Setting up Venus OS SDK

1. Intro

This page explains setting up a cross compiling environment for Venus. Cross compiling means that the software is built/compiled on a different system (your computer aka host) than the one on which it is executed (for example your CCGX).

Notes:

- rebuilding the whole rootfs and image from scratch is something entirely different, explained here: https://github.com/victronenergy/venus
- this page assumes your host pc / virtual runs linux
- it is often faster to do most development and debugging of software on your pc first. So no cross-compiling required at first. See here.
- when looking for ordinary packages, such as git, gdb, or something else, as opposed to your own development, make sure to have a look at all pre-compiled and available packages too. Login to the ccgx and run this command to see available packages:

  ```
  opkg list
  ```

- another alternative: compile on the target itself. Use opkg to install git, make and gcc, then checkout whatever source you want to compile. Easier than cross compiling, but can be a bit slower :)

2. Getting started

To cross compile, you need to setup an SDK, which contains the gcc compiler, as well as all header files and other setup of the CCGX.

More info about what you are installing here:
http://www.yoctoproject.org/bulk/devday-eu-2014/ypdd14-hudson-sdk.pdf

2.1 Prerequisites

This example has been made on Ubuntu.

First replace dash with bash:

```
sudo dpkg-reconfigure dash   (and choose NO)
```

Then install all the prerequisites. For (X)Ubuntu do:

```
sudo apt-get install gawk wget git-core diffstat unzip texinfo gcc-multilib
build-essential chrpath socat libsdl1.2-dev xterm
```

For other distros, see the Yocto documentation for the requirements.

2.2 Install the SDK

The SDK includes the gcc compiler for the ARM processor, as well as all the needed libraries and header files.

First, download the latest sdk here.

- Cortex A8 for the Venus GX and CCGX
- Cortex A7 for the Raspberrypi

The file needed is the one ending with .sh.

There is no need to worry about it not being the same version as the latest available CCGX firmware version. Using the latest SDK available will be fine.

Only in case we are making a major change in Venus you do need to make sure to use proper sdk. In such case, when developing for a device running a candidate image, then also download the sdk from the candidate feed instead of the release feed linked above.

Then install it. It will ask where you want to have it installed, **make sure to install the ccgx sdk in its default location!**. And, in these examples, make sure to replace v1.40 to the version you downloaded:

```
chmod u+x ./venus-jethro-x86_64-arm-cortexa8hf-neon-toolchain-qte-v2.07.sh
sudo ./venus-jethro-x86_64-arm-cortexa8hf-neon-toolchain-qte-v2.07.sh
```

Make a symlink /opt/venus/current

```
sudo ln -s /opt/venus/jethro-v2.07-arm-cortexa8hf-neon /opt/venus/current
```

Now to use this SDK, the following command is to be executed in the terminal where you also call make or start qtcreator. This has to be done every time, but you are free to automate it of course:

```
. /opt/venus/current/environment-setup-cortexa8hf-vfp-neon-ve-linux-gnueabi
```

2.3 Cross compile your first project

Create a file helloworld.c with the following content:

```
#include <stdio.h>

int main()
{
    puts("hello world");
    return 0;
```

```
}
```

The following is needed to compile above for a ccgx

```
# first setup the environment:
. /opt/venus/jethro-v2.07-arm-cortexa8hf-neon/environment-setup-cortexa8hf-
vfp-neon-ve-linux-gnueabi

$CC helloworld.c -o helloworld
```

The resulting binary is now called helloworld. This is an ARM executable, this can be checked with

```
file helloworld
```

This should report something like: helloworld: ELF 32-bit LSB executable, ARM, EABI5 version 1 (SYSV), dynamically linked (uses shared libs), for GNU/Linux 2.6.16, not stripped

2.4 Cross compiling QT projects

QT projects, which are projects using 1 or more QT libraries, rely on the qmake engine. Compiling a projects works like this:

```
# first setup the environment:
. /opt/venus/jethro-v2.07-arm-cortexa8hf-neon/environment-setup-cortexa8hf-
vfp-neon-ve-linux-gnueabi

# change directory to the location of the qmake file (.pro extension)
cd <path to project file>

# Run qmake to create a makefile. Use the qmake supplied with the SDK!
/opt/venus/jethro-v2.07-arm-cortexa8hf-neon/sysroots/x86_64-ve-
linux/usr/bin/qmake <project file>.pro

# Build the project
make
```

2.5 Cross compiling velib projects

(and maybe linux and uboot since they also use CROSS_COMPILE).

```
# first setup the environment:
. /opt/venus/jethro-v2.07-arm-cortexa8hf-neon/environment-setup-cortexa8hf-
vfp-neon-ve-linux-gnueabi

# unset CROSS_COMPILE
# Its related to
http://git.yoctoproject.org/cgit.cgi/poky/commit/?id=678e8798ebe0f4fd1bd347d
b136f1499b8fe00c9
```

```
# Reason: if CROSS_COMPILE exists, velib make rules will redefine CC. For
more info
# on that, see README_make.txt in velib.
# And, to help the search engines: if you don't do this, --sysroot won't be
set,
# which leads to a stdint.h missing error in the compiler.

# this is not necessary if used velib version includes this patch:
#
https://github.com/victronenergy/velib/commit/21f0d3a1094874883fedfa91523ae0
77495ba07b

export CROSS_COMPILE=

make
```

Note that, besides above instruction, you'll -as always- also need to setup the build after checking a project out. Typically by running ./ext/velib/mk/init_build.sh

LUXURY - now that you have done the basics, go for the IDE

Now that you have successfully compiled a project from the command-line, time for the next step.

0. Install QT Creator

```
sudo apt-get install qtcreator (or take latest from qt website)
```

To start QTCreator, start a new terminal, and execute the command

```
. /opt/venus/current/environment-setup-armv7a-vfp-neon-ve-linux-gnueabi
```

And then start qtcreater: make sure to start it from the same terminal where you typed `. /opt/venus/…` !!

```
qtcreator
```

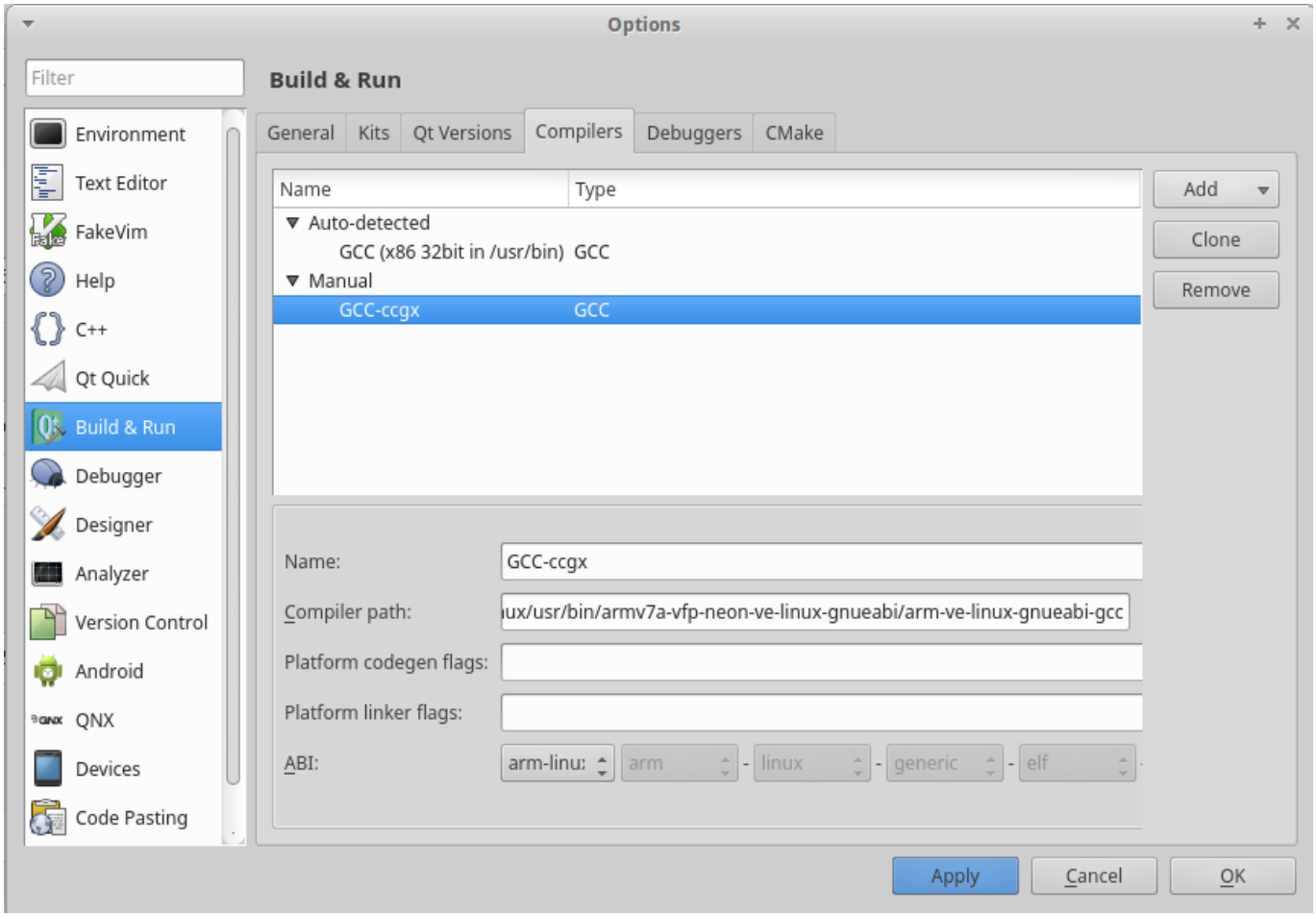
1. Configuring QT Creator

1.1 Add the cross-compiler

Goto Options→Build & Run→Compilers, and press Add. Select GCC as the type. And point it to:

```
/opt/venus/current/sysroots/i686-ve-linux/usr/bin/armv7a-vfp-neon-ve-linux-
gnueabi/arm-ve-linux-gnueabi-gcc
```

Result will look like this:



1.2 Add the debugger

Same screen, but one tab to the right: Debuggers. Click add and point it to:

```
/opt/venus/current/sysroots/i686-ve-linux/usr/bin/armv7a-vfp-neon-ve-linux-gnueabi/arm-ve-linux-gnueabi-gdb
```

1.3 Add the Qt version

Same screen, but then one tab to the left, Qt Versions. Point it to

```
/opt/venus/current/sysroots/i686-ve-linux/usr/bin/qmake
```

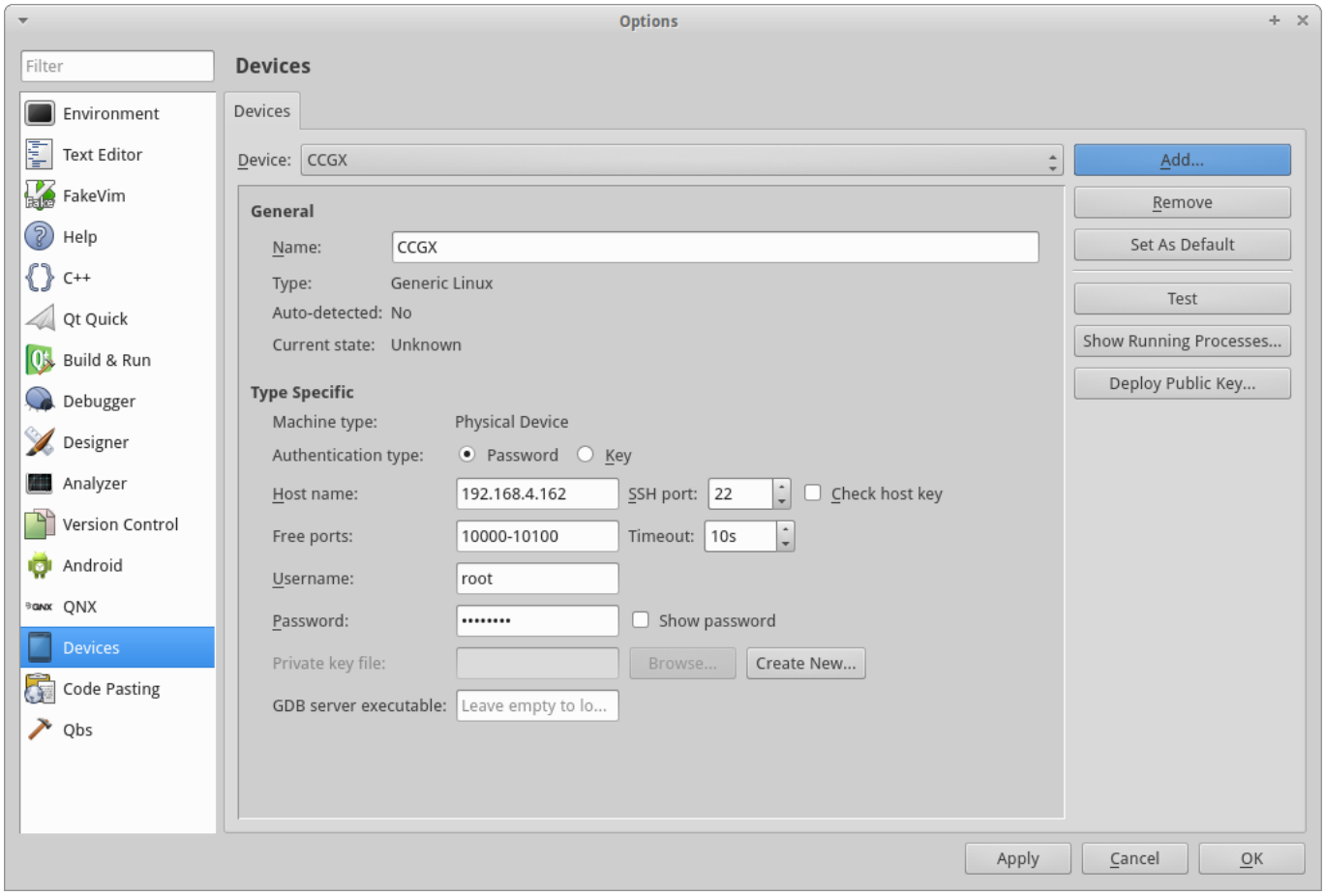
1.4 Prepare your CCGX

- Arrange root access.

Its not, or no longer, necessary to install gdbserver on the CCGX, as it is already installed by default.

1.5 Add the device to qtcreator

Add device, see screenshot.

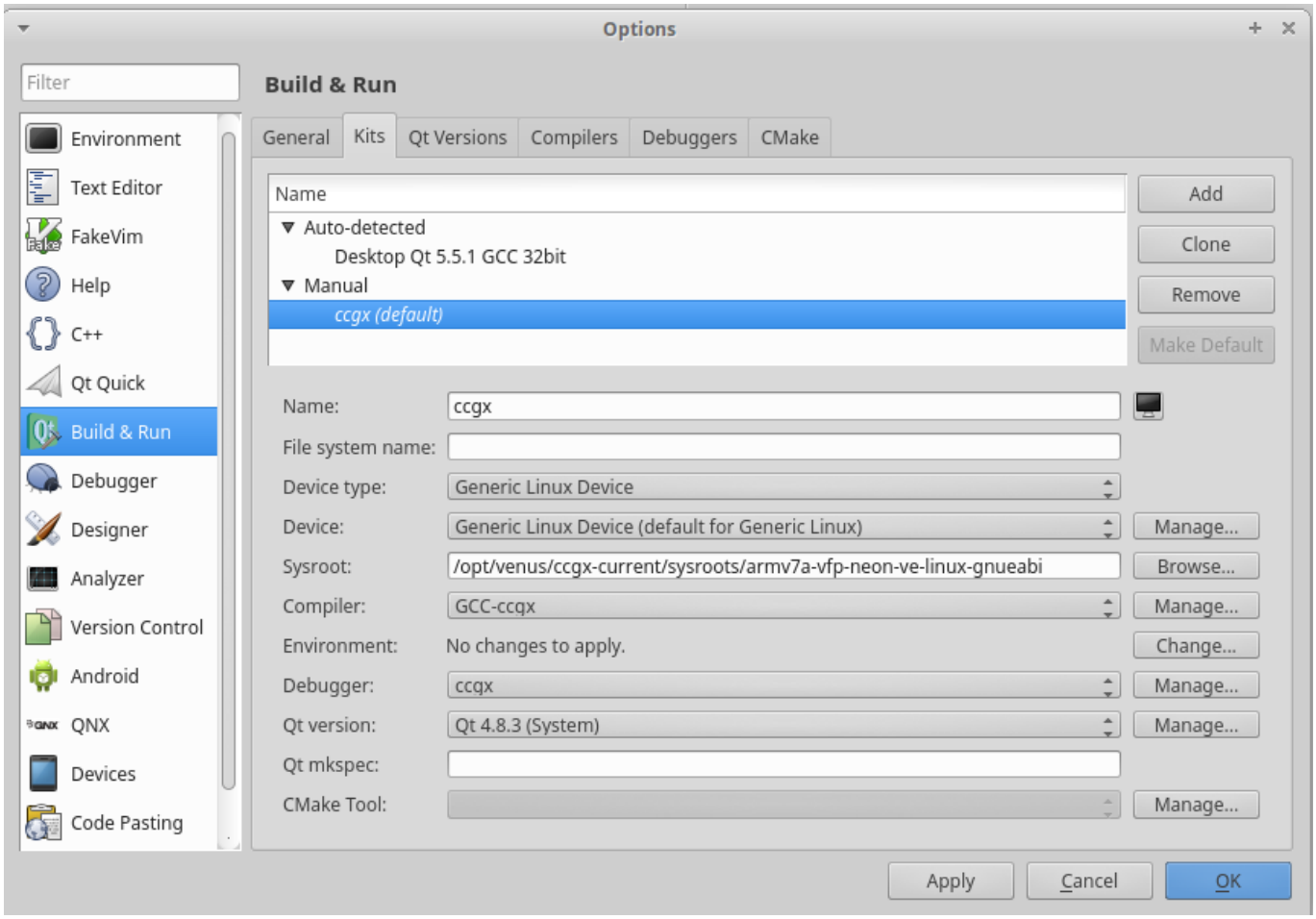


1.6 Add a Kit

Next add a new kit:

- select the Compiler, Debugger and Qt Version which you have created in the previous steps.
- select a sysroot: /opt/venus/current/sysroots/armv7a-vfp-neon-ve-linux-gnueabi

End result will look like this:



2 Try it

Now you are ready to start compiling. Open a QT project file (.pro extension) and chose the CCGX kit, and chose Build→Build Project. If you get an error message 'c: Command not found', you probably forgot to run the environment script before starting QT Creator.

After a successful build deploy the executable to the CCGX (Build→Deploy project). Note that it is not possible to overwrite an executable that is currently running. So, for this gui example, make sure to first stop the gui on the ccgx:

```
svc -d /service/gui
```

Cross-compile run:
Executable on device: /opt/color-control/gui

3 Notes

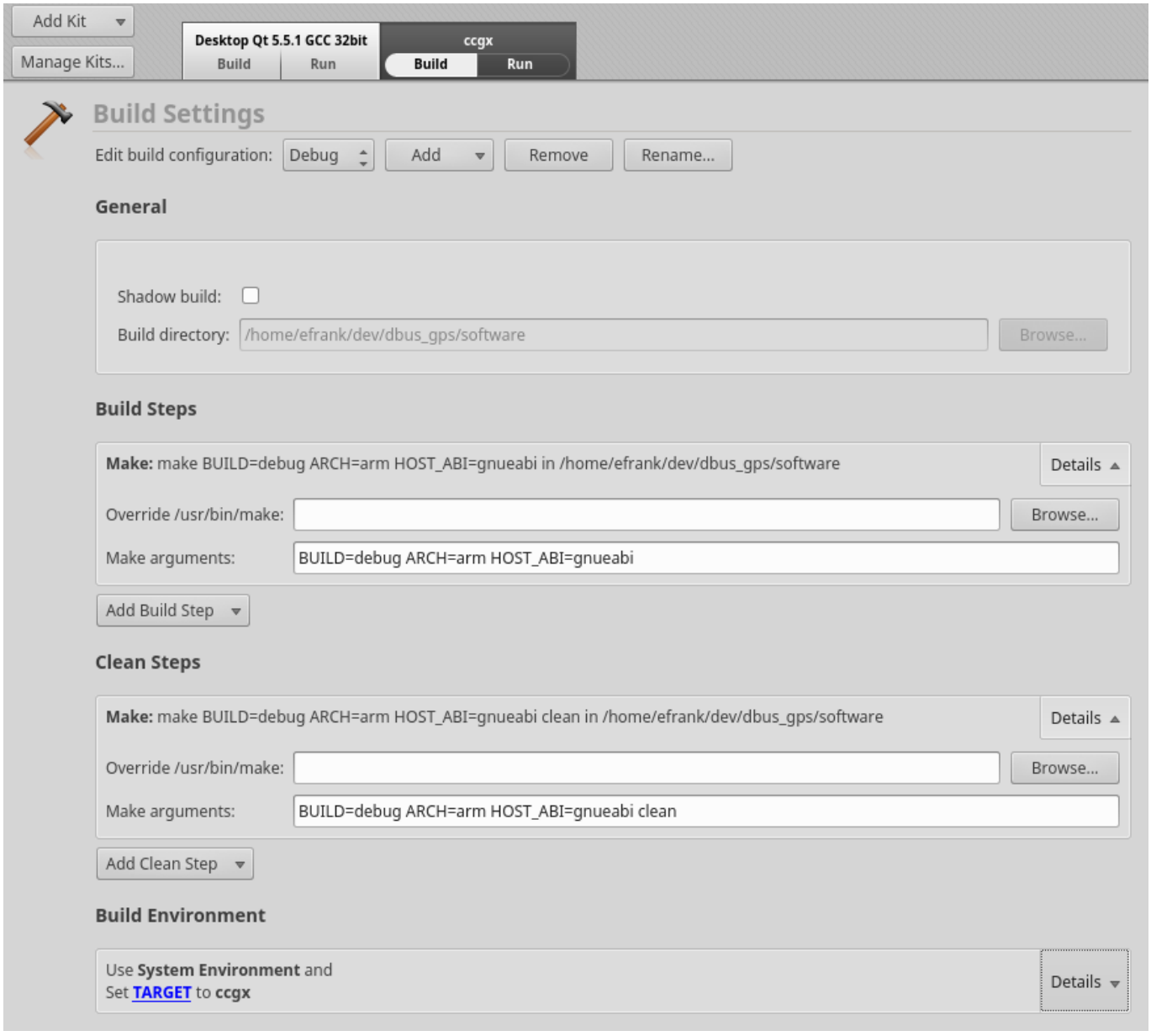
When working on a velib project, make sure to change these settings in the Kit:

1. Remove qmake from build steps in the kit
2. Disable shadow build
3. Add ARCH=arm HOST_ABI=gnueabi to the Make arguments of the build steps
4. Probably you need to unset the CROSS_COMPILE variable, see basic section above.
5. For the debug build, also add BUILD=debug

6. Add the same to the clean steps

And if you are going to build release builds with qtcreator, do more or less the same for that build config.

End result will look like this:



More bits and pieces that might come in handy

Mount CCGX file system locally

To save yourself some time copying files back and forth between your PC and your CCGX, for example while editing Python code, use sshfs to mount the CCGX drive to your local machine:

```
mkdir ~/rem
```

```
sshfs root@ccgx:/opt/color-control ~/rem
```

Use fusermount -u PATH to unmount it again. or just reboot your machine.

Developing and running on your PC instead of immediately on the target

Developing, running, debugging a module on your (Linux) PC is often much faster than first having it uploaded to the CCGX everytime you want to run it. And the good news is that it is perfectly possible.

Most of our modules will run perfectly on a pc: localsettings, dbus_gps, dbus_modbustcp, dbus_fronius, etcetera. Even the gui runs on a pc, but that is a bit more difficult since it needs some changes which we made to the qt libraries.

Most -perhaps even all- of our D-Bus implementations (C, Cpp, Python, etc) automatically choose the Session D-Bus instead of the System D-Bus which is used on the ccgx. This is done at either compile- or run-time. To see what is going on on the D-Bus, use the DBusCli command-line tool. Make sure to omit the -y commandline parameter. Tips and tricks for command line D-Bus access here.

For some modules you'll need to run localsettings on your pc. Github repo including explanation of what it is is here. Look for localsettings on this page for instructions on setting it up. Note that it shouldn't be necessary to change the dbus config files! Since it will be using the (open) session dbus, and not the system dbus which is usually locked down.

DISQUS

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