

How to use the GNU Cross Debugger for Ethernet-based Remote Debugging

The GNU cross tool chain for DNP/5280 Linux C programming offers a pre-build cross version of the GNU Debugger, called `m68k-elf-gdb`.

This debugger runs on a PC-based Linux and allows you to debug DNP/5280 uCLinux executables with ELF layout at C source code level over a remote connection to the DNP/5280.

The cross debugger needs a Ethernet-based TCP/IP link between the PC and the DNP/5280. In addition the debugger needs also a remote debugging agent, called `gdbserver` for the DNP/5280. This agent is pre-installed within the DNP/5280 Linux.

- **1. Step:** Write your C program and translate the C source code with the GNU cross C compiler to a executable and a symbol file. Use the following command line with the `-g` parameter. This sample command line builds a executable, called `loop` from a source code file with the name `loop.c` and a file `loop.gdb` with symbol information.

```
m68k-elf-gcc -Wall -g -m5307 -Wl,-elf2flt -Os -o loop loop.c -lc
```

```
Terminal - Terminal <2>
Datei Sitzungen Optionen Hilfe
linux:/home/dnp5280 # cat loop.c
#include <stdio.h>
#include <stdlib.h>

int main (void)
{
    int i= 2;

    while (i < 256)
        printf ("%d\n", i= square (i));
    return (EXIT_SUCCESS);
}

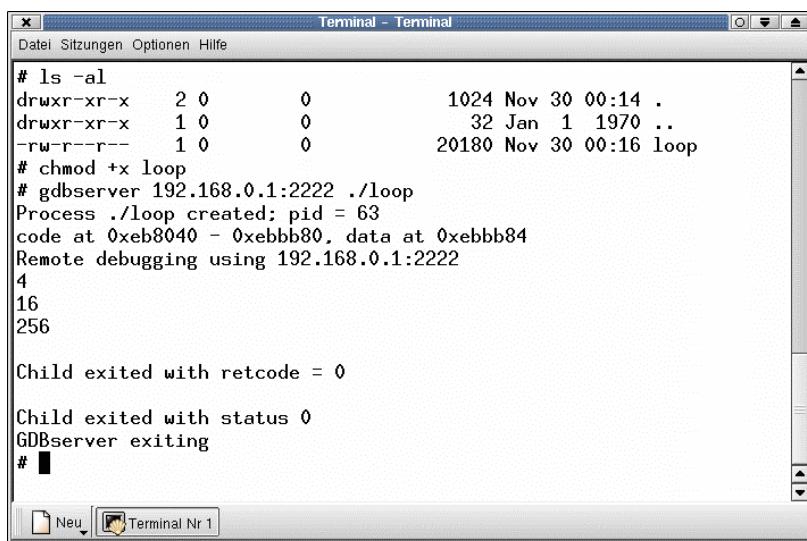
int square (int x)
{
    return (x * x);
}
linux:/home/dnp5280 # m68k-elf-gcc -Wall -g -m5307 -Wl,-elf2flt -Os -o loop loop.c -lc
loop.c: In function `main':
loop.c:9: warning: implicit declaration of function `square'
linux:/home/dnp5280 # ls -al loop.gdb
-rwxr-xr-x  1 root      root      78612 Dez 18 16:56 loop.gdb
linux:/home/dnp5280 # ls -al loop
-rwxr--r--  1 root      root      20180 Dez 18 16:56 loop
linux:/home/dnp5280 # ■
```

- **2. Step:** Transfer the executable from your PC hard disk drive to the DNP/5280 RAM disk or JFFS-based flash disk drive and run the executable on your DNP/5280 with the help of `gdbserver`. Use a TFTP session and a Telnet session for this task. Please enter the following commands within the DNP/5280 Telnet session window:

```
tftp -g -l loop 192.168.0.1
chmod +x loop
```

```
gdbserver 192.168.0.1:2222 ./loop
```

The first command line transfers the executable **loop** from the PC to the DIL/NetPC DNP/5280. This line assumes that your PC is using the IP address 192.168.0.1. The second line makes sure that the executable attribute is set for **hello**. The next command line runs **loop** with the help of **gdbserver**. Within this command line you need the IP address of the PC together with a TCP/IP port number. We use the port number 2222 for this sample.



```
# ls -al
drwxr-xr-x  2 0          0          1024 Nov 30 00:14 .
drwxr-xr-x  1 0          0          32 Jan  1 1970 ..
-rw-r--r--  1 0          0        20180 Nov 30 00:16 loop

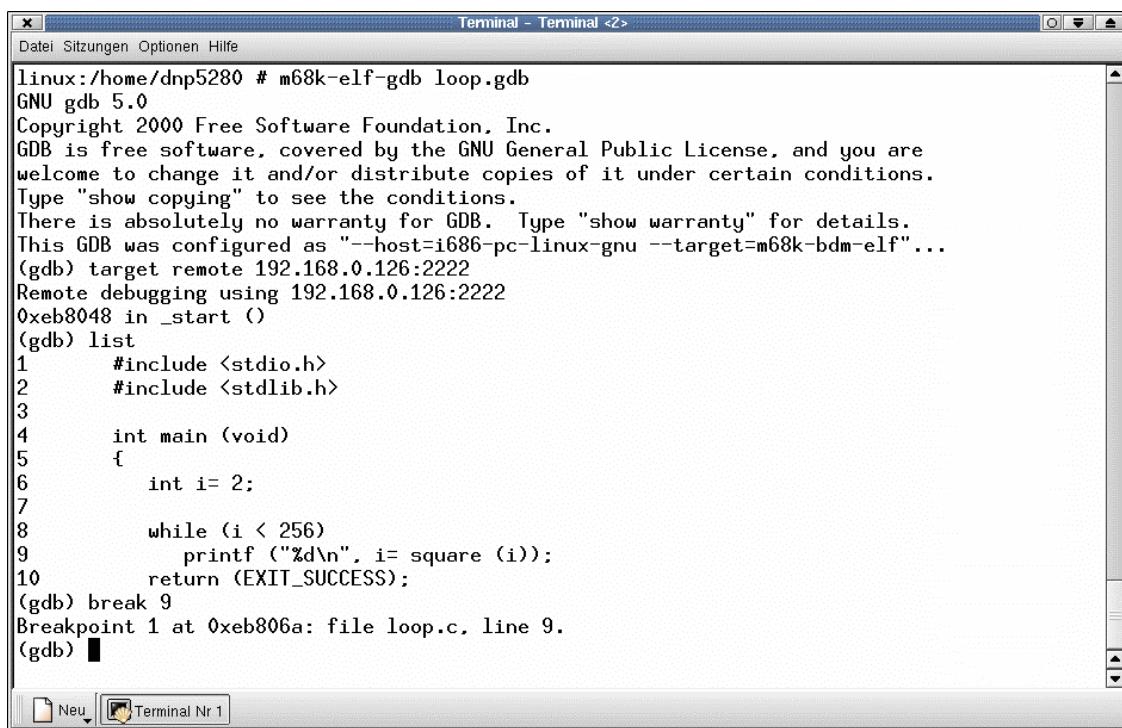
# chmod +x loop
# gdbserver 192.168.0.1:2222 ./loop
Process ./loop created; pid = 63
code at 0xeb8040 - 0xebbb80, data at 0xebbb84
Remote debugging using 192.168.0.1:2222
4
16
256

Child exited with retcode = 0

Child exited with status 0
GDBserver exiting
#
```

- **3. Step:** Run the GNU cross Debugger m68k-elf-gdb on your PC. Use the following command line. The parameter **loop.gdb** is the file name for the symbol information file.

```
m68k-elf-gdb loop.gdb
```



```
linux:/home/dnp5280 # m68k-elf-gdb loop.gdb
GNU gdb 5.0
Copyright 2000 Free Software Foundation, Inc.
GDB is free software, covered by the GNU General Public License, and you are
welcome to change it and/or distribute copies of it under certain conditions.
Type "show copying" to see the conditions.
There is absolutely no warranty for GDB. Type "show warranty" for details.
This GDB was configured as "--host=i686-pc-linux-gnu --target=m68k-bdm-elf"...
(gdb) target remote 192.168.0.126:2222
Remote debugging using 192.168.0.126:2222
0xeb8048 in _start ()
(gdb) list
1      #include <stdio.h>
2      #include <stdlib.h>
3
4      int main (void)
5      {
6          int i= 2;
7
8          while (i < 256)
9              printf ("%d\n", i= square (i));
10         return (EXIT_SUCCESS);
(gdb) break 9
Breakpoint 1 at 0xeb806a: file loop.c, line 9.
(gdb) ■
```

- **4. Step:** Now the debugger waits for your debugging commands. First please enter always the following command line:

```
target remote 192.168.0.126:2222
```

This debugger command line is setting up the Ethernet-based TCP/IP connection between the PC and the DNP/5280.

Please use the same TCP/IP port number (see step 2). The sample command line assumes that the DNP/5280 is using the IP address 192.168.0.126.

- **5. Step:** Then set your breakpoints within the C source code and run your program with your remote debugging session between the PC and the DNP/5280. Use the debugger command

```
continue
```

for running the program. The program runs to the next breakpoint. The short form for this command is `cont`.

```
Breakpoint 1 at 0xeb806a: file loop.c, line 9.
(gdb) cont
Continuing.

Breakpoint 1, main () at loop.c:9
9      printf ("%d\n", i = square (i));
(gdb) cont
Continuing.

Breakpoint 1, main () at loop.c:9
9      printf ("%d\n", i = square (i));
(gdb) print i
$1 = 4
(gdb) cont
Continuing.

Breakpoint 1, main () at loop.c:9
9      printf ("%d\n", i = square (i));
(gdb) print i
$2 = 16
(gdb) ■
```

That is all.