The Build Process

of (GNU Arm Embedded Toolchain 10-2021-q1-update)
2021-02

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Preface

This manual provides a step-by-step guide to help you build '`GNU Arm Embedded Toolchain`' on a newly installed Ubuntu 14.04 LTS 64-bit operating system.

Note that the steps below may most likely also work on an Ubuntu which is not newly installed or version other than 14.04 LTS, but it is not guaranteed. In this case please go through Appendix A [Known Issues], page 10 before you go, and you need to solve any other problems you may encounter by yourself. We highly appreciate if you could share the problems and solutions with us.

1 Build GNU Tools for Linux and Windows Platforms

1.1 Install Ubuntu

Ubuntu 14.04.5 ISO image is available from http://releases.ubuntu.com/14.04/ubuntu-14.04.5-desktop-amd64.iso. You can install it as a native system or a virtual machine.

1.2 Install Dependencies

1.2.1 Install dependencies available in Ubuntu's repositories

Execute the commands in this section to install the tools needed to build the toolchain. Lines starting with '$' denote commands that need to be input as is while lines starting with '#' are comments and as such do not need to be typed in.

Please note that the "Ignoring Provides line" and "unknown Multi-Arch type" warnings when executing `apt-get update` are harmless and can thus safely be ignored. Similarly, the warning about `update-alternatives` skipping the creation of symbolic links when executing `apt-get install` is also harmless and can therefore safely be ignored.

```
# Start root session
$ sudo su

# Add extra repositories to be used by APT
$ apt-get install software-properties-common
$ add-apt-repository universe
$ cat >/etc/apt/sources.list.d/xenial.list <<EOF
deb http://archive.ubuntu.com/ubuntu xenial main universe
deb-src http://archive.ubuntu.com/ubuntu xenial main universe
deb http://security.ubuntu.com/ubuntu xenial-security main
EOF

# Ensure package for Ubuntu Trusty are chosen by default
$ echo 'APT::Default-Release "trusty";' > /etc/apt/apt.conf.d/00default

# Enable use of 32bit packages
$ dpkg --add-architecture i386
$ apt-get update
```

```
# Install packages
$ apt-get install -y -t xenial \
    gcc-mingw-w64-i686 g++-mingw-w64-i686 binutils-mingw-w64-i686
$ apt-get -f install -y \
    build-essential \
    autoconf \
    autogen \
    bison \
    dejagnu \
    flex \
    flip \
    gawk \
    git \
    gperf \
    gzip \
    nsis \
    openssh-client \
    p7zip-full \
    perl \
    python-dev \
    libisl-dev \
    scons \
    tcl \
    texinfo \
    tofrodos \
    wget \
    zip \
    texlive \
    texlive-extra-utils \
    libncurses5-dev

# End root session
$exit
```

1.3 Build GNU Arm Embedded Toolchain

You are now ready to build the toolchain. Just follow the below instructions, substituting `~/toolchain` by the directory in which you wish to build the toolchain. Note that if you are not interested in the Windows toolchain, you can speed up the build by passing the option `--skip_steps=mingw32` to **all** of install-sources.sh, build-prerequisites.sh and build-toolchain.sh.

```
# Create a directory in which to build the toolchain and copy the source
# release package into it.
$ mkdir ~/toolchain
$ cp gcc-arm-none-eabi-10-2021-q1-update-src.tar.bz2 ~/toolchain

# Untar the source tarball.
$ cd ~/toolchain
$ tar -xjf gcc-arm-none-eabi-10-2021-q1-update-src.tar.bz2
$ cd ./gcc-arm-none-eabi-10-2021-q1-update
$ ./install-sources.sh

# Build the toolchain(s).
$ ./build-prerequisites.sh
$ ./build-toolchain.sh
```

Once the build completes you can find the binary and source tarballs in '`~/toolchain/gcc-arm-none-eabi-10-2021-q1-update/pkg`' along with the md5 checksum.

2 Build GNU Tools on Mac OS X

In addition to the build on Ubuntu, the build scripts in same source package can also be used on Mac OS X to build native toolchain whose host is Mac OS X and target is arm-none-eabi.

In this step we will describe how to install required software components and how to execute the build scripts. After this step you should be able to generate a same toolchain with the one released.

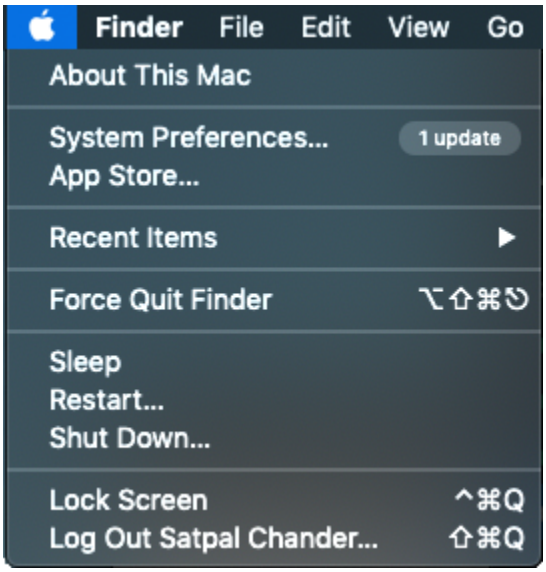
Due to resource limitation, this build process is only tested against:

- macOS Mojave 10.14.6
- macOS Catalina 10.15.4

2.1 Prepare a Mac OS X environment

The hardware should be an x86-based Apple Mac family machine. The installed host OS should be Mac OS X which is updated to 10.14.6 or newer. The way to find out the Mac OS X version information is to click the **Apple** menu and choose **About This Mac** or use command line:

```
$ sw_vers -productVersion
```



For the environment we are using, it looks as below:

2.2 Install the Command Line Tools for Xcode

You can install this package with command:

```
$ xcode-select --install
```

If above led to the error please visit:

https://developer.apple.com/download/more/

to download e.g. Command Line Tools for Xcode 11.5 directly from Apple webpage. You will be asked to login with your Apple ID.

2.3 Using Bash on Mac OS X

Please note that this step is optional. We suggest you to use Bash 5 when executing toolchain Bash build scripts. We are currently using Bash:

```
$ bash --version
GNU bash, version 5.0.16(1)-release (x86_64-apple-darwin18.7.0)
```

We recommend to use homebrew to install the latest version of Bash:

```
$ brew install bash
```

2.4 Build Texinfo a GNU Documentation System

Texinfo is the official documentation format of the GNU project. Texinfo produce output in a number of formats, both online and printed. These formats include: dvi, html, info, pdf, xml, etc. This package is needed to build both manual and How-to PDF document. Note: you can skip building of manual and How-to PDF document with '`--skip_steps=howto,manual`' command line option for '`build-toolchain.sh`' build script.

Fetch Texinfo 6.5 sources:

```
$ cd /tmp
$ curl -OL https://ftp.gnu.org/gnu/texinfo/texinfo-6.5.tar.xz
$ tar xf texinfo-6.5.tar.xz
$ cd texinfo-6.5/

# For this example we will install Texinfo binaries in arbitrary /tmp/texinfo
# directory
$ mkdir /tmp/texinfo
$ ./configure --prefix=/tmp/texinfo
$ make
$ make install
```

Add Texinfo 6.5 installation directory to the system PATH.

```
$ export PATH=/tmp/texinfo/bin:$PATH
```

2.5 Install MacTeX to build PDF format documents

This is an optional step and can be skipped if PDF format documents aren't needed. The build process will use TeX engineer provided by MacTeX-2012 to generate PDF format documents. This component can be freely obtained from its official FTP server `ftp://ftp.tug.org/historic/systems/mactex/2012/MacTeX.pkg`. Its original size is approximately 2.1G. Once downloaded, just double click on the '`MacTeX.pkg`' file and follow the instructions to install it. By default the related TeX executable files won't be installed into the default path like '`/usr/bin`', so the Terminal need to be restarted before running the build scripts.

Note: It is possible to install MacTeX with homebrew using Homebrew Cask via:

```
$ brew install Caskroom/cask/mactex
```

If you would like to install MacText without the GUI, you can:

```
$ brew install Caskroom/cask/mactex-no-gui
```

2.6 Build the toolchain under Mac OS X

With all the dependent packages installed, we can start to build the native toolchain on Mac OS. Following are the commands and steps we are using:

```
# Copy the src release package into ~/mac-build/ directory
$ cp gcc-arm-none-eabi-10-2021-q1-update-src.tar.bz2 ~/mac-build

# Prepare source codes
$ cd ~/mac-build
$ tar xjf gcc-arm-none-eabi-10-2021-q1-update-src.tar.bz2
$ cd ./gcc-arm-none-eabi-10-2021-q1-update
$ ./install-sources.sh

# Start building the toolchain.
$ ./build-prerequisites.sh
$ ./build-toolchain.sh
```

When build is completed you will find toolchain binaries, sources and MD5 checksum files under pkg/ directory, see:

```
~/mac-build/gcc-arm-none-eabi-10-2021-q1-update/pkg $ ls -l
gcc-arm-none-eabi-10-2021-q1-update-mac-10.15.4.tar.bz2
gcc-arm-none-eabi-10-2021-q1-update-src.tar.bz2
md5-x86_64-darwin.txt
```

Appendix A Known Issues

- If you are using different build environment and tools, you might run into a problem where binutils can not be successfully built. This is probably caused by binutils bug 13036. For more information, please refer to http://sourceware.org/bugzilla/show_bug.cgi?id=13036.
- Some shell scripts in gcc and other packages are incompatible with the dash shell, which is the default /bin/sh for Ubuntu 14.04 LTS. You must make /bin/sh a symbolic link to one of the supported shells: saying bash. Here on Ubuntu 14.04 LTS system, this can be done by running following command:

  ```
  $ sudo dpkg-reconfigure -plow dash
  ```

  Then choose '`No`' in the '`Configuring dash`' popup dialog and press enter. You can run following command and check that /bin/sh points to '`bash`':

  ```
  $ ls -l /bin/sh
  ...... /bin/sh -> bash
  ```