

STM32 RTOS ???? - ???? RTOS ??????????????

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? ?????

- `HAL_Delay` (Software Timer) `HAL_Delay`
 - `HAL_Delay`
 - `osDelay` `osDelay`
-

? RTOS Software Timer ??

RTOS `osDelay`

? ??

- `HAL_Delay`
 - `HAL_Delay` Timeout `HAL_Delay`
 - `osDelay`
-

? STM32CubeMX ?? Timer

Step 1??? Timer

- `Middleware > FreeRTOS > Timers`
- `Timer`

- `myTimer01`
- Period `1000` `ms`
- Callback Function `TimerCallback01`
- Auto-Reload

Step 2??????

- `StartDefaultTask`

```
osTimerStart(myTimer01Handle, 0);
```

Step 3??????

```
void TimerCallback01(void *argument)
{
    HAL_GPIO_TogglePin(GPIOC, GPIO_PIN_13);
}
```

? ????????

`osDelay()` Blocked

????? millis ??????? HAL_GetTick?

```
uint32_t last_tick = 0;
for(;;)
{
    if(HAL_GetTick() - last_tick >= 1000)
    {
        last_tick = HAL_GetTick();
        HAL_GPIO_TogglePin(GPIOA, GPIO_PIN_5);
    }
    // 
    osDelay(1); // CPU
}
```

????? FreeRTOS ???????

timer callback

??????

- Timer LED GPIO
 - osDelay
 -
-

??????

5 RTOS Memory Pool

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