

Cross-compilation

Many or even most tasks can be implemented using the integrated [SDK](#) with the C-like scripting language and the router API functions.

Toolchain

However, if for some reasons you want or have to cross-compile a C application, you will find the different [Cross-compilation toolchains](#) on our FTP server. The toolchains consists of a compiler ([GNU Compiler Collection \(GCC\)](#) version 4.4.5), a assembler and linker ([GNU binutils](#)) and a [C standard library](#) ([uClibc](#) version 0.9.31), all built to produce binaries for NetModule Routers.

The following Cross-Compilation toolchains are available:

- [PowerPC](#) / NB1600, NB2700, NB2710, NB3700 and NB3710
- [ARM](#) / NB2800, NB3701, NB3711 and NB3800
- [ARM](#) / NB800

For further introduction to GCC please refer to [An Introduction to GCC](#), chapter 2 and following ones.

Please be ware that NetModule can not support systems with customer extensions.

Getting Started

1. Download and install the corresponding toolchain from above on your Linux x86 PC

wget

```
ftp://share.netmodule.com/router/public/toolchain/netbox-ppc/  
toolchain-ppc-4.4.5-x86_64.tar.bz2  
tar -xvf toolchain-ppc-4.4.5-x86_64.tar.bz2 -C /opt  
export PATH=$PATH:/opt/toolchain-ppc-4.4.5-x86_64/bin
```

2. Write a program

[hello.c](#)

```
#include<stdio.h>  
#include<features.h>  
int main()  
{  
    printf("Hello World\n");  
    #ifdef __UCLIBC__  
        printf("We are coding against uClibc\n");  
        printf("uClibc v%i %i.%i\n", __UCLIBC_MAJOR__, __UCLIBC_MINOR__,  
        __UCLIBC_SUBLEVEL__);  
    #endif  
    return 0;  
}
```

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The [Linux man-pages](#) project documents the Linux kernel and C library interfaces that are employed by user-space programs. [Section 2](#) documents the system calls provided by the Linux kernel and [section 3](#) documents the functions provided by the standard C library. Another reference guide for the C standard library can be found [here](#).

3. Compile it

PowerPC:

```
powerpc-openwrt-linux-gcc -Wall hello.c -o hello
```

ARM:

```
arm-openwrt-linux-gcc -Wall hello.c -o hello
```

4. Copy it to the router (e.g. via SCP) and run it.

Example: Compile a program from Source

This example shows you how to compile a program from source. The program in this example is [jq](#)

PowerPC

```
wget https://github.com/stedolan/jq/releases/download/jq-1.5/jq-1.5.tar.gz
tar -xzf jq-1.5.tar.gz
cd jq-1.5
CC=powerpc-openwrt-linux-gcc ./configure --host=powerpc --disable-
maintainer-mode
make
```

ARM

```
wget https://github.com/stedolan/jq/releases/download/jq-1.5/jq-1.5.tar.gz
tar -xzf jq-1.5.tar.gz
cd jq-1.5
CC=arm-openwrt-linux-gcc ./configure --host=arm --disable-maintainer-mode
make
```

Note: Patch required to fix y0, y1, j0 and j1 related build issue on uClibc

Our default uClibc configuration does not have DO_XSI_MATH=y, so it lacks certain math functions. jq generates some wrappers for the libm functions, even for functions that are not actually used by jq. By simply removing those wrappers, we get jq to build on uClibc that have DO_XSI_MATH disabled.

We can now check the file type and we see, that the program has been compiled for PowerPC. Now we can copy jq to NB1600 and run it.

file jq

```
jq: ELF 32-bit MSB executable, PowerPC or cisco 4500, version 1 (SYSV),
dynamically linked (uses shared libs), with unknown capability 0x41000000 =
0x13676e75, with unknown capability 0x10000 = 0xb0402, not stripped
```

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Oracle Virtual Box Image

For small projects or if you don't have a Linux environment you can also use the very small [Virtual Box Image](#). The image uses Tiny Core Linux (<http://tinycorelinux.net/>). Please read the startup message carefully. This is only valid for the NB1600, NB2700/2710, NB3700/3710.

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