes addons, such as configurations and patches.	
Recipe name	**Recipe path**
lxdm	recipes-graphics/lxdm/lxdm_0.5.3.bbappend
wayland-protocols	recipes-graphics/wayland/wayland-protocols_1.16.bbappend
weston-init	recipes-graphics/wayland/weston-init.bbappend
xserver-nodm-init	recipes-graphics/x11-common/xserver-nodm-init_%.bbappend
xinit	recipes-graphics/xorg-app/xinit_%.bbappend
pixman	recipes-graphics/xorg-lib/pixman_0.34.0.bbappend
alsa-utils	recipes-multimedia/alsa/alsa-utils_1.1.6.bbappend
gstreamer1.0-libav	recipes-multimedia/gstreamer/gstreamer1.0-libav_1.14.4.bbappend
gstreamer1.0-plugins-bad	recipes-multimedia/gstreamer/gstreamer1.0-plugins-bad_1.14.4.bbappend
gstreamer1.0-plugins-base	recipes-multimedia/gstreamer/gstreamer1.0-plugins-base_1.14.4.bbappend
gstreamer1.0-plugins-good	recipes-multimedia/gstreamer/gstreamer1.0-plugins-good_1.14.4.bbappend
pulseaudio	recipes-multimedia/pulseaudio/pulseaudio_12.2.bbappend
v4l-utils	recipes-multimedia/v4l2apps/v4l-utils_1.16.0.bbappend
packagegroup-qt5-toolchain-target	recipes-qt/packagegroups/packagegroup-qt5-toolchain-target.bbappend
qtbase	recipes-qt/qt5/qtbase_git.bbappend
qtmultimedia	recipes-qt/qt5/qtmultimedia_git.bbappend
st-image-userfs	recipes-samples/images/st-image-userfs.bbappend
ntp	recipes-support/ntp/ntp_%.bbappend
netdata	recipes-webadmin/netdata/netdata_git.bbappend

Trusted Firmware for Arm Cortex-A

Das U-Boot -- the Universal Boot Loader (see U-Boot_overview)

Open Portable Trusted Execution Environment

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.

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

Direct Memory Access

Digital Filter for Sigma-Delta Modulator

Serial Audio Interface (Mechanism used to transfer non-buffered audio data between processors and/or audio converters.)

Integrated Interchip Sound

Pulse Width Modulation

BlueTooth

Universal Asynchronous Receiver/Transmitter

Digital Camera Memory Interface

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

Consumer Electronics Control (HDMI standard)

Inter-Processor Communication Controller

Cyclic redundancy check calculation unit

Random Number Generator

Doubledata rate (memory domain)

Non Applicable

Display Serial Interface (MIPI® Alliance standard)

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

Ethernet

Graphics Processing Units

High-Definition Multimedia Interface (HDMI standard)

LCD TFT Display Controller (STM32 specific)

Inter-Integrated Circuit (Bi-directional 2-wire bus standard for efficient inter-IC control.)

Hardware Semaphore

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

General-Purpose Input/Output (A realization of open ended transmission between devices on an embedded level. These pins available on a processor can be programmed to be used to either accept input or provide output to external devices depending on user desires and applications requirements.)

Power Management Integrated Circuit

Real Time Clock

Serial Peripheral Interface

Android Runtime (see https://source.android.com/devices/tech/dalvik)

USB Host (STM32 specific)

USB On-The-Go (Capability/type of USB port, acting primarily as USB device, to also act as USB host. Also known as USB OTG.)

voltage reference buffer (STM32 specific)

Independent Watchdog

Secure digital input/output

Read Only Memory

First Stage Boot Loader

Second Stage Boot Loader

Secondary Program Loader, *Also known as* ***U-Boot SPL***

Reset and Clock Control

Universal Synchronous/Asynchronous Receiver/Transmitter

MultimediaCard

Boot and Security and OTP control

One Time Programmed

System Configuration

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

Boot Loader stage 2

Open NAND Flash interface (The ONFI working group, acronym for Open NAND Flash Interface, was founded in 2005. The group's mission consists in creating a common industry standard for NAND Flash interfaces, to simplify integration of NAND Flash memory into consumer electronics (CE) devices and computing platforms. ST is one of the co-founder companies together with Hynix, Intel, Micron, Phison and Sony.)

Multi Speed Internal oscillator (STM32 clock source)

High Speed Internal oscillator (STM32 clock source) or High Speed Synchronous Serial Interface (MIPI® Alliance standard)

Elliptic Curve Digital Signature Algorithm

Power State Coordination Interface

Extended TrustZone Protection Controller

input/output

Silicon Provider

Low Power (MIPI® Alliance DSI standard)

Operating System

Generic Interrupt Controller

Central processing unit

System Management Bus

Tamper

Board support package

Open Graphics Library (See http://www.opengl.org/ for more details)

Open Vector Graphics (See http://www.khronos.org/openvg/ for more details)

Khronos Native Platform Graphics Interface (See http://www.khronos.org/egl/ for more details)

Trusted Application

Human Interface Device (for USB, Bluetooth...)

Direct Rendering Manager (kernel module that gives direct hardware access to DRI clients, find more information on official DRI web site http://dri.freedesktop.org/wiki/DRM)

Kernel Mode Setting