

STM32 Debug with QtCreator

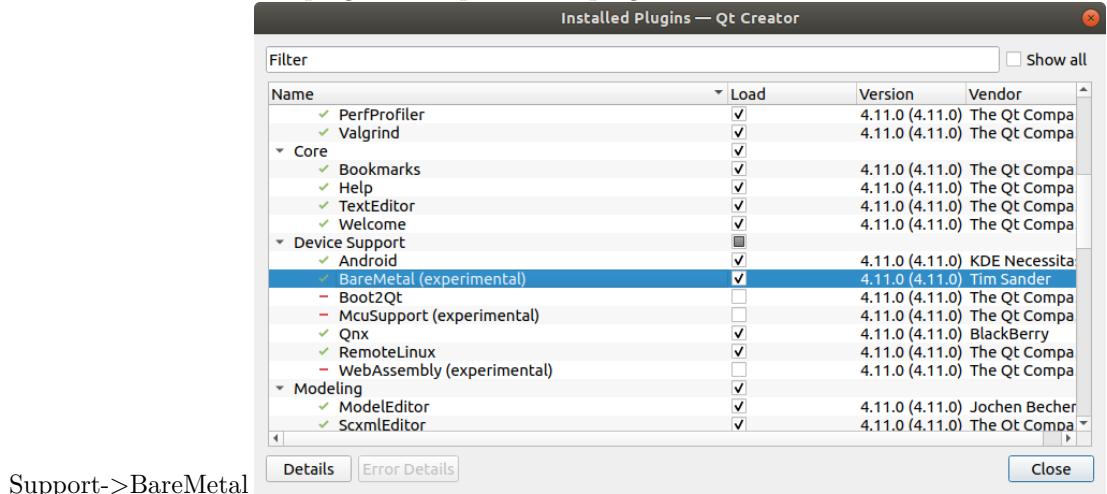
QtCreator is a cross-platform integrated development environment (IDE) that can be configured for the STM32. It embeds: * a source editor * a build system * an easy-to-use graphical debugger interface

We focus here on how to use the debugger (instead of the command line gdb).

Tested with QtCreator 4.11.0. GCC for ARM should be installed first (compiler)

Installation

- install QtCreator
- check for the BareMetal plugin in Help->About plugins..., and Device



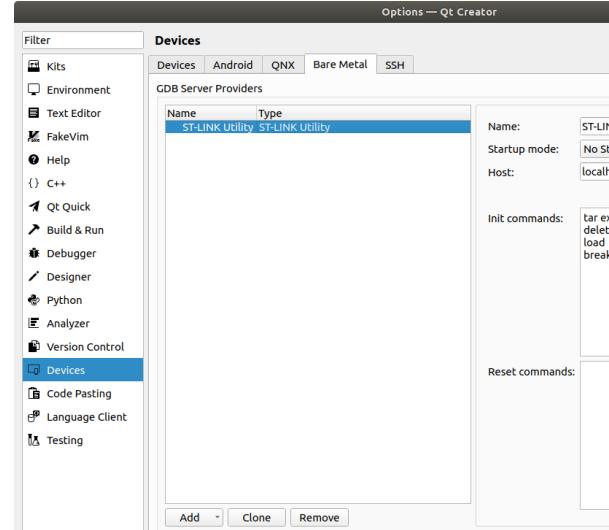
Configuration

Qt Creator should be configured in 2 sections `tools->options`:

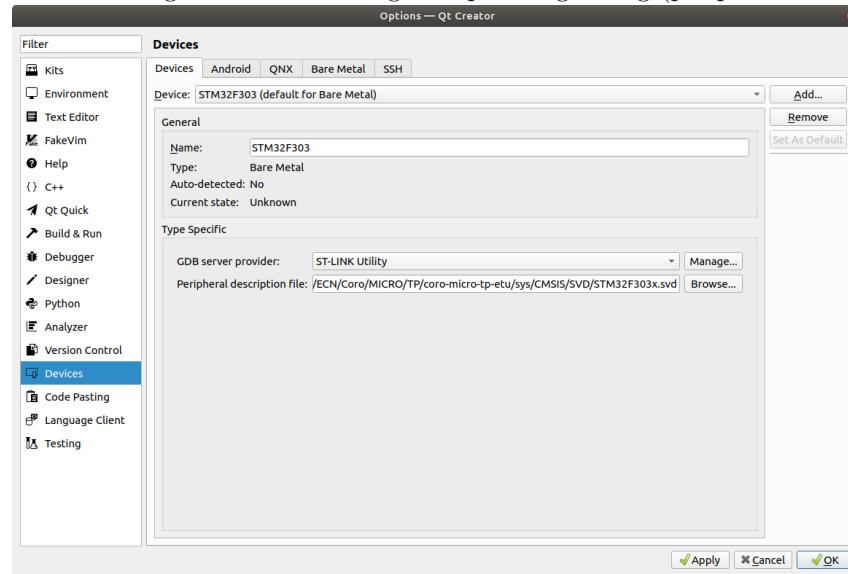
- the `Devices` part
- the `Kits` part

Devices

Define the Device (how to connect to the device), in the `Devices` part:

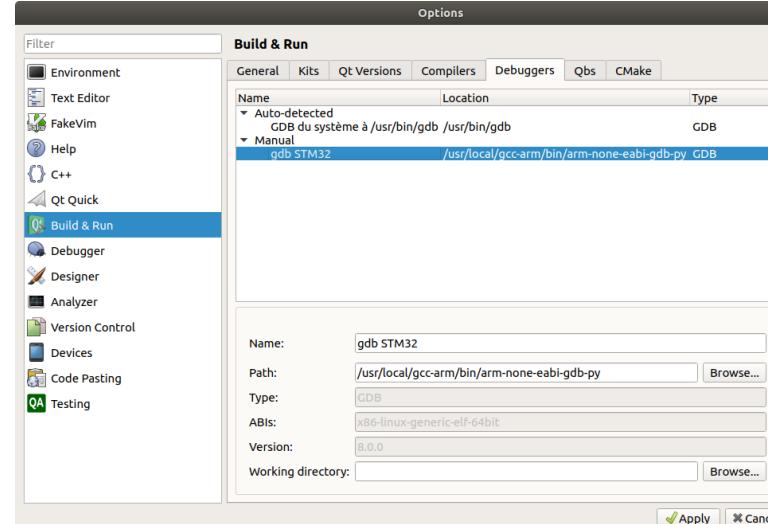


- In the tab **Bare Metal**, click add->ST-LINK utility
 - In the tab **Devices**, add a new device and associate it to the ST-LINK utility.
 - There is also a **peripheraldescription file** edit line. You can give the file **sys/CMSIS/SVD/STM32F303x.svd**. The SVD file give the information on the register set of the MCU, so that we can inspect the full configuration of the target chip during debug (peripheral view)

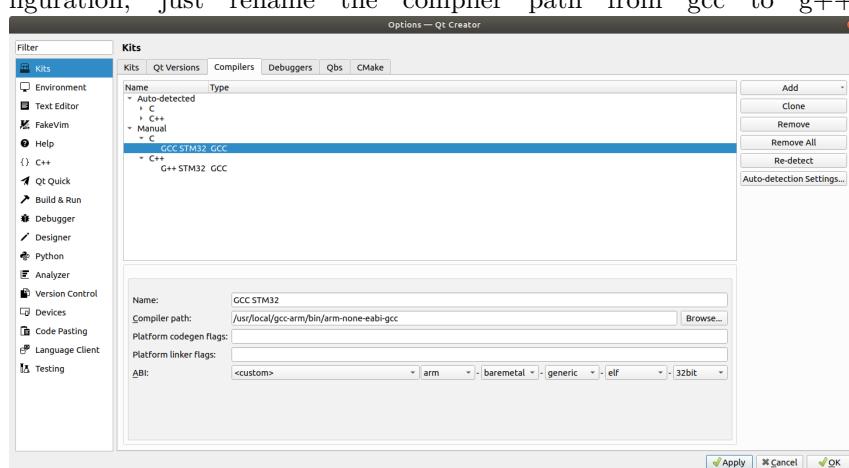


Kits

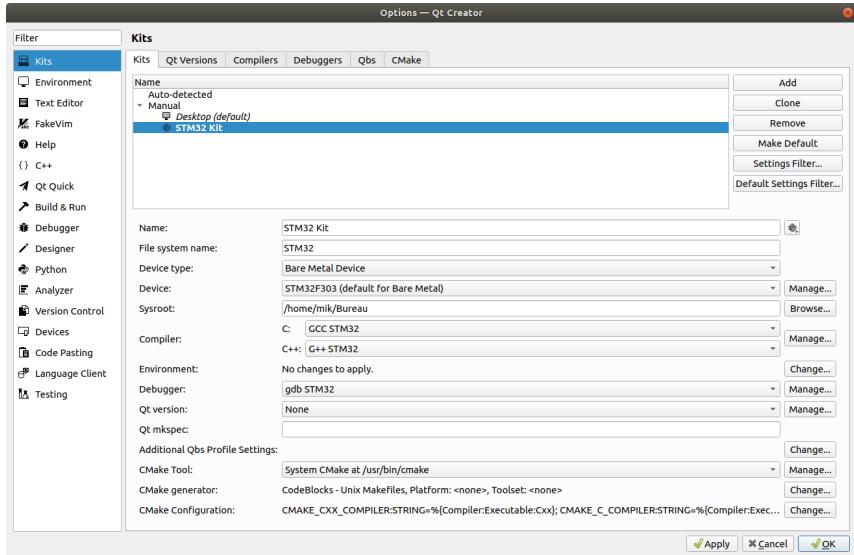
In the Kits part:



- First define the debugger **Debugger** tab:
To know where is your gdb version, you can simply type in a terminal:
`sh which arm-none-eabi-gdb` QtCreator requires to use a gdb version that embeds the python extension. it is the `arm-none-eabi-gdb-py` version in the GCC version provided by ARM.
- You can set the cross-compiler. This is not required if you want to debug only. Here, I have both set the C compiler (gcc) and the c++ compiler (g++). It is exactly the same configuration, just rename the compiler path from gcc to g++:



- The we can define the **kit** that contains all the stuff (device/debugger) in



Kits section:

There is a warning in the Kit configuration if no compiler is associated.

Debugging session

Debug session start

To start a debugging session, the binary `.elf` should be generated:

`make`

Then, the `st-util` tool should be called. The utility makes the connection between the board and the computer (using the STLink protocol). In a terminal:

```
$ st-util
st-util 1.5.1-12-g30de1b3
2019-12-13T08:22:40 INFO common.c: Loading device parameters....
2019-12-13T08:22:40 INFO common.c: Device connected is: F3xx medium density device, id 0x100
2019-12-13T08:22:40 INFO common.c: SRAM size: 0x3000 bytes (12 KiB), Flash: 0x10000 bytes (64 MiB)
2019-12-13T08:22:40 INFO gdb-server.c: Chip ID is 00000438, Core ID is 2ba01477.
2019-12-13T08:22:40 INFO gdb-server.c: Listening at *:4242...
```

If all is ok, st-util waits to a connection on `localhost:4242` port.

Then, we can connect to st-link using Qt Creator, in `Debug->Start debugging->Attach to Running Debug Server...`: * define the server port to 4242 (ST-util server port) * give the Local executable full path (path to the `.elf` file)

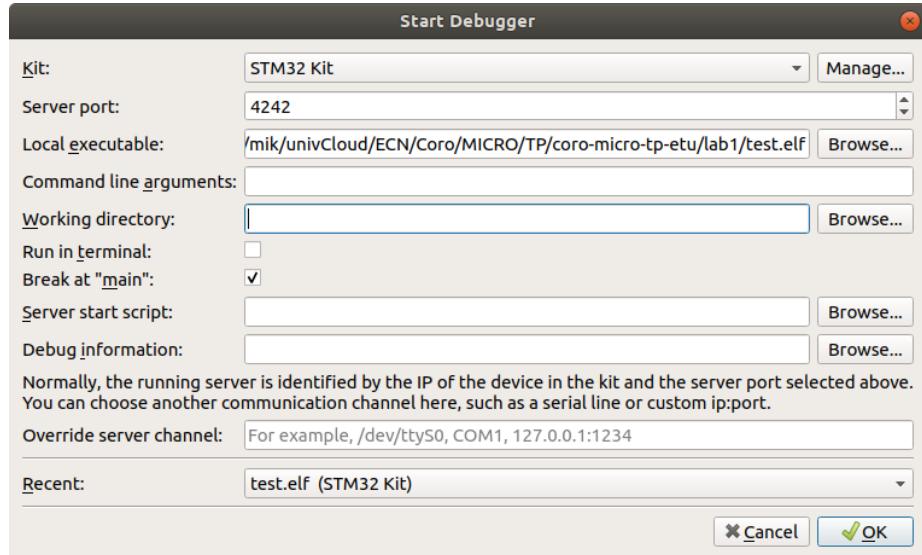


Figure 1:

Using debug session

Qt Creator acts only as a graphical user interface, and all the gdb command are now available using the GUI:

In the image just below: * the yellow arrow shows the next instruction that will be executed * the red dot is a **breakpoint**, where the program should stop. It is inserted/removed by a simple click just before the line number.

```

17  /* main function */
18  int main(void)
19  {
20  →     unsigned int i = 0;
21      setup();
22      /* Infinite loop */
23  →     while (1)
24      {
25          /* Add application code here */
26          GPIOB->BSRR = 1<<3;           //bit set
27          wait();
28  →         GPIOB->BSRR = 1<<(3+16);    //bit reset
29          wait();
30          i++;
31     }
32 }
```



The program execution is controlled by the commands
(A tip label is displayed when the mouse gets over the buttons): *
start/stop/resume commands * step over won't enter in a function,
but execute it directly * step into will enter in a function so that it can be
debugged

With the SVD file provided in the `Device` configuration, we can have a look at the peripheral state (in read-only mode at this date), using `window->views->Peripheral Registers`. Then, a right click on the peripheral register window to choose the peripheral to display. In the following capture, the GPIOB peripheral is displayed, and since the last breakpoint, the bit 3 of ODR has been updated (shown in red):

Name	Value	Access
► MODER	0x00000040	RW
► OTYPER	0x00000000	RW
► OSPEEDR	0x000000c0	RW
► PUPDR	0x00000000	RW
► IDR	0x0000f73c	RO
▼ ODR	0x00000008	RW
ODR15	0x0	N/A
ODR14	0x0	N/A
ODR13	0x0	N/A
ODR12	0x0	N/A
ODR11	0x0	N/A
ODR10	0x0	N/A
ODR9	0x0	N/A
ODR8	0x0	N/A
ODR7	0x0	N/A
ODR6	0x0	N/A
ODR5	0x0	N/A
ODR4	0x0	N/A
ODR3	0x1	N/A
ODR2	0x0	N/A
ODR1	0x0	N/A
ODR0	0x0	N/A
► BSRR	0x00000000	WO
► LCKR	0x00000000	RW
► AFRL	0x00000000	RW
► AFRH	0x00000000	RW
► BRR	0x00000000	WO

Figure 2: