



Coprocessor power management



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Contents

1 Article purpose	2
2 Low power modes available on the chip	2
2.1 Wakeup sources	3
3 Software overview	3
3.1 APIs description	3
3.2 Code source location	4

1 Article purpose

The purpose of this article is to give an overview of the software APIs available on the Arm[®] Cortex[®]-M4 (also named MCU) side to handle the low power modes.

2 Low power modes available on the chip

Refer to [STM32MP15 reference manuals](#) for the full description of the modes.

The [AN5109 low power application note](#) also gives details on these modes.

The modes are handled by [RCC](#) and [PWR](#) peripherals.

The table below explains the chip hardware states corresponding to each low power mode.

Subsystem either refers to Arm[®] Cortex[®]-A7 side (also called MPU) or Arm[®] Cortex[®]-M4 side (also called MCU). A mode prefixed by 'C' refers to a subsystem mode.

A platform mode is the combination of MPU and MCU modes.

Level	Mode	Vddcore state	Clocks state
	MPU CRun	on	on
	MPU CStop	on	Subsystem off
	MPU CStandby	on	Subsystem off
	MCU CRun	on	on



Level	Mode	Vddcore state	Clocks state
Subsystem	MCU CStop	on	Subsystem off

MPU mode	MCU mode	Platform mode	Vddcore state	Clocks state
CRun	CRun	Run	On	On
CStop	CRun	Run	On	On
CStandby	CRun	Run	On	On
CRun	CStop	Run	On	On
CStop	CStop	Stop/LPLV-Stop/Standby	On/Retention/Off	Off/Off/Off
CStandby	CStop	Stop/LPLV-Stop/Standby	On/Retention/Off	Off/Off/Off

2.1 Wakeup sources

The above modes are left due to a wakeup event.

The following table gives the list of wakeup sources available in each mode.

Mode	Available wakeup sources
CStop /CStandby /Stop	BOR, PVD, AVD, Vbat mon, Temp mon, LSE CSS, RTC, TAMP, USB, CEC, ETH, US ART, I ² C, SPI, LPTIM, IWDG, GPIO, Wakeup pins
LPLV-Stop	BOR, PVD, AVD, Vbat mon, Temp mon, LSE CSS, RTC, TAMP, IWDG, GPIO, Wakeup pins
Standby	BOR, Vbat mon, Temp mon, LSE CSS, RTC, TAMP, IWDG, Wakeup pins

3 Software overview

The power HAL is used to select the Cortex-M4 low power mode.

Further information on HAL can be found here: [STM32CubeMP1 architecture](#)

3.1 APIs description

The power HAL supports the following APIs related to power management:

```
HAL_PWR_EnterSLEEPMode: CSleep mode is entered
```



HAL_PWR_EnterStopMode: CStop mode is entered allowing Stop as the deepest platform low power mode

HAL_PWR_EnterStandbyMode: CStop mode is entered allowing Standby as the deepest platform low power mode

3.2 Code source location

STM32CubeMP1 Package provides power HAL driver:

Drivers/STM32MP1xx_HAL_Driver/Src/stm32mp1xx_hal_pwr.c

Microcontroller Unit (MCUs have internal flash memory and are intended to operate with a minimum amount of external support ICs. They commonly are a self-contained, system-on-chip (SoC) designs.)

Microprocessor Unit

Brownout reset

Programmable Voltage Detector

Analog Voltage Detector

Low Speed External oscillator (STM32 clock source)

Cascading Style Sheets (web standard)

Real Time Clock

Tamper

Consumer Electronics Control (HDMI standard)

Ethernet

Universal Synchronous/Asynchronous Receiver/Transmitter

Serial Peripheral Interface

low-power timer (STM32 specific)

Independent Watchdog

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.)

Hardware Abstraction Layer