

Instalação do ambiente no Windows

- Instalar Cygwin
- Baixar o software do livro/bibliotecas
- Instalar o FreeRTOS
- Instalar o Compilador GCC-ARM
- Instalar o St-Flash e drivers ST-Link
- Opcional – Reverter drivers



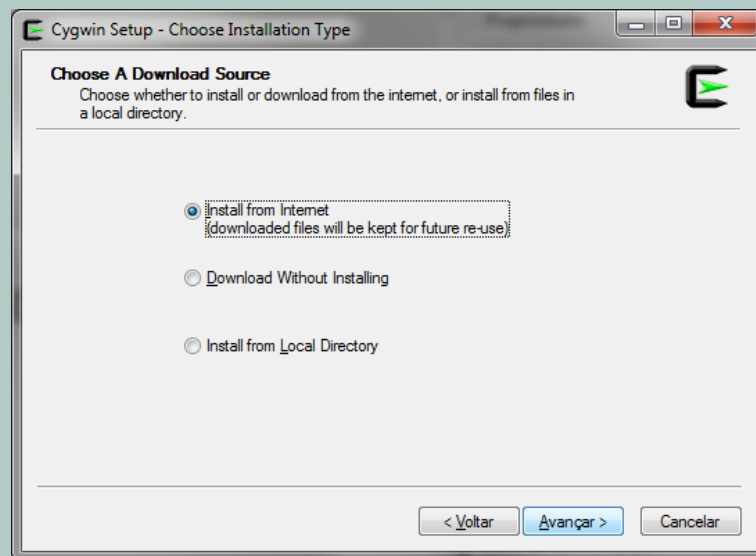
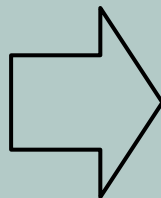
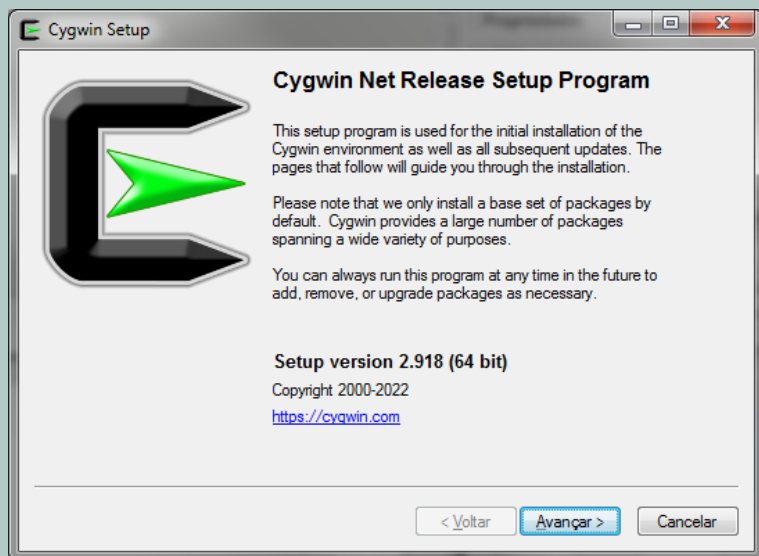
Cygwin

- Website: <https://www.cygwin.com>
- Instalador (online)

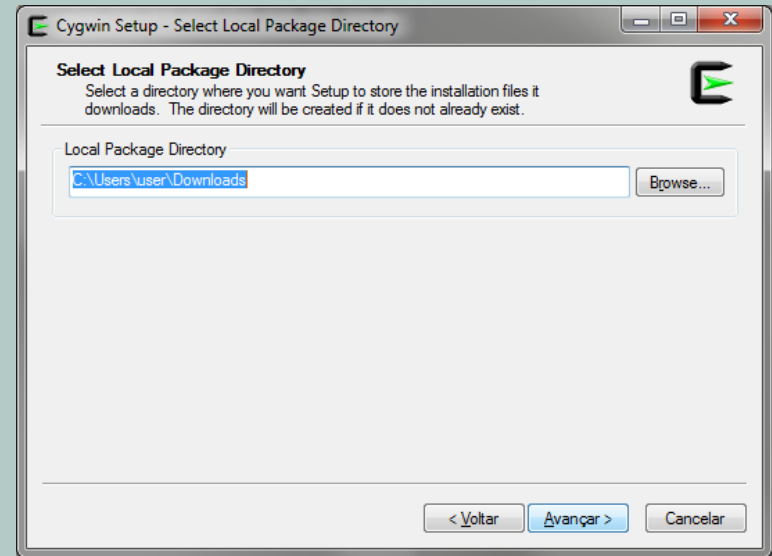
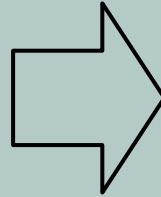
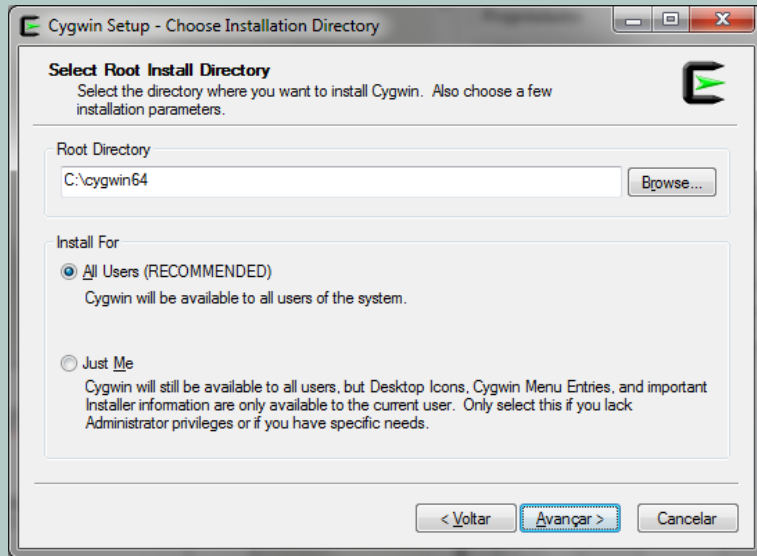
https://www.cygwin.com/setup-x86_64.exe

- Notas:
 - No instalador marcar também pacotes “make” e “git”
 - a versão de 32 bits, embora ainda disponível não é recomendada no site do Cygwin

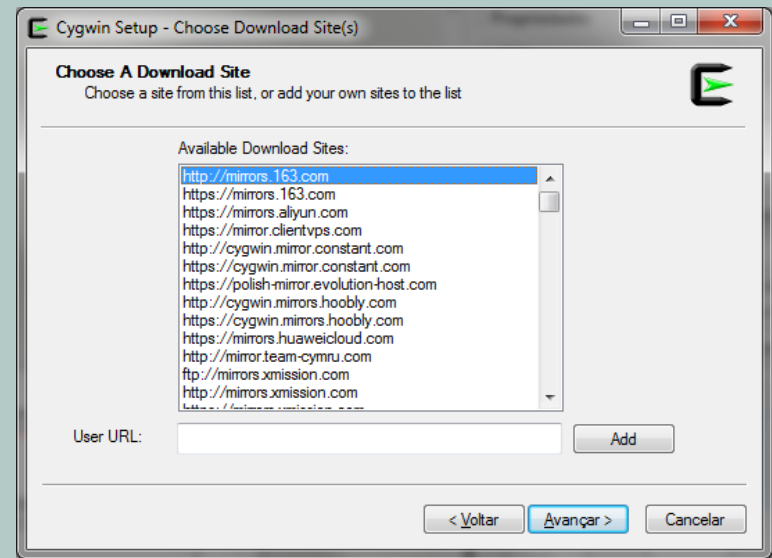
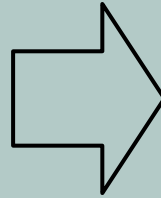
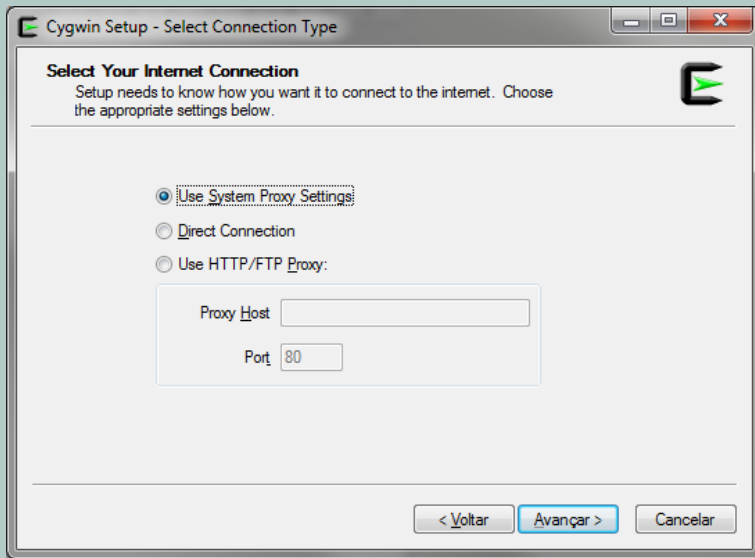
Instalador Cygwin 1/11



Instalador Cygwin 2/11

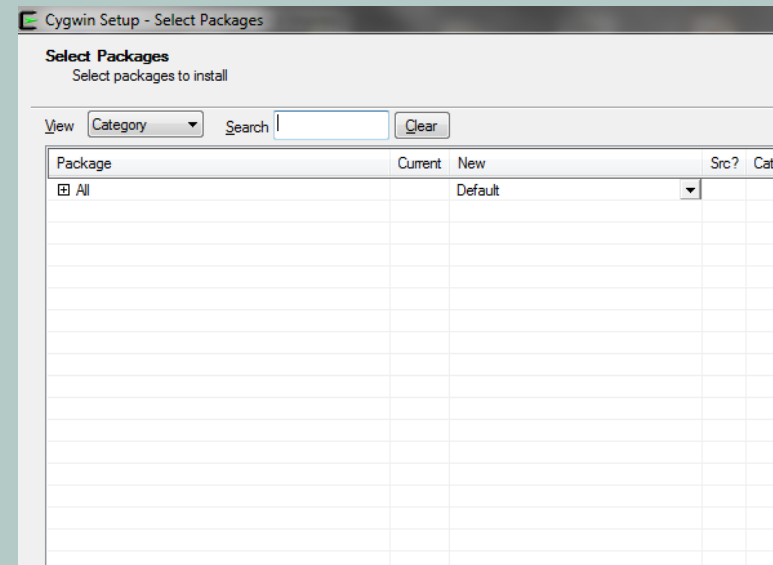
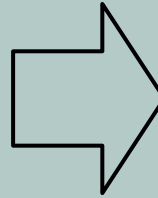
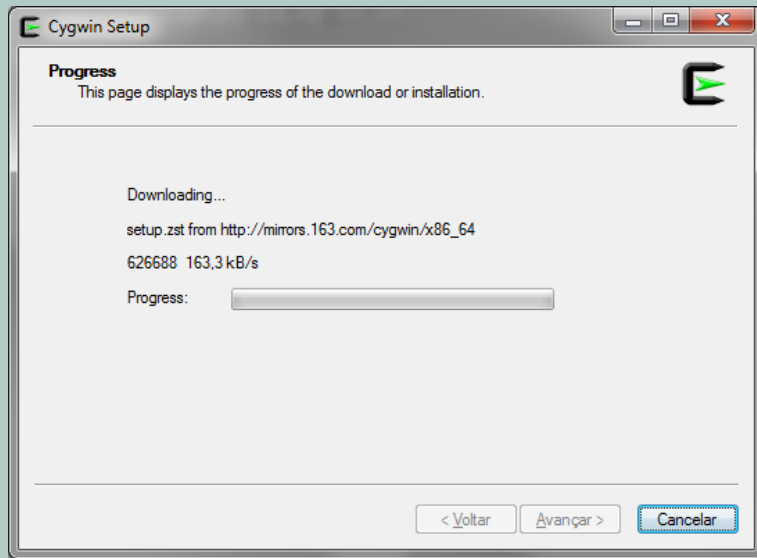


Instalador Cygwin 3/11



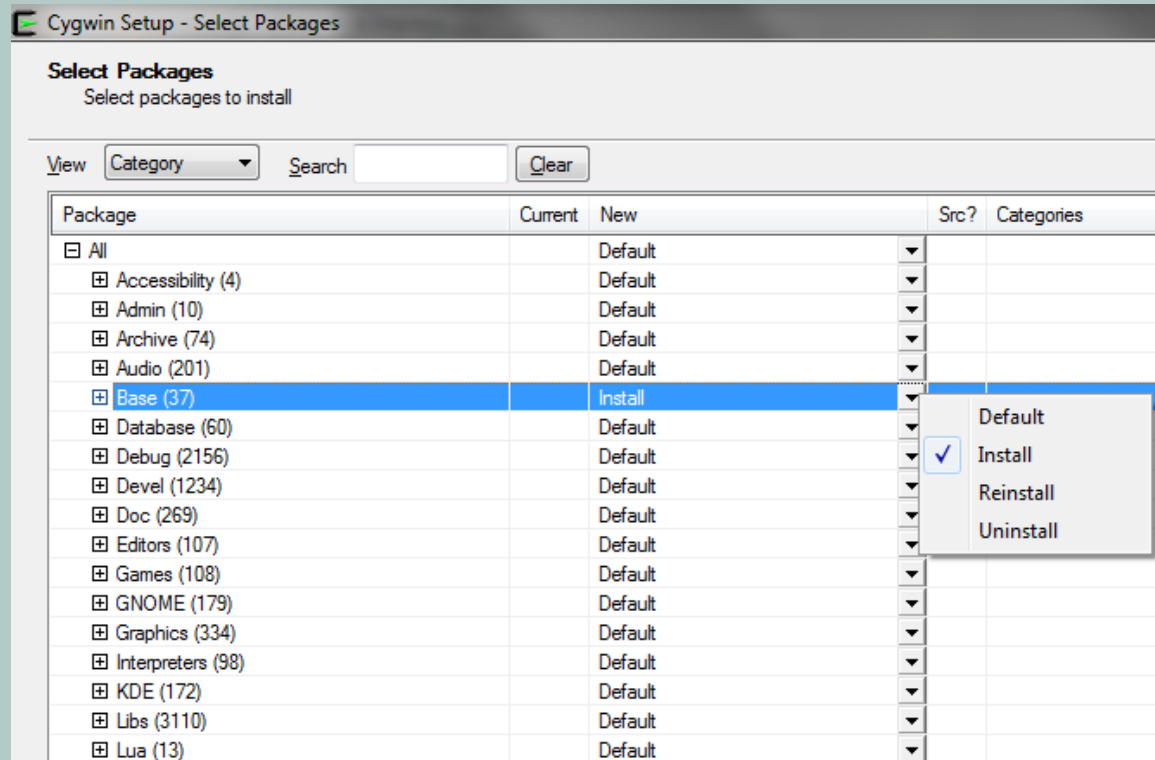
Clicar em um dos repositórios qualquer para escolher de onde baixar

Instalador Cygwin 4/11



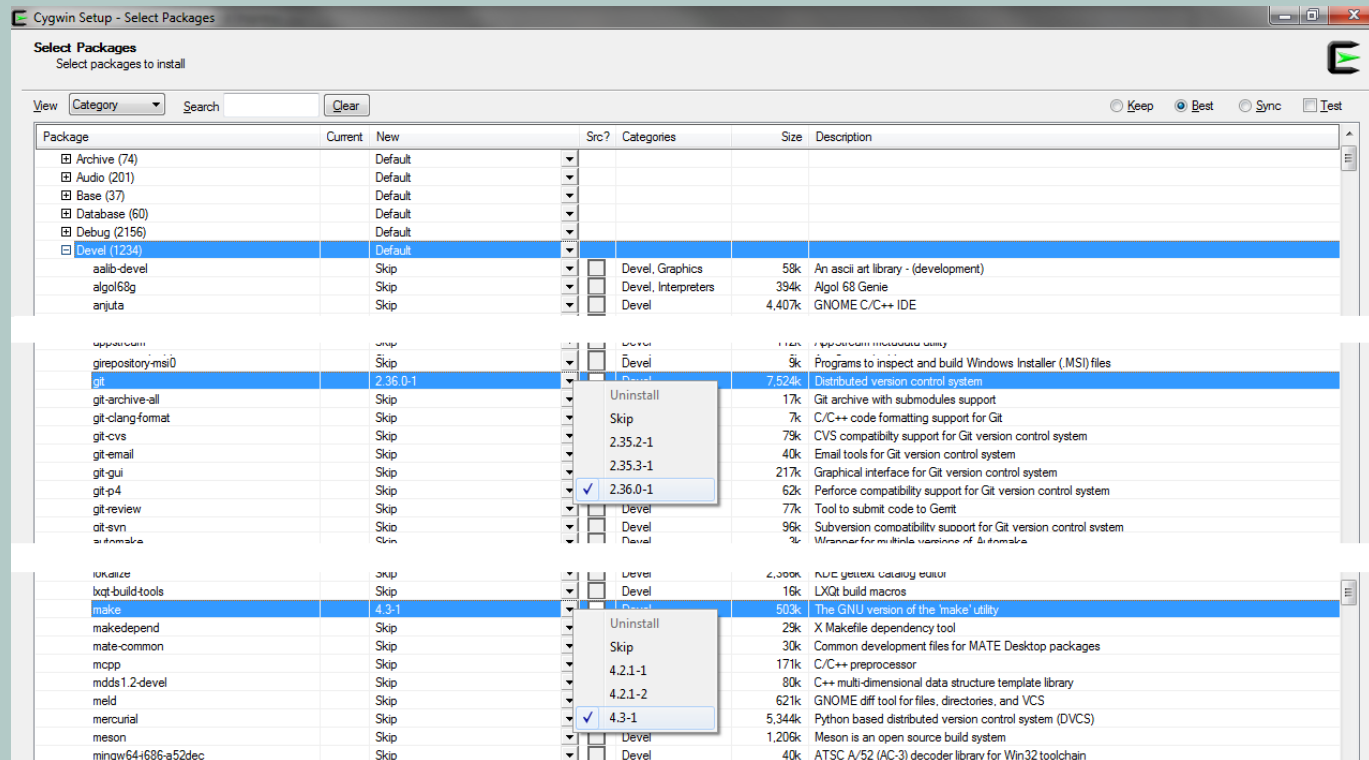
Clicar em [+] All para expandir lista dos pacotes de software disponíveis

Instalador Cygwin 5/11



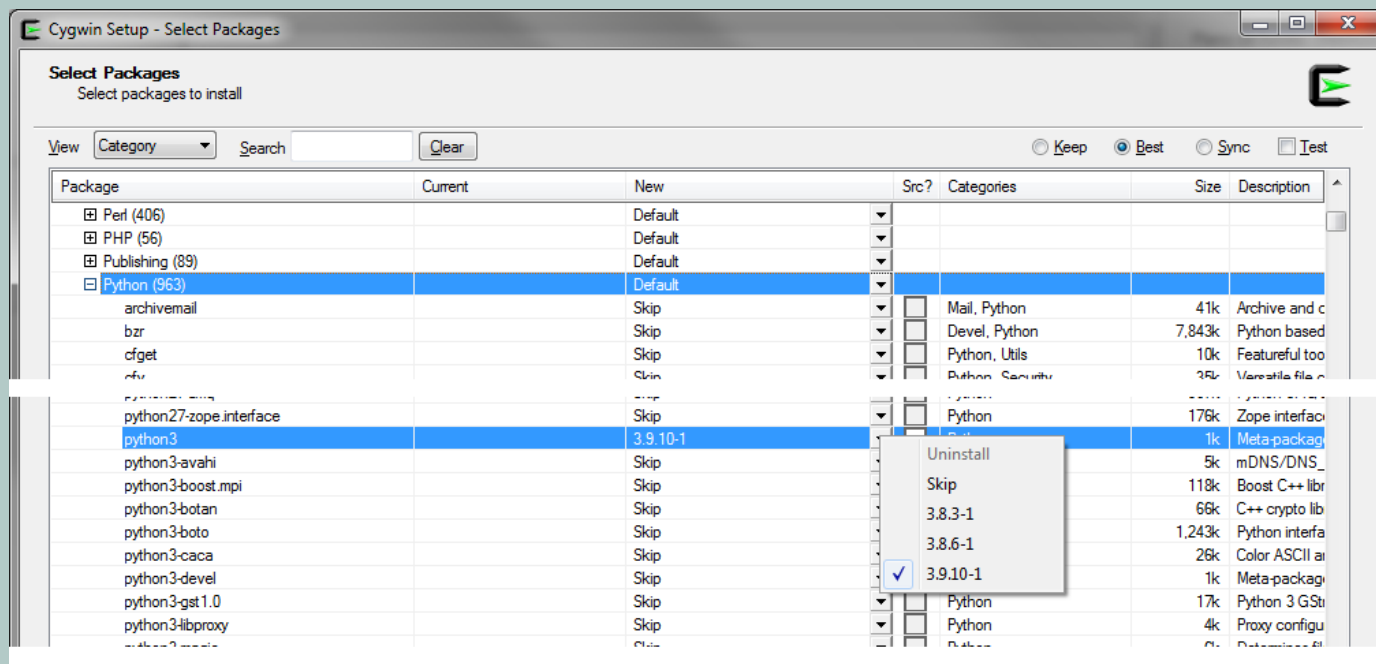
Marque para instalar a família de pacotes “Base” inteira

Instalador Cygwin 6/11



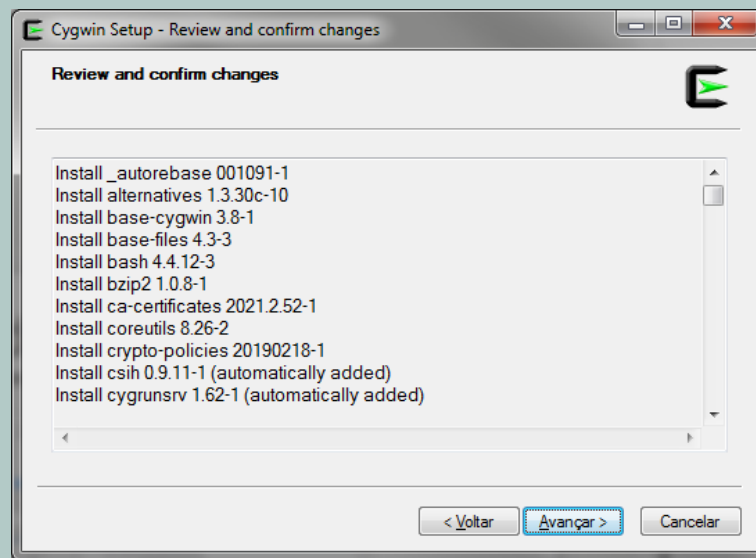
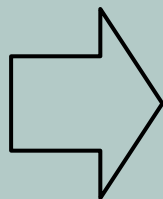
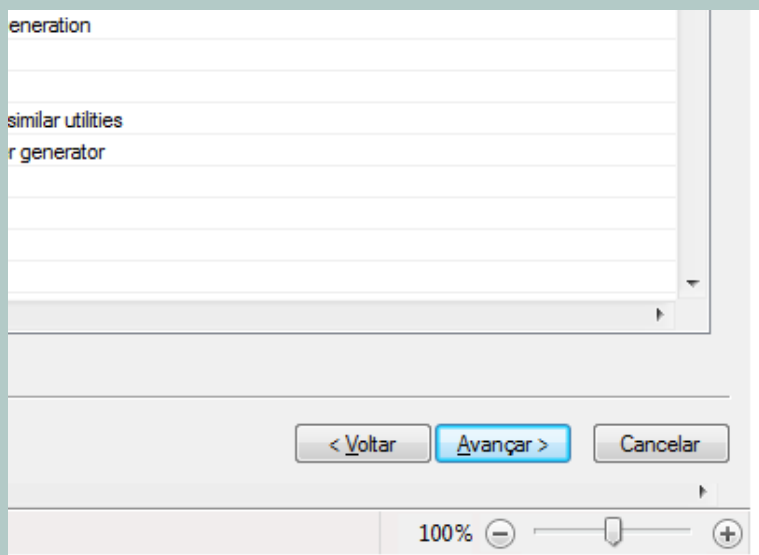
No ramo “Devel” marque para instalar o “make” e o “git”

Instalador Cygwin 7/11



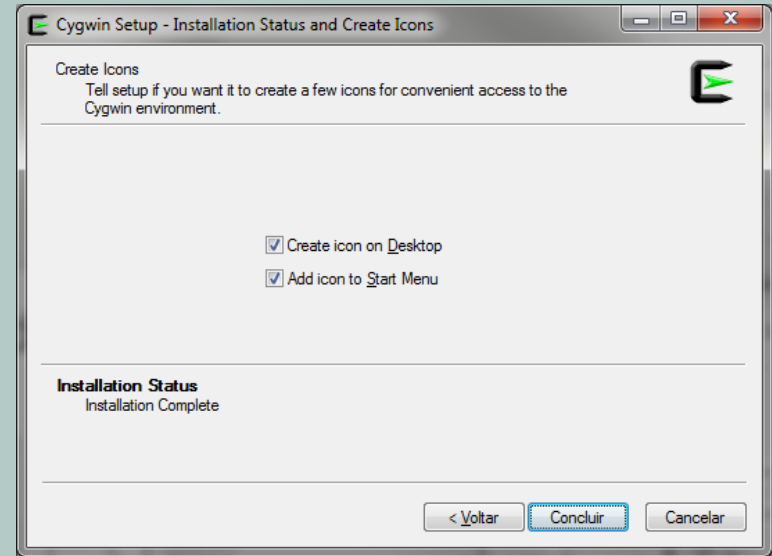
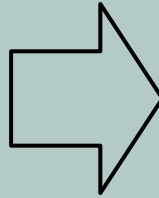
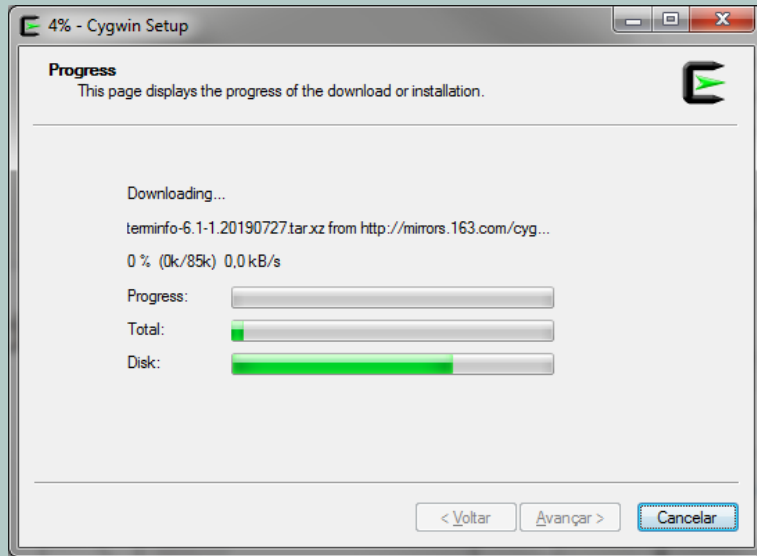
No ramo “Python” marque para instalar o “python3”

Instalador Cygwin 8/11



Após escolhidos os pacotes, clique em “Avançar”, depois confirme que os pacotes “git” e “make” estão entre os selecionados, e clique em “Avançar” novamente

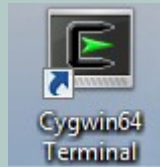
Instalador Cygwin 9/11



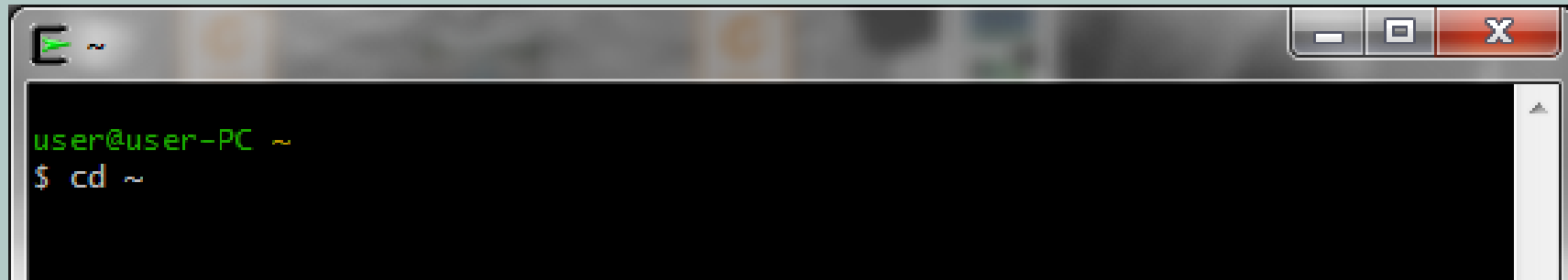
Após escolhidos os pacotes serem instalados, clique em concluir.

Instalador Cygwin 10/11

- Verifique que o ícone para o Terminal do ambiente Cygwin foi instalado:



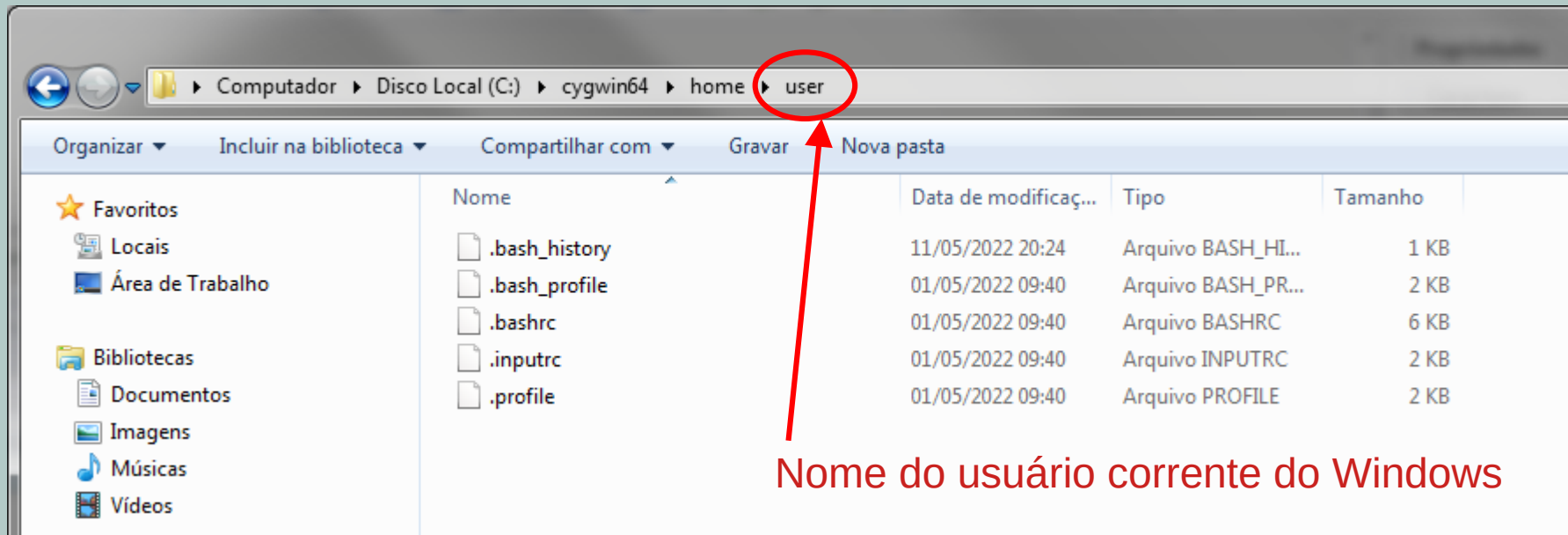
- Clique no ícone para o verificar que o ambiente Cygwin está operacional:



Instalador Cygwin 11/11

Notas:

- O diretório raiz do usuário do ambiente Cygwin encontra-se no seguinte caminho do Windows.
- Os arquivos iniciados em '.' são ocultos



Software do Livro / Bibliotecas

- O software do livro está disponível no Github:

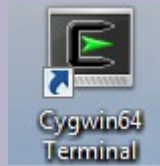
<https://github.com/ve3wwg/stm32f103c8t6>

- A biblioteca openCM3 também está disponível no Github:

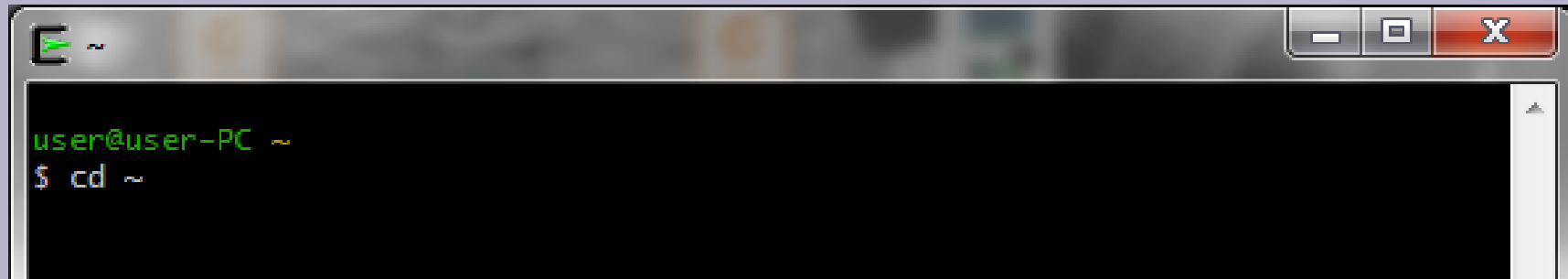
<https://github.com/libopencm3>

Baixar Software / Bibliotecas 1/3

- Abra uma janela de comando (Terminal) do Cygwin



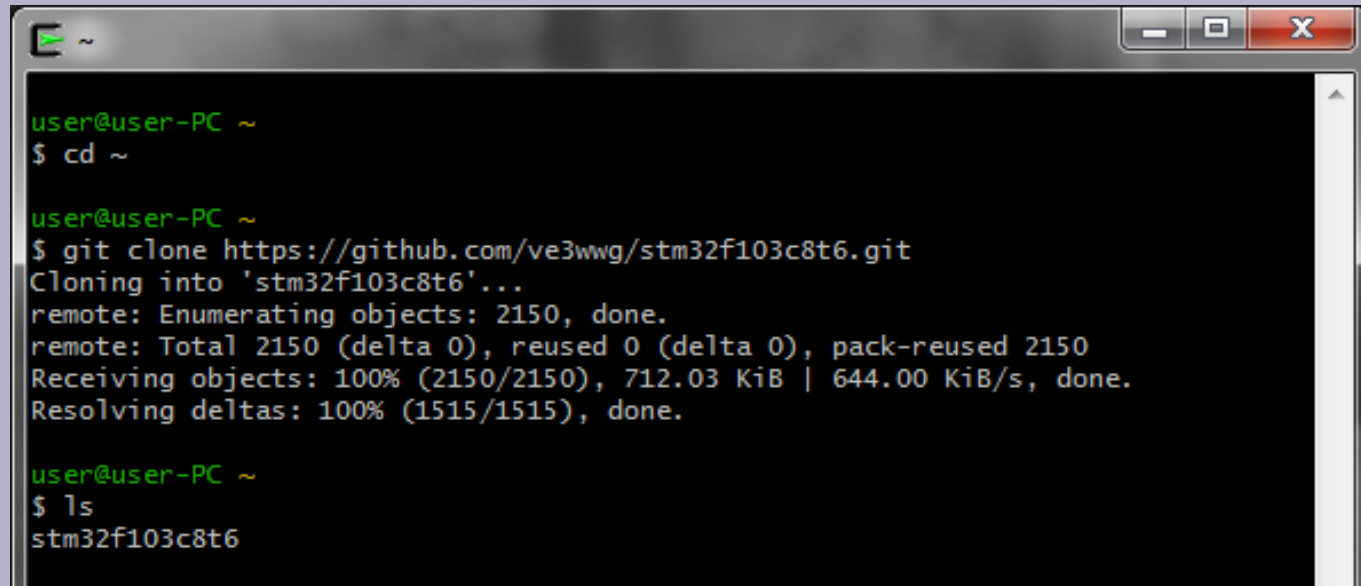
- Na janela aberta digite o comando “cd ~” para garantir que estamos no diretório raiz do usuário



Baixar Software / Bibliotecas 2/3

- A partir da janela raiz do usuário utilize o comando abaixo para baixar o software que acompanha o livro. Ao final da instalação utilize o comando 'ls' para verificar a existência do diretório stm32f103t6

```
git clone https://github.com/ve3wwg/stm32f103c8t6.git
```

A screenshot of a terminal window with a dark background and light green text. The window title bar shows a green icon and the text '~'. The terminal content shows the user at the root directory (~) running 'cd ~', then cloning a repository from GitHub. The cloning process shows progress for enumerating objects, total objects, and resolving deltas. Finally, the user runs 'ls' and the output shows the directory 'stm32f103c8t6' has been created.

```
user@user-PC ~  
$ cd ~  
  
user@user-PC ~  
$ git clone https://github.com/ve3wwg/stm32f103c8t6.git  
Cloning into 'stm32f103c8t6'...  
remote: Enumerating objects: 2150, done.  
remote: Total 2150 (delta 0), reused 0 (delta 0), pack-reused 2150  
Receiving objects: 100% (2150/2150), 712.03 KiB | 644.00 KiB/s, done.  
Resolving deltas: 100% (1515/1515), done.  
  
user@user-PC ~  
$ ls  
stm32f103c8t6
```


Baixar Software / Bibliotecas 3/3

- Use o comando 'cd' para entrar no diretório stm32f103c8t6 e em seguida digite comando abaixo. Ao final da instalação utilize o comando 'ls' para verificar a existência dos diretórios da biblioteca libopencm3:

```
git clone https://github.com/libopencm3/libopencm3.git
```

```
user@user-PC ~
$ cd ~/stm32f103c8t6

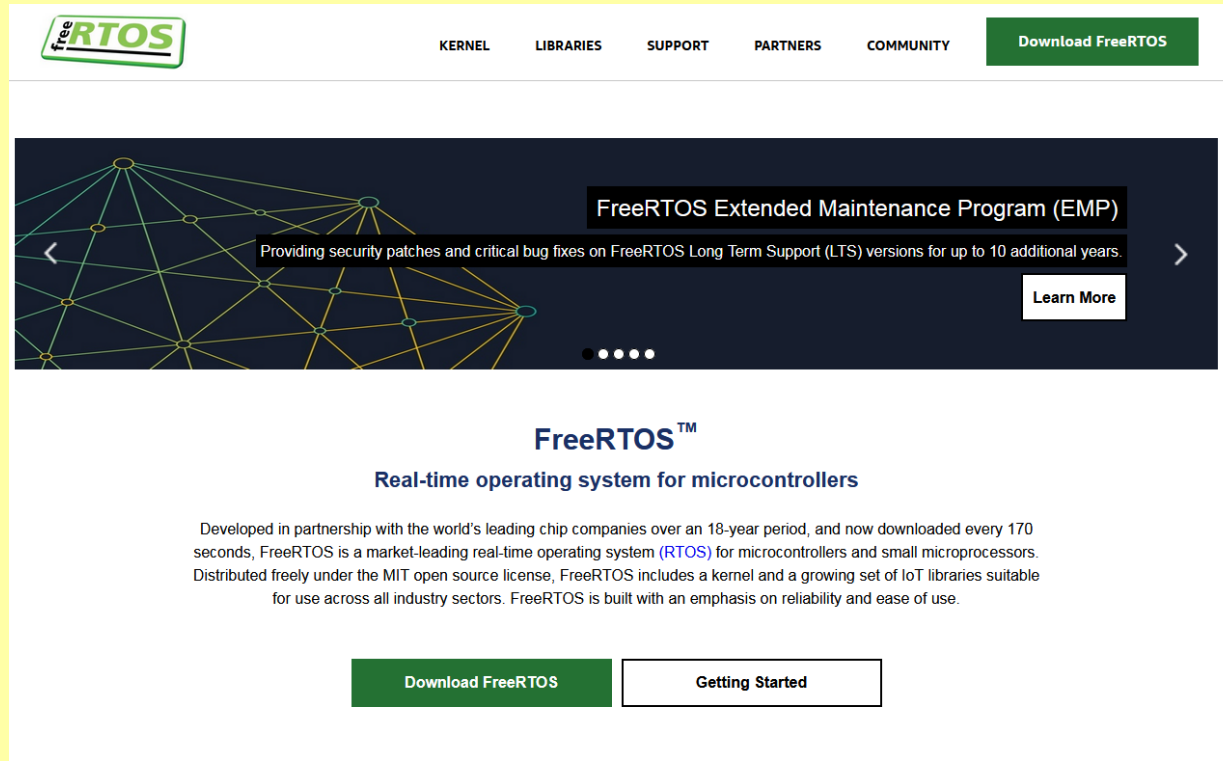
user@user-PC ~/stm32f103c8t6
$ git clone https://github.com/libopencm3/libopencm3.git
Cloning into 'libopencm3'...
remote: Enumerating objects: 30203, done.
remote: Counting objects: 100% (547/547), done.
remote: Compressing objects: 100% (251/251), done.
remote: Total 30203 (delta 333), reused 410 (delta 292), pack-reused 29656
Receiving objects: 100% (30203/30203), 7.02 MiB | 619.00 KiB/s, done.
Resolving deltas: 100% (19618/19618), done.
Updating files: 100% (1195/1195), done.

user@user-PC ~/stm32f103c8t6
$ ls
LICENSE  Makefile.incl  hse  libopencm3  miniblink  stlink  uart
Makefile  README.md     hsi  mco_pll2   rtos       stm32f103c8t6.ld  uarthewfc
```

FreeRTOS

- O FreeRTOS encontra-se disponível como um pacote ZIP na página do projeto

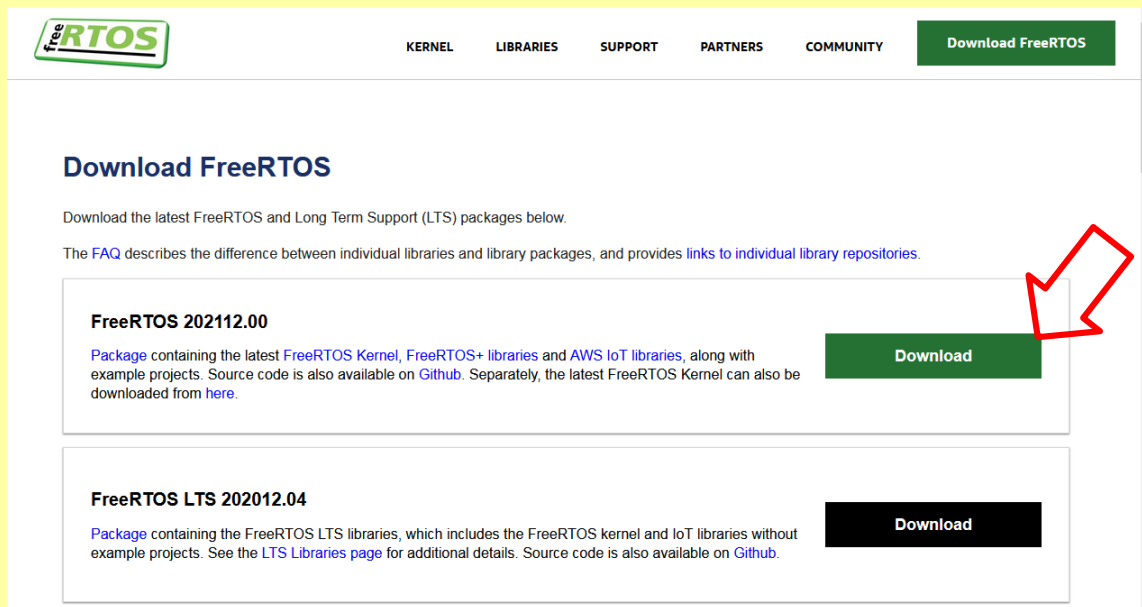
<http://www.freertos.org>



Baixar FreeRTOS 1/5

- Entre no website do FreeRTOS e baixe o pacote com o kernel + bibliotecas

www.freertos.org



The screenshot shows the 'Download FreeRTOS' page on the official website. At the top, there is a navigation bar with links for 'KERNEL', 'LIBRARIES', 'SUPPORT', 'PARTNERS', and 'COMMUNITY', along with a 'Download FreeRTOS' button. The main heading is 'Download FreeRTOS'. Below it, a paragraph states: 'Download the latest FreeRTOS and Long Term Support (LTS) packages below.' Another paragraph mentions: 'The [FAQ](#) describes the difference between individual libraries and library packages, and provides [links to individual library repositories](#).' There are two download options listed in boxes. The first is 'FreeRTOS 202112.00', described as a 'Package containing the latest FreeRTOS Kernel, FreeRTOS+ libraries and AWS IoT libraries, along with example projects. Source code is also available on [Github](#). Separately, the latest FreeRTOS Kernel can also be downloaded from [here](#).' To the right of this description is a green 'Download' button, which is highlighted by a red hand-drawn arrow. The second option is 'FreeRTOS LTS 202012.04', described as a 'Package containing the FreeRTOS LTS libraries, which includes the FreeRTOS kernel and IoT libraries without example projects. See the [LTS Libraries page](#) for additional details. Source code is also available on [Github](#).' To the right of this description is a black 'Download' button.

FreeRTOS 202112.00

Package containing the latest [FreeRTOS Kernel](#), [FreeRTOS+ libraries](#) and [AWS IoT libraries](#), along with example projects. Source code is also available on [Github](#). Separately, the latest FreeRTOS Kernel can also be downloaded from [here](#).

Download

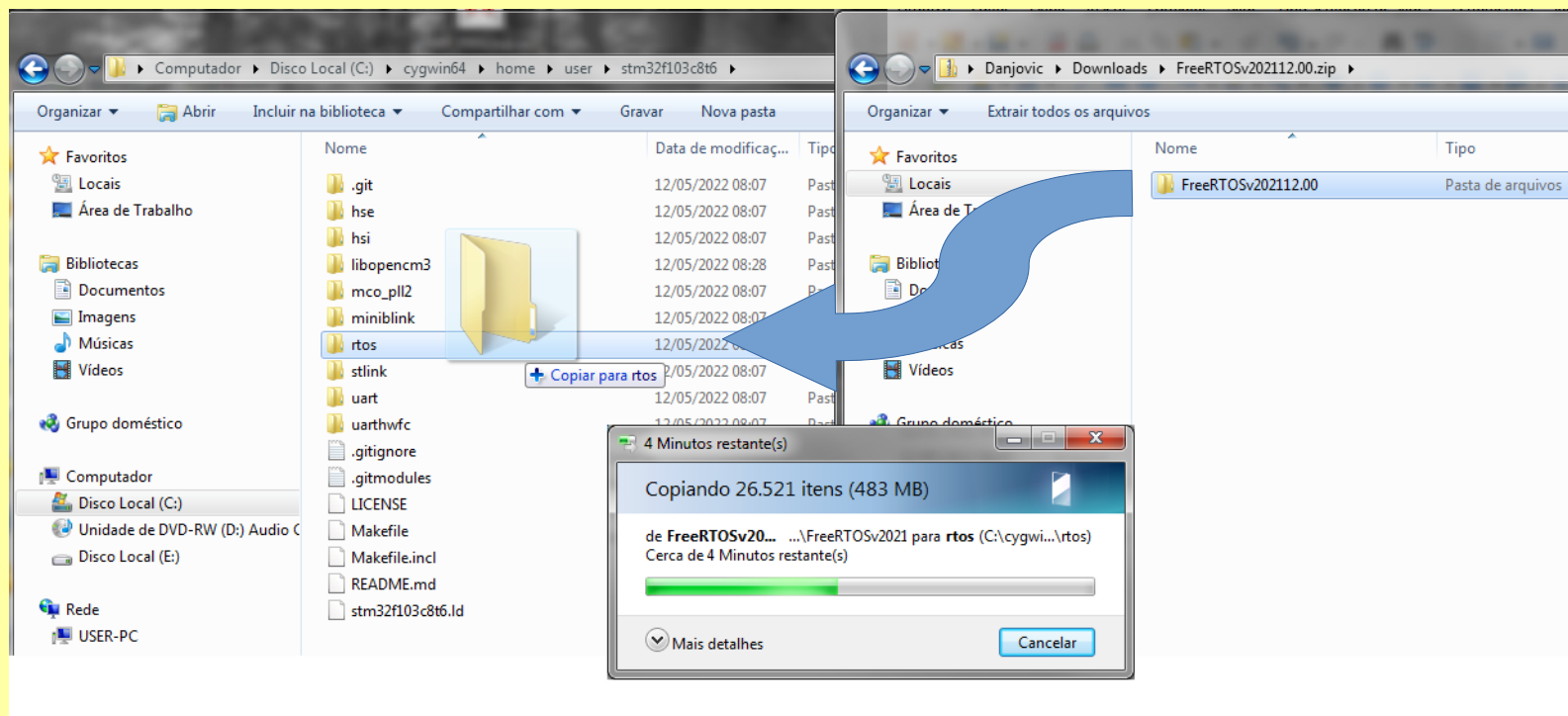
FreeRTOS LTS 202012.04

Package containing the FreeRTOS LTS libraries, which includes the FreeRTOS kernel and IoT libraries without example projects. See the [LTS Libraries page](#) for additional details. Source code is also available on [Github](#).

Download

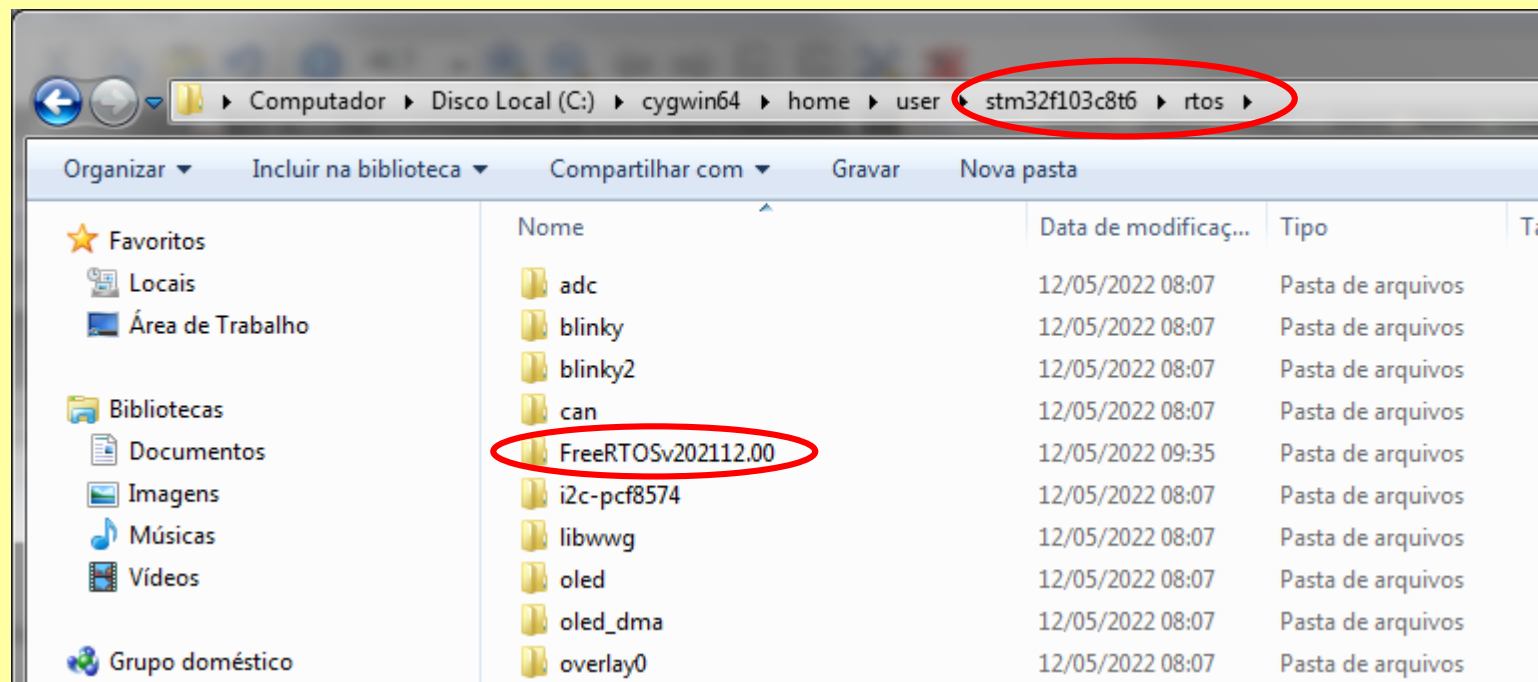
Baixar FreeRTOS 2/5

- Descompacte o zip do arquivo FreeRTOS dentro da pasta '`~/stm32f103c8t6/rtos`'



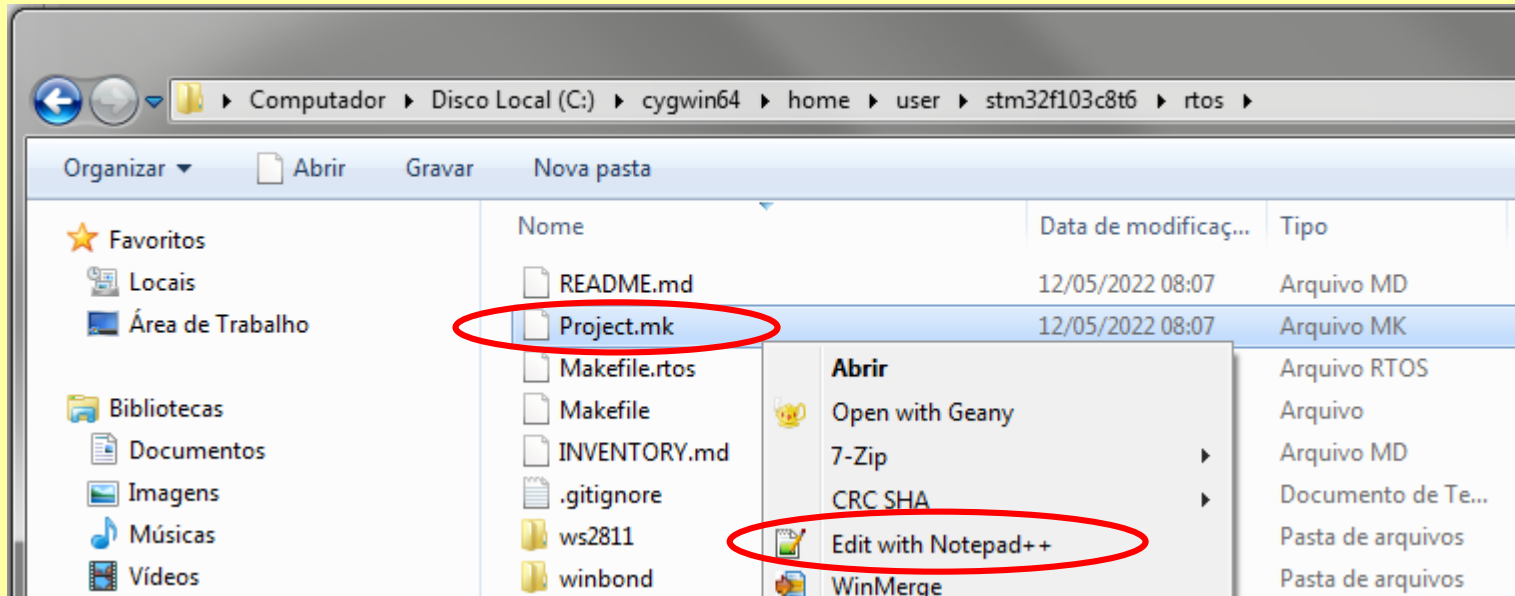
Baixar FreeRTOS 3/5

- Verifique que a pasta do FreeRTOSxxxx ficou dentro da pasta 'stm32f103c8t6/rtos'. O nome exato da pasta depende da versão do FreeRTOS. Copie o nome dessa pasta para usar no próximo passo.



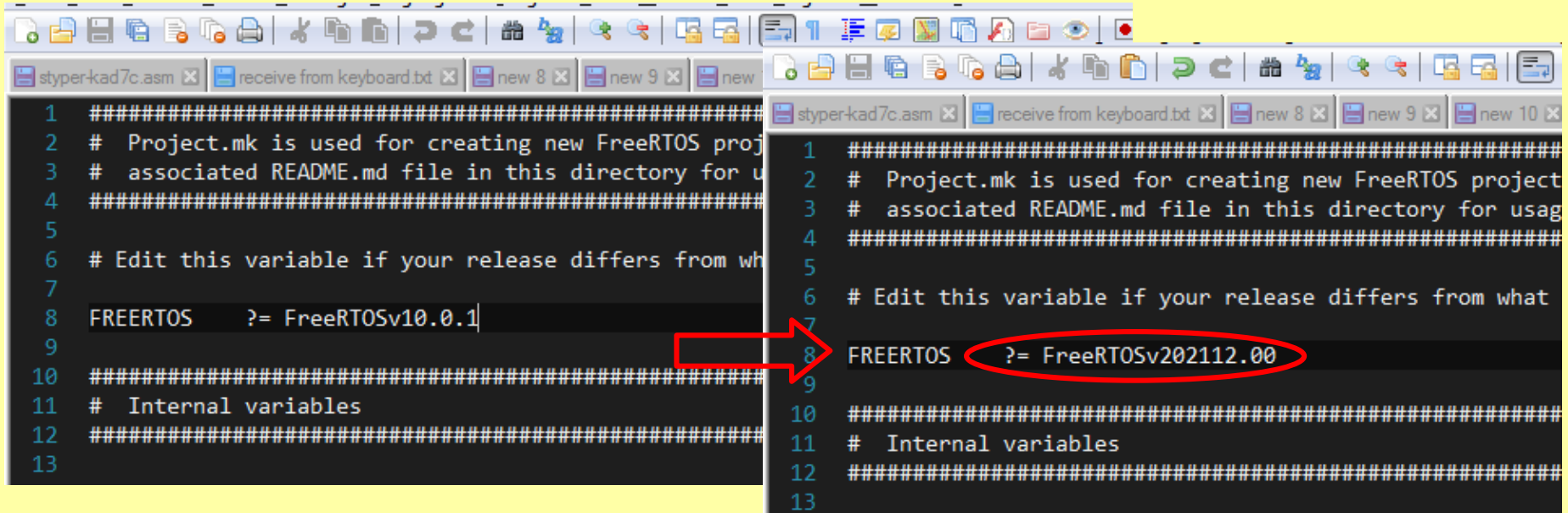
Baixar FreeRTOS 4/5

Edite o arquivo 'Project.mk' que se encontra dentro da pasta '~/stm32f103c8t6/rtos'



Baixar FreeRTOS 5/5

Substitua o nome da versão existente pelo nome do diretório da versão atual do FreeRTOS e salve o arquivo.



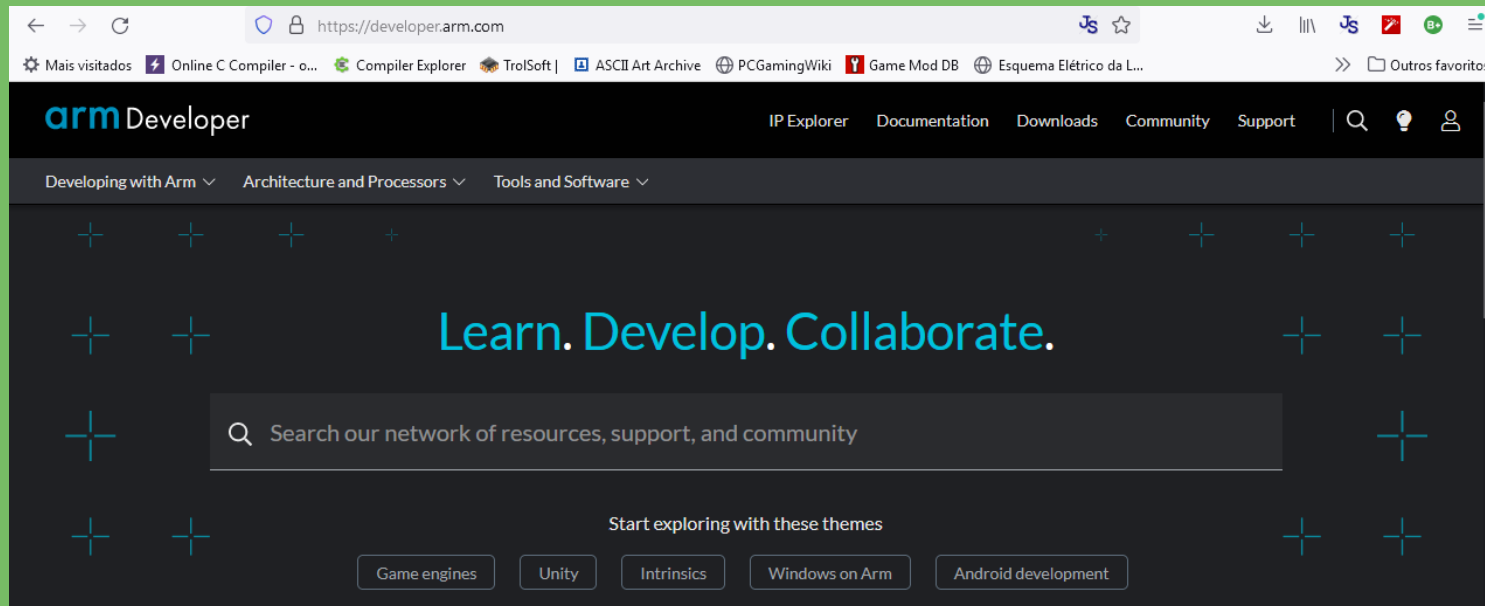
```
1 #####
2 # Project.mk is used for creating new FreeRTOS project
3 # associated README.md file in this directory for use
4 #####
5
6 # Edit this variable if your release differs from what is available
7
8 FREERTOS    ?= FreeRTOSv10.0.1
9
10 #####
11 # Internal variables
12 #####
13
```

```
1 #####
2 # Project.mk is used for creating new FreeRTOS project
3 # associated README.md file in this directory for use
4 #####
5
6 # Edit this variable if your release differs from what is available
7
8 FREERTOS    ?= FreeRTOSv202112.00
9
10 #####
11 # Internal variables
12 #####
13
```

Compilador ARM

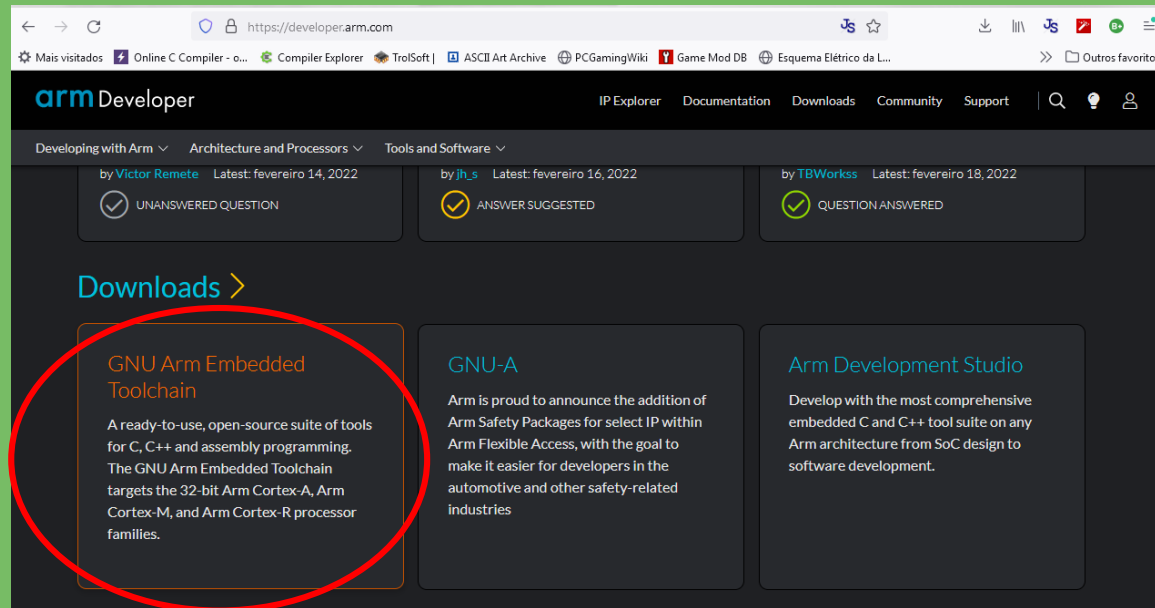
- O Compilador ARM encontra-se disponível como um executável na página da ARM:

<https://developer.arm.com>



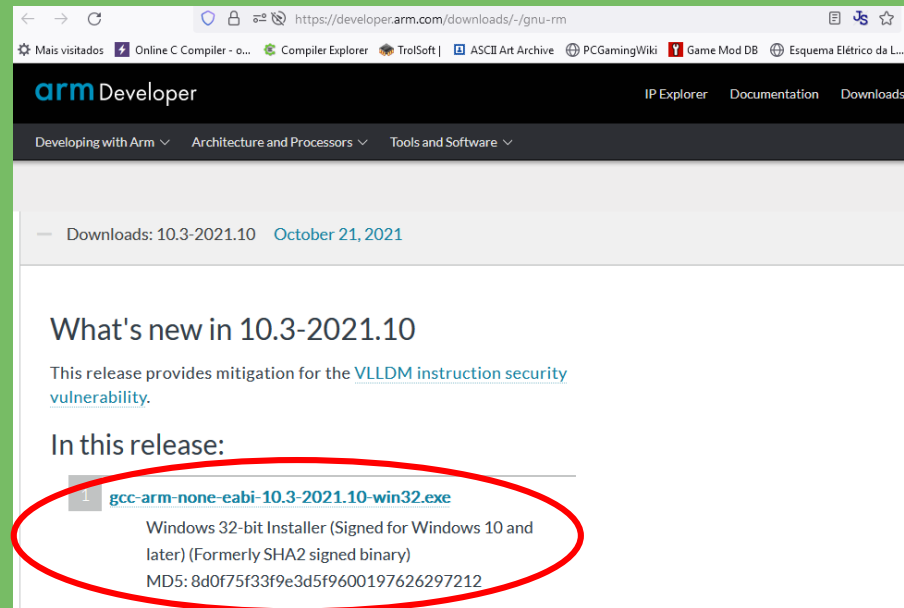
Instalar Compilador ARM 1/7

Role pela página inicial até os downloads e escolha o conjunto de ferramentas de desenvolvimento GNU



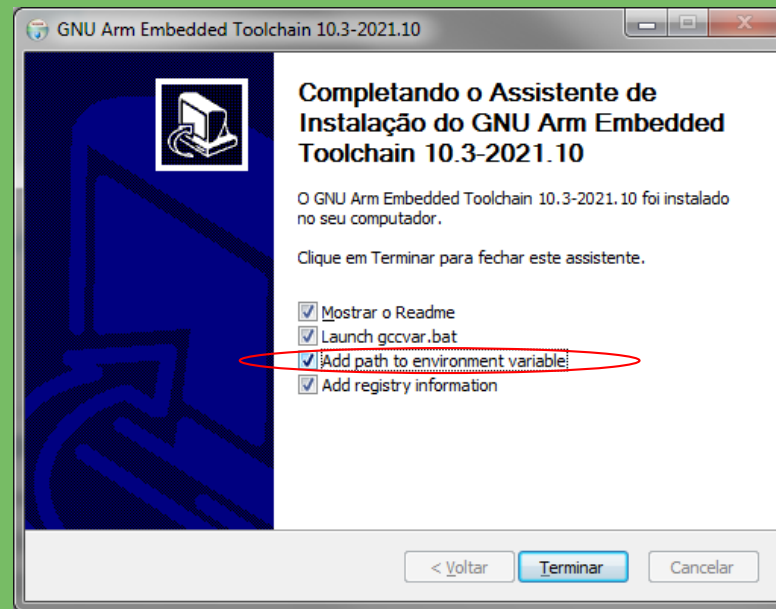
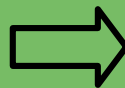
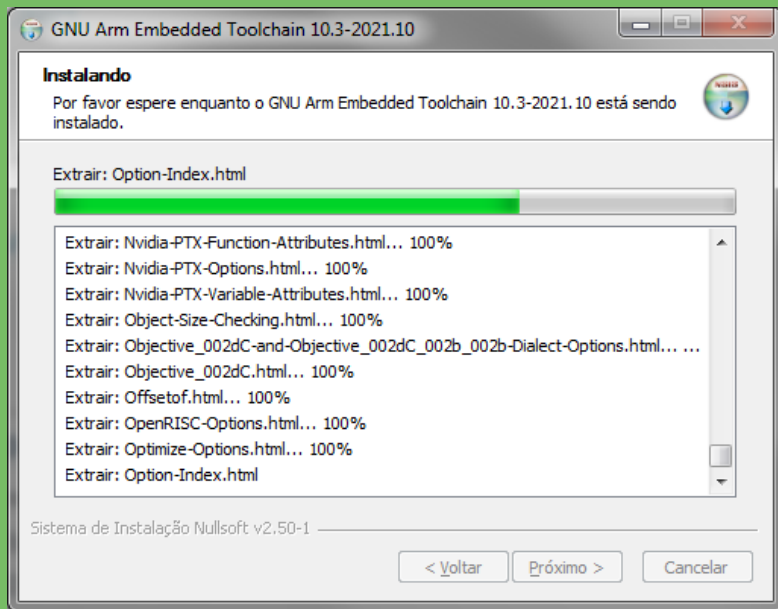
Instalar Compilador ARM 2/7

Faça o download do .exe e execute o instalador para instalar o compilador.
Versões anteriores também estão disponíveis.



Instalar Compilador ARM 3/7

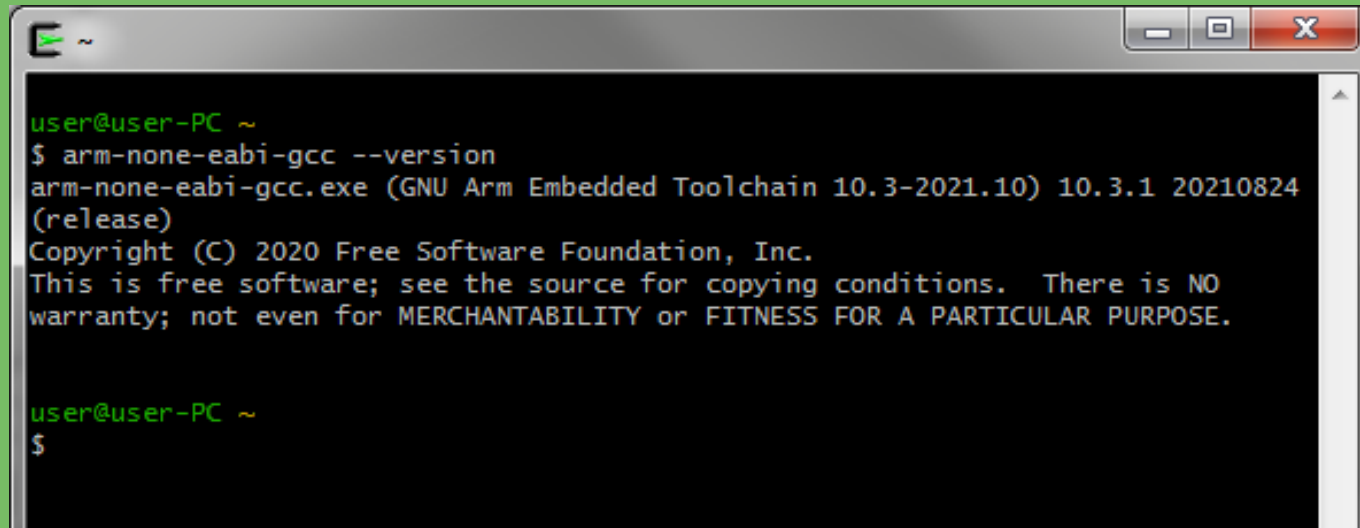
Ao final da instalação, marque a opção de adicionar o caminho às variáveis de ambiente.



Instalar Compilador ARM 4/7

- Feche o terminal do Cygwin e em seguida abra de novo para que o ambiente recarregue as variáveis de ambiente.
- Em seguida digite o seguinte comando para verificar a versão do compilador.

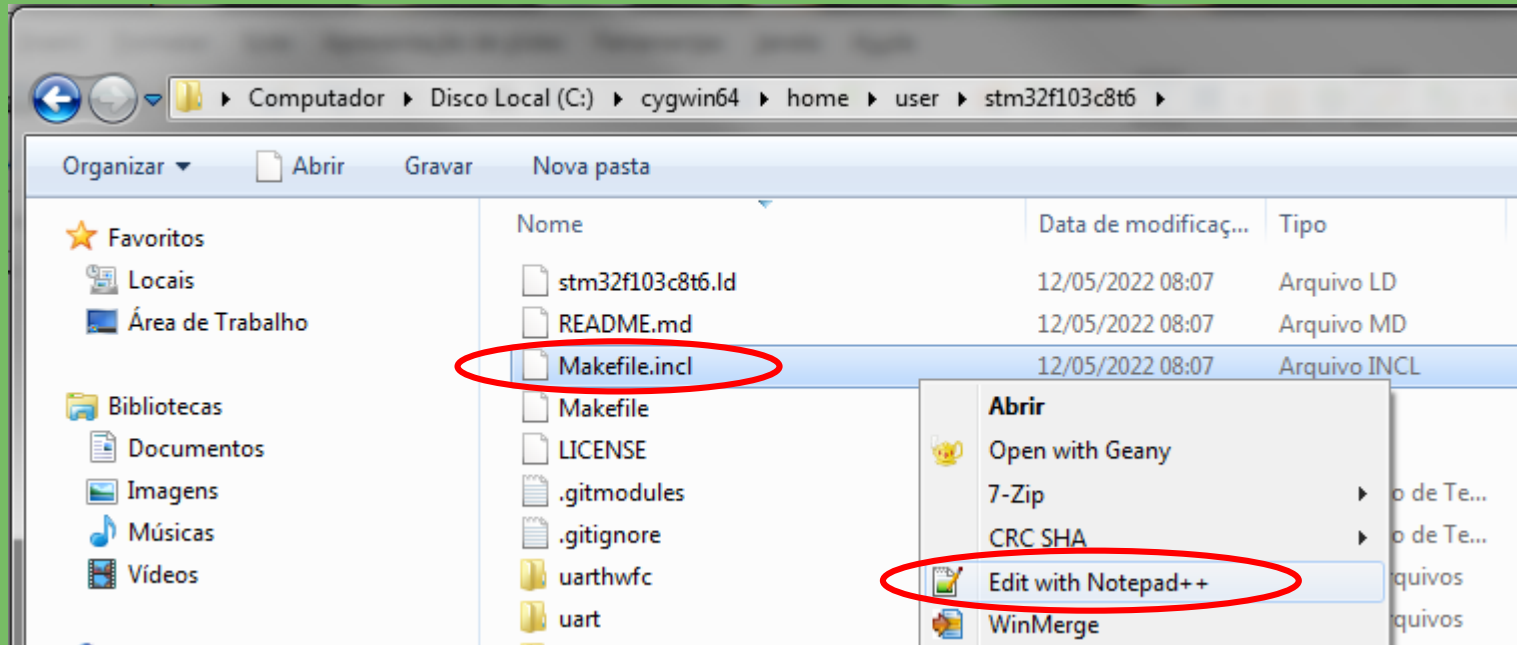
```
$ arm-none-eabi-gcc --version
```

A screenshot of a Cygwin terminal window. The window has a title bar with a green icon and a tilde symbol, and standard Windows window controls (minimize, maximize, close). The terminal content shows the prompt 'user@user-PC ~' followed by the command '\$ arm-none-eabi-gcc --version'. The output is: 'arm-none-eabi-gcc.exe (GNU Arm Embedded Toolchain 10.3-2021.10) 10.3.1 20210824 (release)' followed by copyright and warranty information. The prompt returns to 'user@user-PC ~' and '\$' on the next line.

```
user@user-PC ~  
$ arm-none-eabi-gcc --version  
arm-none-eabi-gcc.exe (GNU Arm Embedded Toolchain 10.3-2021.10) 10.3.1 20210824  
(release)  
Copyright (C) 2020 Free Software Foundation, Inc.  
This is free software; see the source for copying conditions. There is NO  
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  
  
user@user-PC ~  
$
```

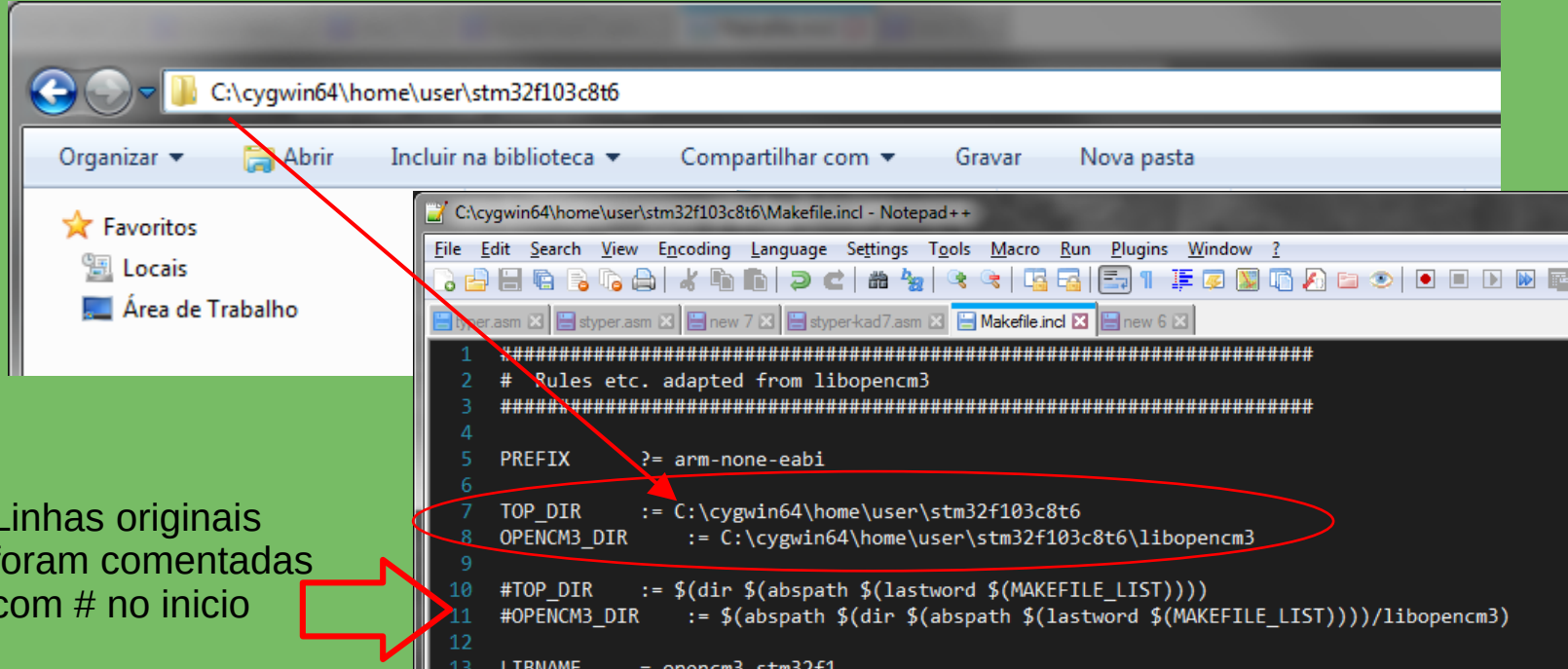
Instalar Compilador ARM 5/7

Edite o arquivo 'Makefile.incl' que se encontra dentro da pasta '~/stm32f103c8t6'



Instalar Compilador ARM 6/7

Substitua os caminhos das variáveis TOP_DIR e OPENCM3_DIR no arquivo 'Makefile.incl' pelos caminhos absolutos das pastas no Windows



The screenshot shows a Windows File Explorer window with the address bar set to `C:\cygwin64\home\user\stm32f103c8t6`. Below it, a Notepad++ window is open, displaying the `Makefile.incl` file. The file contains several lines of code. Lines 7 and 8 are circled in red:

```
7 TOP_DIR := C:\cygwin64\home\user\stm32f103c8t6
8 OPENCM3_DIR := C:\cygwin64\home\user\stm32f103c8t6\libopencm3
```

Below these, lines 10 and 11 are commented out with a hash symbol (#):

```
10 #TOP_DIR := $(dir $(abspath $(lastword $(MAKEFILE_LIST))))
11 #OPENCM3_DIR := $(abspath $(dir $(abspath $(lastword $(MAKEFILE_LIST))))/libopencm3)
```

A red arrow points from the text "Linhas originais foram comentadas com # no inicio" to these commented-out lines.

Linhas originais
foram comentadas
com # no inicio

Instalar Compilador ARM 7/7

Abra um novo terminal do Cygwin e utilize o comando 'cd' para entrar no diretório do projeto stm32f103c8t6.

Em seguida digite comando 'make' e aguarde a compilação dos arquivos do projeto

```
~/stm32f103c8t6
user@user-PC ~
$ cd stm32f103c8t6/

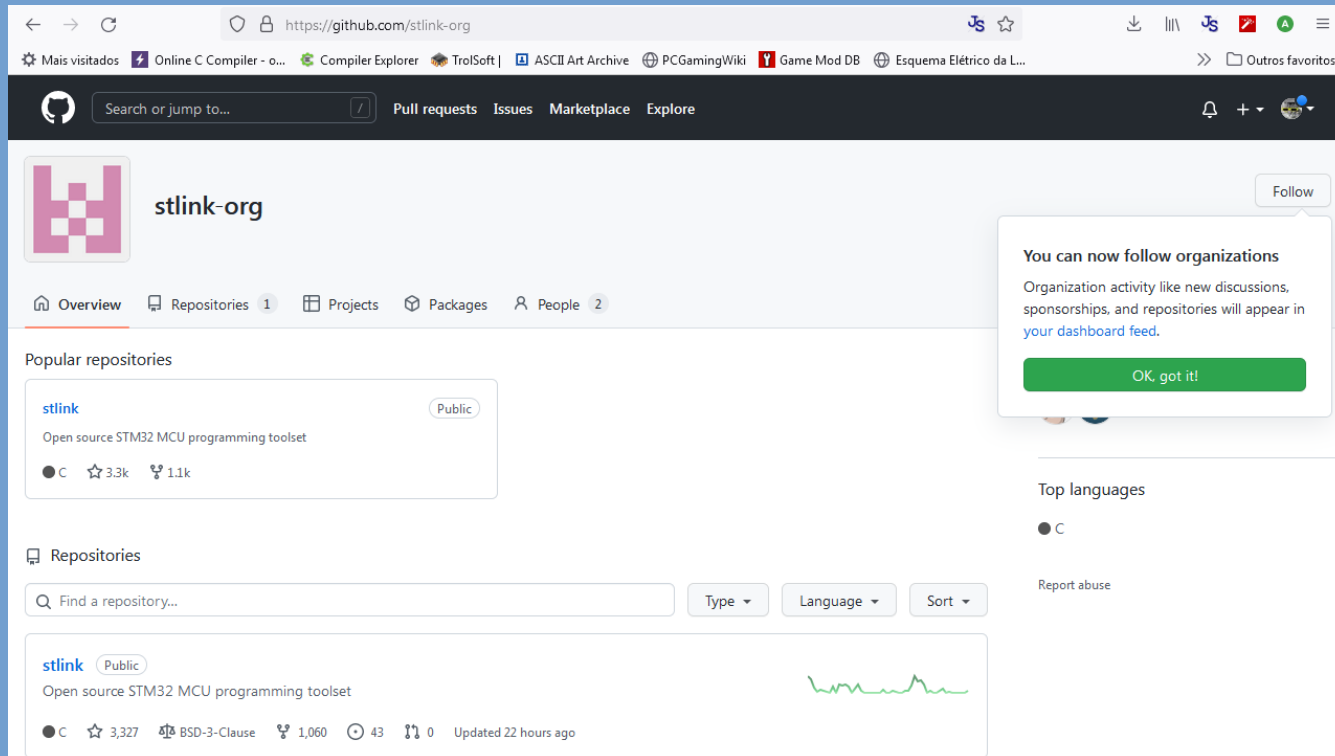
user@user-PC ~/stm32f103c8t6
$ make
make -C libopencm3 TARGETS=stm32/f1
make[1]: Entering directory '/home/user/stm32f103c8t6/libopencm3'
GENHDR  stm32/f1
BUILD   lib/stm32/f1
CC      adc.c
CC      adc_common_v1.c
CC      can.c
CC      crc_common_all.c
CC      dac_common_all.c
CC      dac_common_v1.c
CC      desig_common_all.c
CC      desig_common_v1.c
CC      dma_common_11f013.c
CC      exti_common_all.c
CC      flash.c
CC      flash_common_all.c
```

...

```
~/stm32f103c8t6
\user\stm32f103c8t6\rtos\libwwg\include -o rtos/tasks.o -c rtos/tasks.c
arm-none-eabi-gcc -Os -g -std=c99 -mthumb -mcpu=cortex-m3 -msoft-float -mfix-cortex-m3-ldrd -Wextra -Wshadow -Wimplicit-function-declaration -Wredundant-decls -Wmissing-prototypes -Wstrict-prototypes -fno-common -ffunction-sections -fdata-sections -IC:\cygwin64\home\user\stm32f103c8t6\libopencm3\include -IC:\cygwin64\home\user\stm32f103c8t6\rtos\libwwg\include -I./rtos -I. -MD -Wall -Wundef -DSTM32F1 -IC:\cygwin64\home\user\stm32f103c8t6\libopencm3\include -IC:\cygwin64\home\user\stm32f103c8t6\rtos\libwwg\include -o rtos/opencm3.o -c rtos/opencm3.c
arm-none-eabi-gcc --static -nostartfiles -Tstm32f103c8t6.ld -mthumb -mcpu=cortex-m3 -msoft-float -mfix-cortex-m3-ldrd -Wl,-Map=main.map -Wl,--gc-sections main.o rtos/heap_4.o rtos/list.o rtos/port.o rtos/queue.o rtos/tasks.o rtos/opencm3.o -specs=nosys.specs -Wl,--start-group -lc -lgcc -lnosys -Wl,--end-group -LC:\cygwin64\home\user\stm32f103c8t6\rtos\libwwg -lwwg -LC:\cygwin64\home\user\stm32f103c8t6\libopencm3\lib -lopencm3_stm32f1 -o main.elf
arm-none-eabi-size main.elf
text    data    bss    dec    hex filename
12812   2136   17800  32748  7fec main.elf
make[2]: Leaving directory '/home/user/stm32f103c8t6/rtos/rtc2'
make[1]: Leaving directory '/home/user/stm32f103c8t6/rtos'

user@user-PC ~/stm32f103c8t6
$
```

Instalar ST-Flash e Drivers do ST-Link



The screenshot shows the GitHub profile page for the organization **stlink-org**. The page header includes the GitHub logo, a search bar, and navigation links for Pull requests, Issues, Marketplace, and Explore. The organization's profile section displays the **stlink-org** logo and a **Follow** button. Below this, the **Overview** tab is selected, showing the **Popular repositories** section. The first repository listed is **stlink**, described as an "Open source STM32 MCU programming toolset". It is marked as **Public** and has 3.3k stars and 1.1k forks. A notification box on the right side of the page states: "You can now follow organizations. Organization activity like new discussions, sponsorships, and repositories will appear in your dashboard feed." with an "OK, got it!" button. The **Top languages** section shows C as the primary language. The **Repositories** section includes a search bar and a list of repositories, with the **stlink** repository again listed, showing 3,327 stars, BSD-3-Clause license, 1,060 forks, 43 watchers, and a note that it was updated 22 hours ago.

https://github.com/stlink-org

Mais visitados Online C Compiler - o... Compiler Explorer TrolSoft | ASCII Art Archive PCGamingWiki Game Mod DB Esquema Elétrico da L...

Search or jump to... Pull requests Issues Marketplace Explore

stlink-org

Follow

You can now follow organizations
Organization activity like new discussions, sponsorships, and repositories will appear in your dashboard feed.
OK, got it!

Overview Repositories 1 Projects Packages People 2

Popular repositories

stlink Public
Open source STM32 MCU programming toolset
C 3.3k 1.1k

Repositories

Find a repository... Type Language Sort

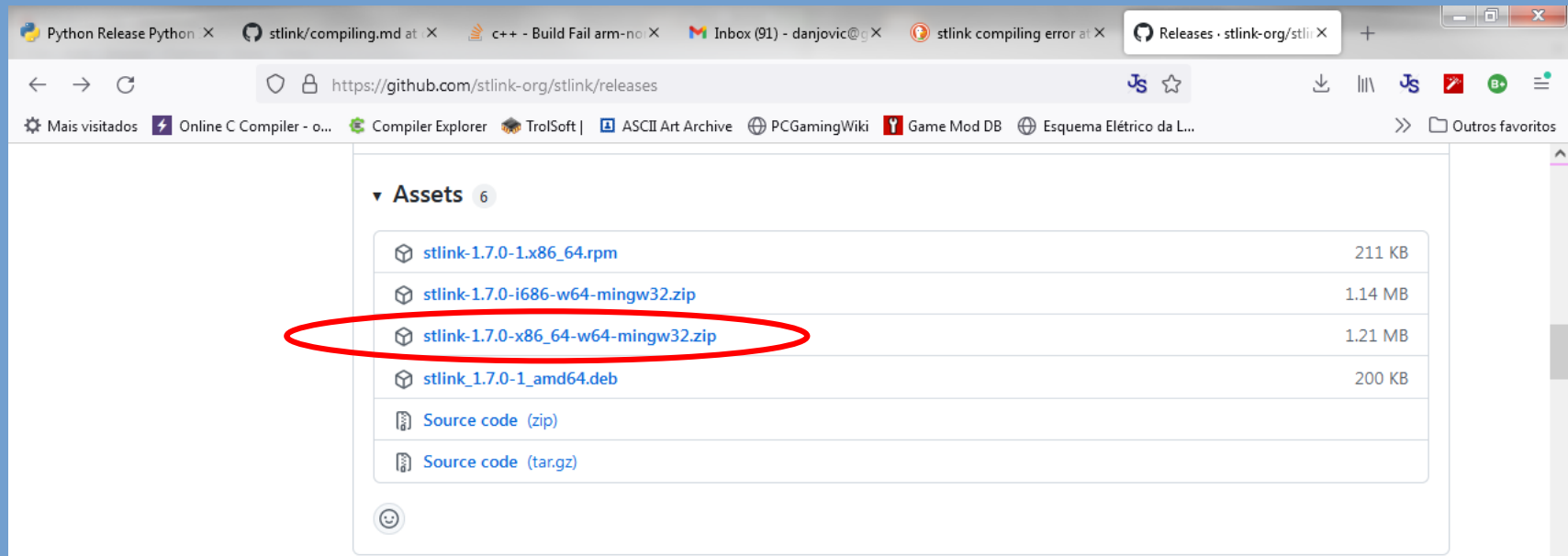
stlink Public
Open source STM32 MCU programming toolset
C 3,327 BSD-3-Clause 1,060 43 Updated 22 hours ago

Top languages
C
Report abuse

Instalar ST-Link 1/9

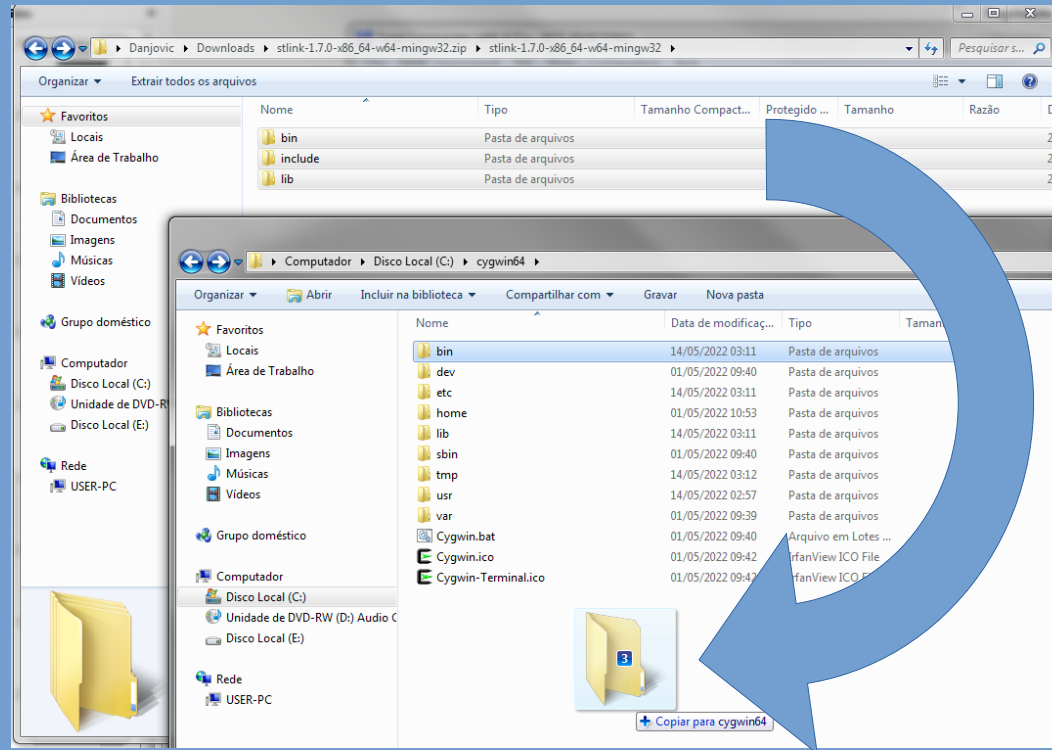
- Baixe o ST-LINK pre-compilado para ambiente cygwin no seguinte endereço:

<https://github.com/stlink-org/stlink/releases>



Instalar ST-Link 2/9

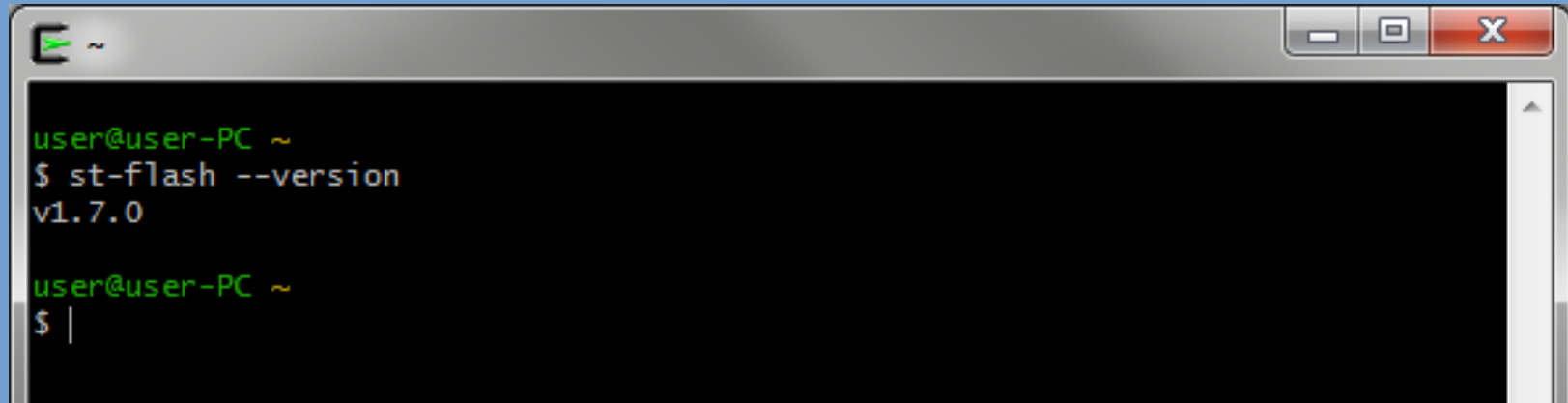
- Abra o arquivo ZIP e copie as três pastas para o diretório raiz do Cygwin



Instalar ST-Link 3/9

- Digite o comando abaixo para verificar que o st-flash foi corretamente instalado e pode ser executado

```
$ st-flash --version
```

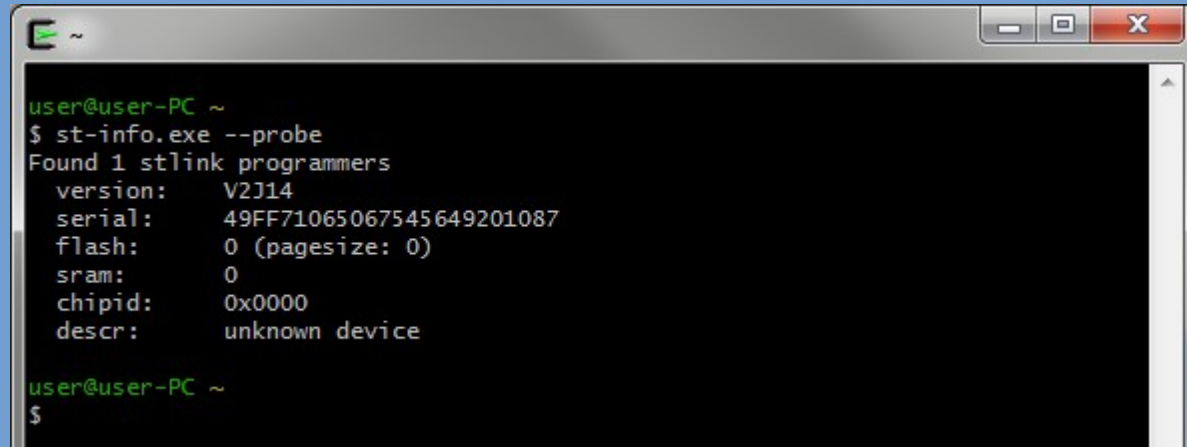
A screenshot of a terminal window with a dark background and a light gray title bar. The title bar contains a green icon on the left and standard window control buttons (minimize, maximize, close) on the right. The terminal text shows a prompt 'user@user-PC ~' in green, followed by the command '\$ st-flash --version' in white, and the output 'v1.7.0' in white. Below this, the prompt 'user@user-PC ~' appears again in green, followed by a white '\$' and a cursor '|'.

```
user@user-PC ~  
$ st-flash --version  
v1.7.0  
  
user@user-PC ~  
$ |
```

Instalar ST-Link 4/9

- Conecte um dispositivo ST-Link e digite o comando abaixo para verificar que o dispositivo de programação foi propriamente reconhecido.

```
$ st-info --probe
```

A screenshot of a terminal window with a black background and white text. The window title bar shows a green icon and the text '~'. The terminal content shows a user prompt 'user@user-PC ~' followed by the command '\$ st-info.exe --probe'. The output of the command is: 'Found 1 stlink programmers', 'version: V2J14', 'serial: 49FF71065067545649201087', 'flash: 0 (pagesize: 0)', 'sram: 0', 'chipid: 0x0000', and 'descr: unknown device'. The prompt returns to 'user@user-PC ~' followed by a '\$' character.

```
user@user-PC ~  
$ st-info.exe --probe  
Found 1 stlink programmers  
version: V2J14  
serial: 49FF71065067545649201087  
flash: 0 (pagesize: 0)  
sram: 0  
chipid: 0x0000  
descr: unknown device  
  
user@user-PC ~  
$
```

Nota: Se o dispositivo não for reconhecido siga os passos seguintes

Instalar ST-Link 5/9

- Caso o dispositivo não seja reconhecido pelo comando 'st-info' baixe o programa chamado Zadig no seguinte endereço.

<https://zadig.akeo.ie/>

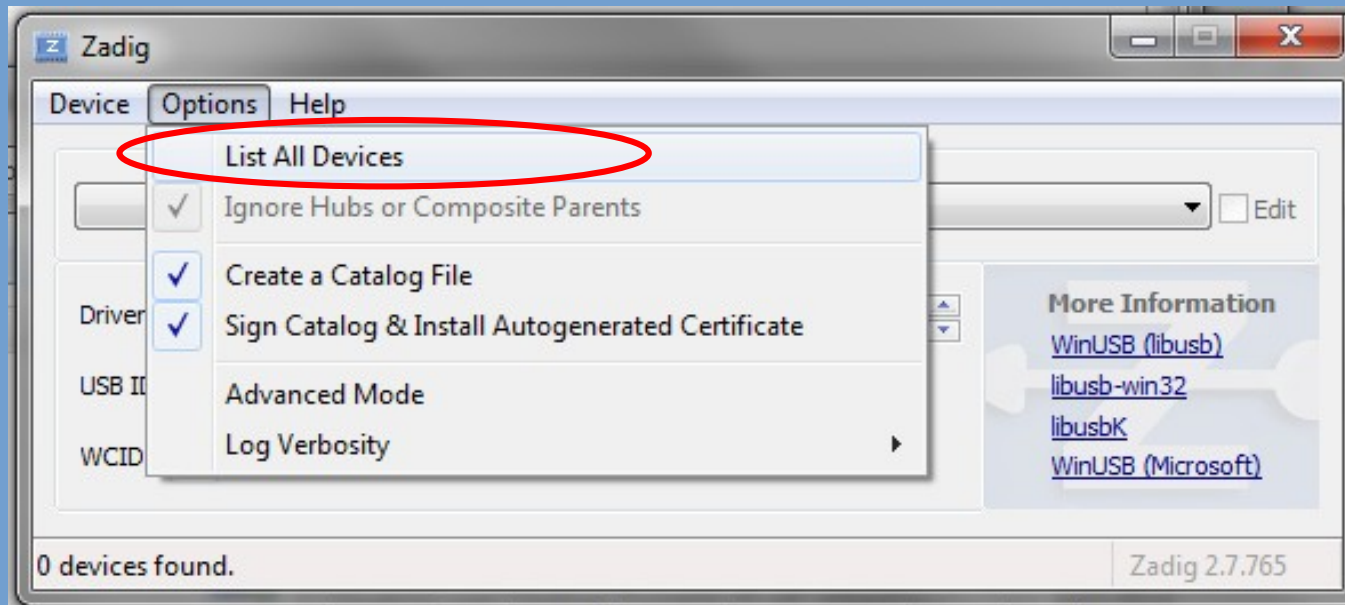


```
user@user-PC ~
$ st-info.exe --probe
2022-05-15T13:21:56 ERROR usb.c: Failed to open USB device 0x0483:0x3744, libusb
error: -12)
Found 0 stlink programmers

user@user-PC ~
$ |
```

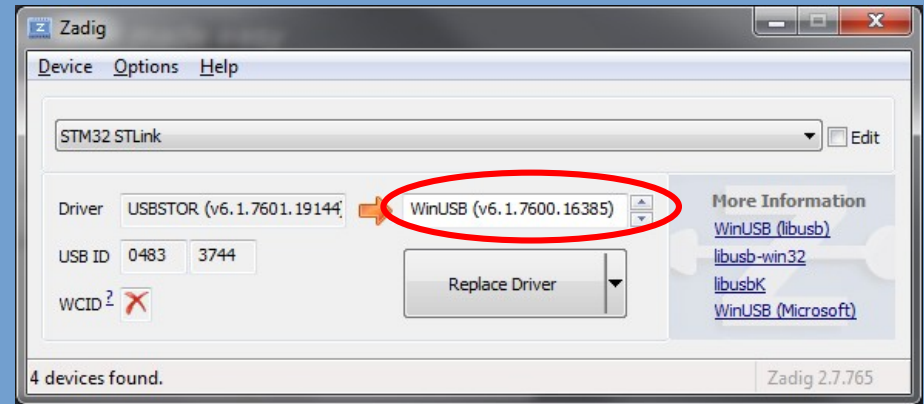
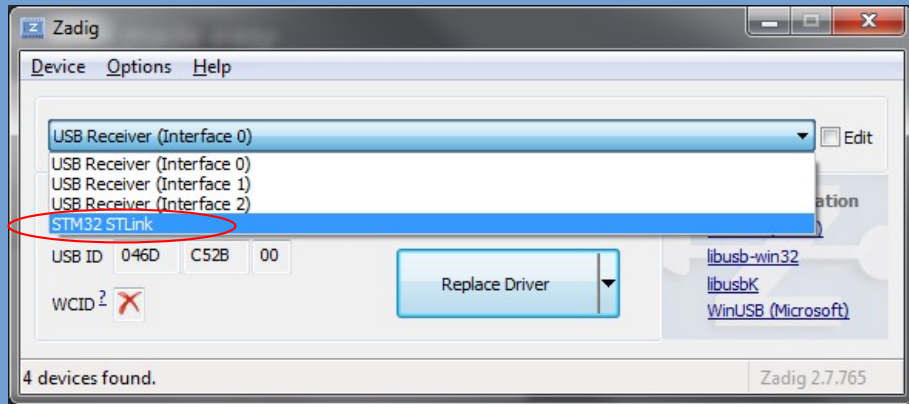
Instalar ST-Link 6/9

- Execute o Zadig e na aba OPTIONS selecione a opção 'List All Devices'



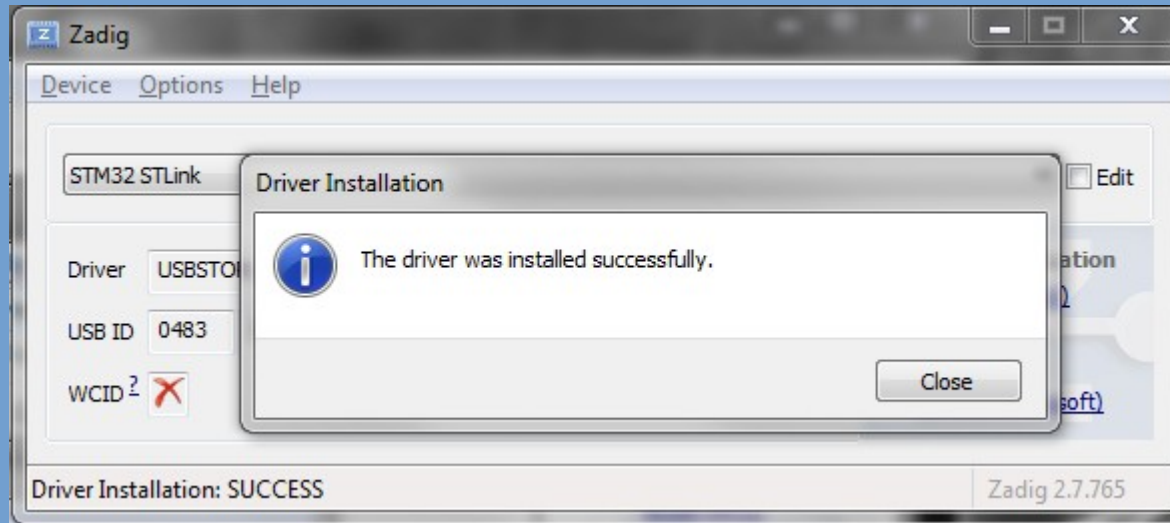
Instalar ST-Link 7/9

- Em seguida selecione a interface STM32 STLink e escolha o driver de destino escolha WinUSB.
- Em seguida clique em 'Replace Driver'



Instalar ST-Link 8/9

- Após alguns segundos o driver será instalado.

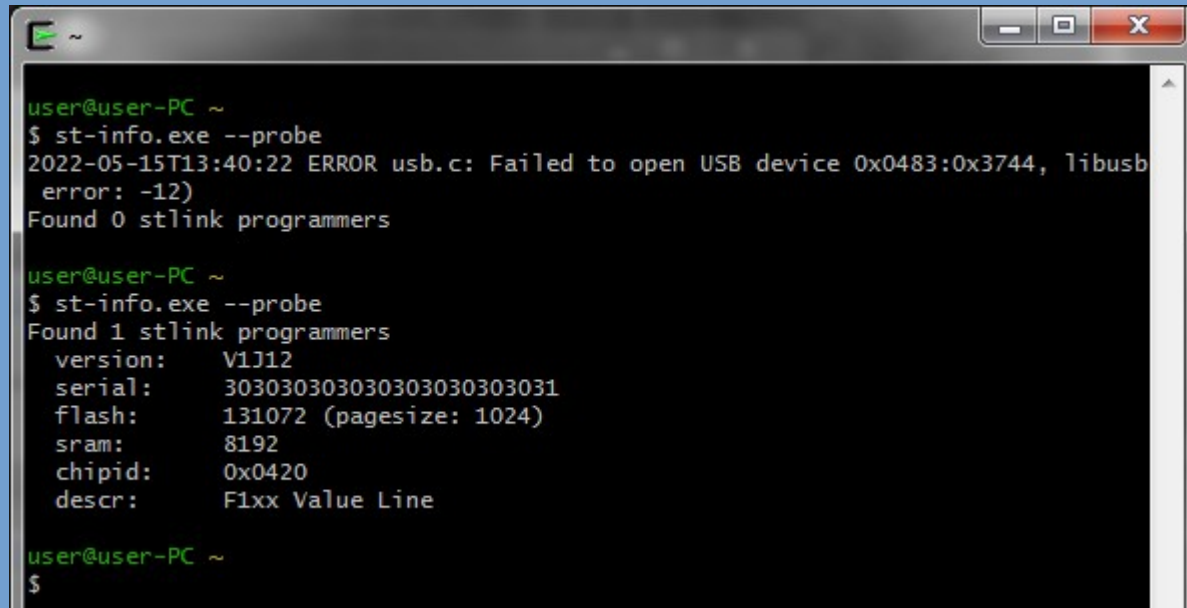


Nota: Ao trocar o driver do dispositivo as aplicações nativas do Windows para o STM32 não vão mais enxergar o ST-Link, mas é possível reverter essa situação reinstalando-se os drivers originais

Instalar ST-Link 9/9

- Após a instalação dos novos drivers, teste novamente a interface, que dessa vez deve ser reconhecida.

```
$ st-info --probe
```



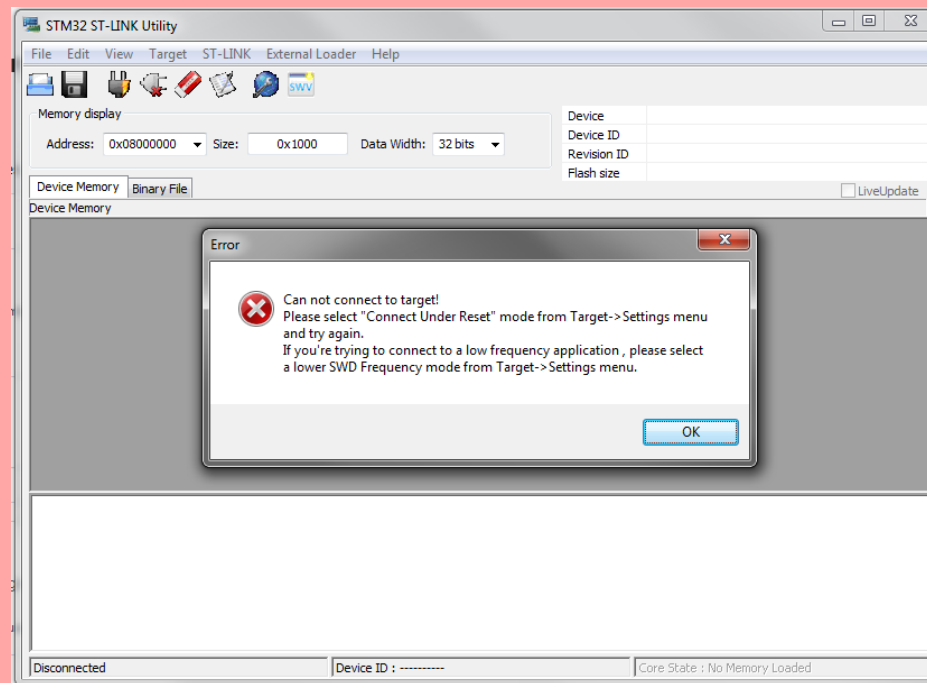
```
user@user-PC ~
$ st-info.exe --probe
2022-05-15T13:40:22 ERROR usb.c: Failed to open USB device 0x0483:0x3744, libusb
error: -12)
Found 0 stlink programmers

user@user-PC ~
$ st-info.exe --probe
Found 1 stlink programmers
  version:  V1J12
  serial:   30303030303030303030303031
  flash:    131072 (pagesize: 1024)
  sram:      8192
  chipid:   0x0420
  descr:    F1xx Value Line

user@user-PC ~
$
```

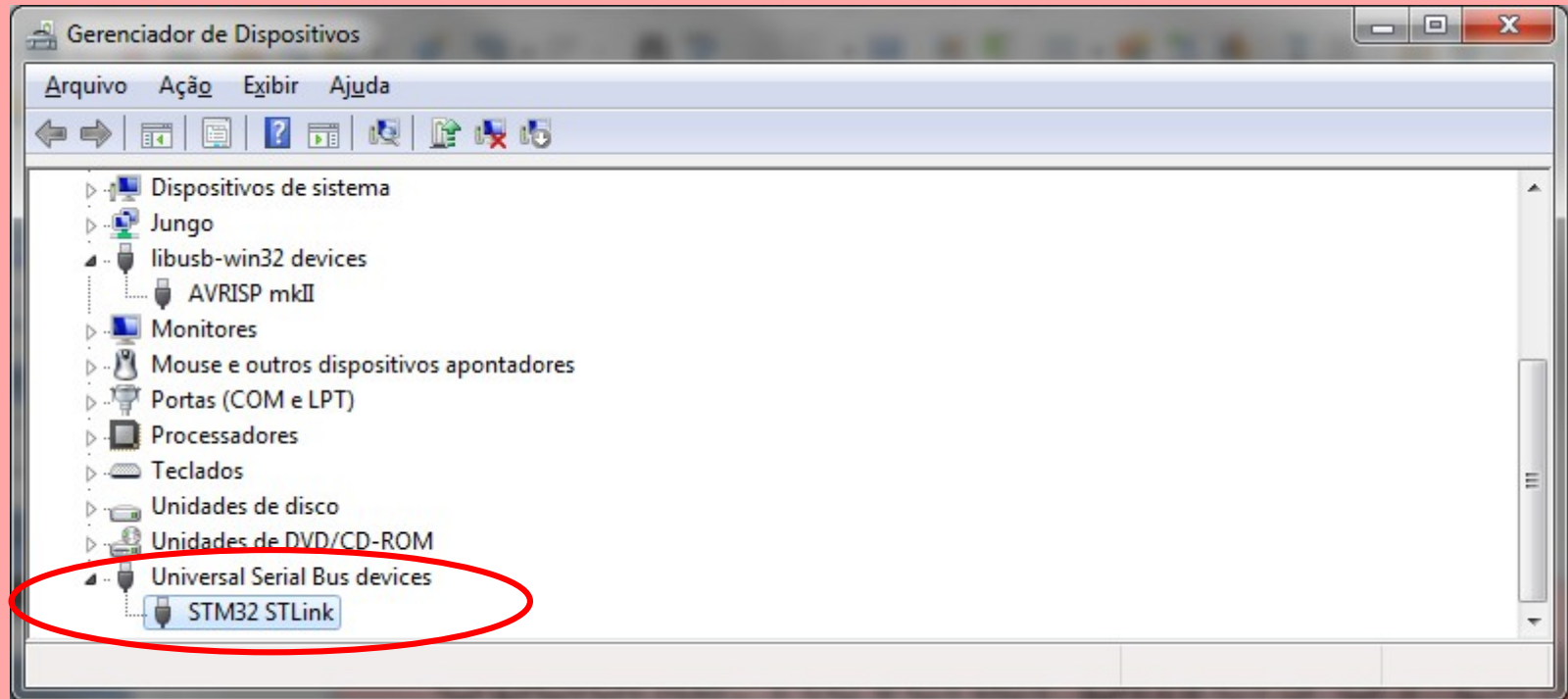
Opcional: Reverter Drivers ST-Link

- Ao trocar o driver do dispositivo pelo Zadig as aplicações nativas do Windows para o STM32 não vão mais enxergar o ST-Link. Para reverter o driver siga os passos seguintes



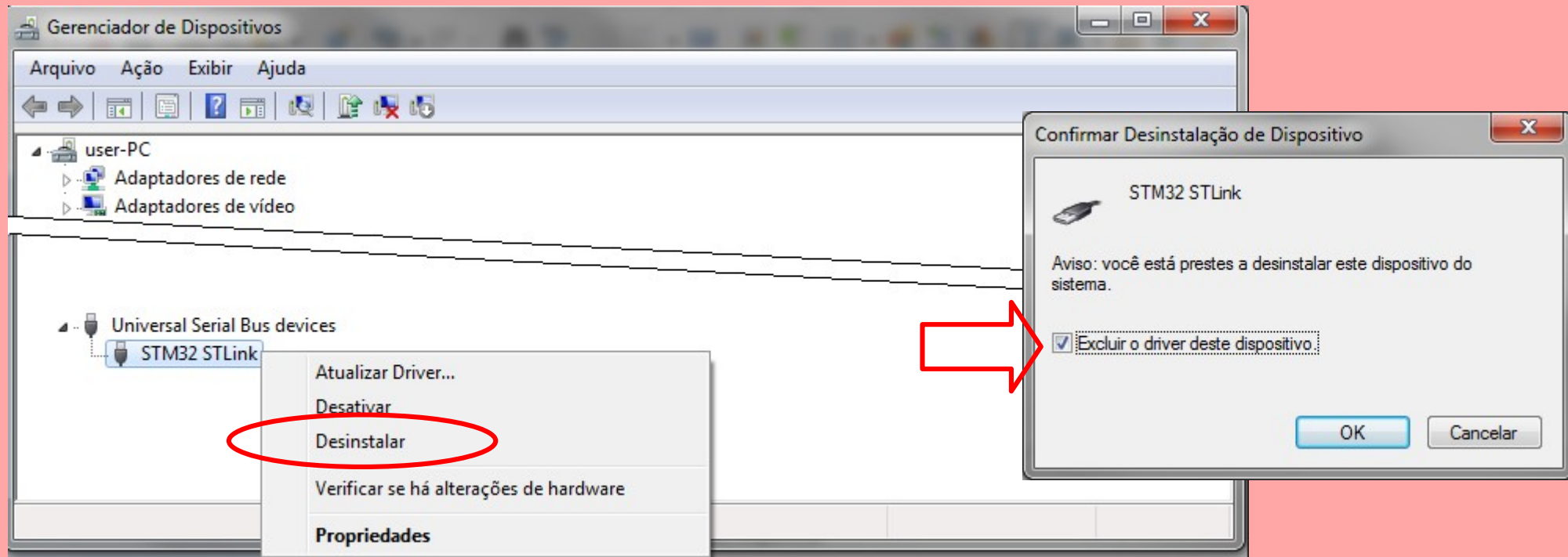
Reverter Drivers ST-Link 1/3

- Caso seja necessário reverter os drivers do ST-Link entre no gerenciador de dispositivos e procure pelo dispositivo STM32 STLink



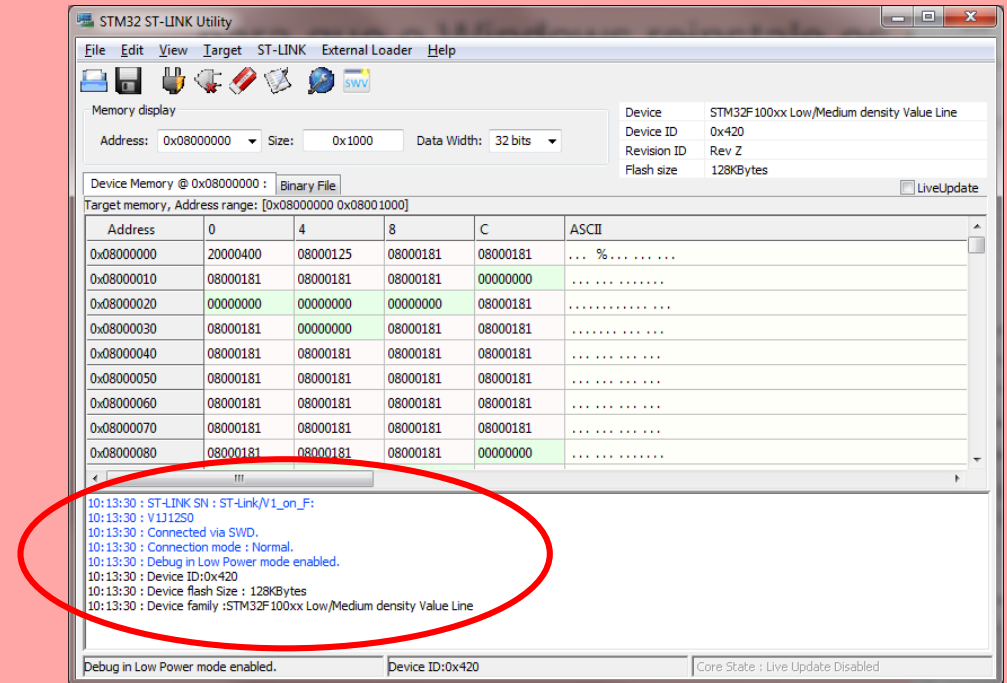
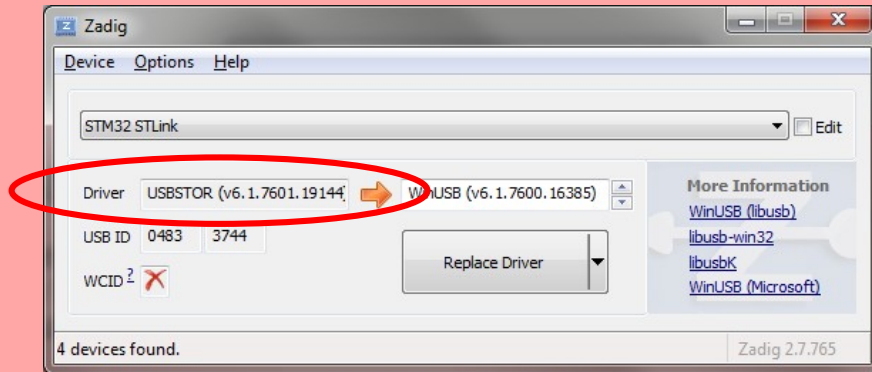
Reverter Drivers ST-Link 2/3

- Com o clique da direita escolha a opção “Desinstalar” e na janela que se abre marque a caixa “Excluir o driver”



Reverter Drivers ST-Link 3/3

- Desconecte o ST-Link da USB e em seguida conecte novamente para que o Windows reinstale os drivers originais, o que pode ser verificado utilizando o Zadig, ou rodando um programa da STM.



FIM