

## Notes for C and C++ programming

Last update: April 28, 2021

[#c](#) [#c++](#)  
[#notes](#)

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## Customize theme to create personalized pages

Configure the theme, override some templates, design new pages and layouts.

Last update: April 28, 2021

[#mkdocs](#)  
[#jinja](#)

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## Clock sources and configure peripheral clock

Understand about the clock source and the frequency. Select the main clock source and its clock tree to enable, disable, and configure the clock on peripherals.

Last update: April 28, 2021

[#arm](#) [#stm32](#)  
[#clock](#)

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## General Purpose Input/Output pins

Understand about GPIO hardware, working modes and speeds, alternative function and input interrupts. Steps to control a GPIO using HAL. Example to blink LEDs and get input from a button.

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[#arm](#) [#stm32](#)  
[#gpio](#)

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## Notes for ARM and STM32 programming

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## Enable semihosting on ARM for debugging purpose

ARM semihosting is a distinctive feature of the ARM platform, that allows to use input and output functions on a host computer that get forwarded to the microcontrollers over a hardware debugger.

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[#arm](#) [#stm32](#) [#debug](#)  
[#semihosting](#)

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## Tool-chain and documents for developing on STM32 MCUs

Install a tool-chain including IDE, programmer, debugger for developing on STM32 ARM Cortex-M. List of necessary documents related to hardware and software. How to read and extract information from documents.

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[#toolchain](#)

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## Redirect the Standard IO to an UART terminal

UART is available in most of microcontrollers, so it can be used to print out debug information. Standard C has built-in functions to communicate on the standard io, such as printf(), gets(). To use those functions on an UART port, redirection technique is used, which re-writes some low-level functions.

Last update: April 28, 2021

#arm #stm32 #uart  
#redirect

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## Universal Synchronous Asynchronous Receiver Transmitter protocol

Understand about USART protocol, how to configure its clock, baud rate, and working mode. Steps to setup an USART module using HAL. Example to print messages, and get user's inputs in polling and interrupt modes.

Last update: April 28, 2021

#arm #stm32 #usart  
#uart

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## Print pages to PDF files

Install print plugins. Add cover page and customize styles for printing. Automatically export to PDF files when building the site.

Last update: April 27, 2021

#python  
#mkdocs

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## Backup SDCard and restore from saved image

Save the SDCard content to an image file to restore it later. Use Content-only mode and Incremental backup mode to reduce the backup size. This is helpful for systems running on an SDCard like Raspberry Pi.

Last update: April 23, 2021

#sdcard #backup  
#restore

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## Diagnostic Camera on I2C Bus

When the camera is not detected, check for a loosen cable or any hardware failure. Or diagnostic the camera module by checking responses on the I2C bus.

Last update: April 23, 2021

#pi #camera  
#i2c

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## Compile FFmpeg with Hardware Acceleration

Download FFmpeg source code and its dependent packages, then compile it on a Raspberry Pi to get a latest version of FFmpeg with new features or new libraries. A simple method thanks to an awesome

latest version of Ffmpeg with new features or new hardware. Example needed thanks to an awesome script.

Last update: April 23, 2021

#pi #ffmpeg #hardware accelerator  
#omx

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## Notes for Raspberry Pi

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#pi  
#notes

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## Monitor resource usage of an process

Create a bash script to execute a process and monitor its CPU and Memory usage using top, grep, and awk. The result is exported to text file, and optionally to a graph if gnuplot available.

Last update: April 23, 2021

#bash #top #grep #awk #performance  
#gnuplot

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## Save Power on Raspberry Pi

Save power when running on battery by turning off unused peripherals, or features.

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#pi  
#power

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## Setup Camera with V4L2, FFmpeg, and PiCamera

Enable Camera module on Raspberry Pi. Install drivers and applications to capture image or video from the camera. Compare the performance of some encoders used in ffmpeg and python picamera package.

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#pi #camera #v4l2 #ffmpeg #python  
#picamera

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## Setup Raspberry Pi in headless mode

Headless Mode means system runs without any primary input and output such as keyboard or monitor. The system won't use desktop environment and therefore GUI applications will not run.

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#pi  
#headless

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## Wifi Access Point

A Raspberry Pi within an Ethernet network can be used as a wireless access point, creating a secondary network. The resulting new wireless network is entirely managed by the Raspberry Pi.

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#pi #wifi  
#access point

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## Camera live streaming using HLS/DASH protocol

Use FFmpeg to generate playlist of video chunks used in HLS/DASH protocol. A simple web server is running on Apache, NGINX, or Python HTTP. Measure performance and delay of HLS/DASH streaming.

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[#pi](#) [#camera](#) [#stream](#) [#hls](#) [#dash](#)  
[#python](#)

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## Camera live streaming using H264 format

Use PiCamera to capture and make H264 video stream. Split video into H264 NAL units, and send over the internet via websocket. Decode H264 frames by Broadway.js.

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[#pi](#) [#stream](#) [#camera](#) [#h264](#) [#python](#)  
[#picamera](#)

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## Camera live streaming using MJPEG format

MJPEG streaming is a simple method to get low latency. It sends JPEG images over the network and display that sequence of images on the user webpage. However, it consumes much more bandwidth. A server can be easily made by Picamera and Python HTTP.

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[#pi](#) [#stream](#) [#camera](#) [#mjpeg](#)  
[#picamera](#)

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## Markdown syntax for writing documents

Install markdown extensions, use new markdown syntax, create better layout, write content faster.

Last update: April 23, 2021

[#markdown](#)

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## MkDocs plugins to manage blog's pages and content

Install MkDocs plugins, add them into the site, customize plugins and rendered content.

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[#mkdocs](#)

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## Interrupts management and events

An interrupt is an asynchronous event that causes stopping the execution of the current code on a priority basis. Interrupts originate by the hardware, and can be controlled via a Nested Vectored Interrupt Controller.

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[#interrupt](#)

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## Introduction to ARM Cortex-M and STM32 MCU

Overview about ARM Cortex and STM32 MCUs, with general information about registers, memory,

interrupts and CMSIS. Different types of STM32 MCUs.

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#arm  
#stm32

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### **Install and configure a blog based on Material for MkDocs**

Install Material for MkDocs, add Markdown extensions, modify layouts and styles.

Last update: April 22, 2021

#python  
#mkdocs

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