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ファームウェアの書き込みと動作

NuttX のビルド でファームウェアのバイナリがビルドできましたので、実機に書き込んで動作させてみます。

```
xubuntu64:~/src/NuttX/nuttX$ ls -ln nuttx*  
-rwxrwxr-x 1 1000 1000 1959884  3月 7 14:06 nuttx  
-rwxrwxr-x 1 1000 1000  116948  3月 7 14:06 nuttx.bin  
-rw-rw-r-- 1 1000 1000  329007  3月 7 14:06 nuttx.hex  
xubuntu64:~/src/NuttX/nuttX
```

ST-Link/V2 とコンソールケーブルの接続

Debugger(ST-Link/V2) と USB-Serial ケーブルを接続しておきます。



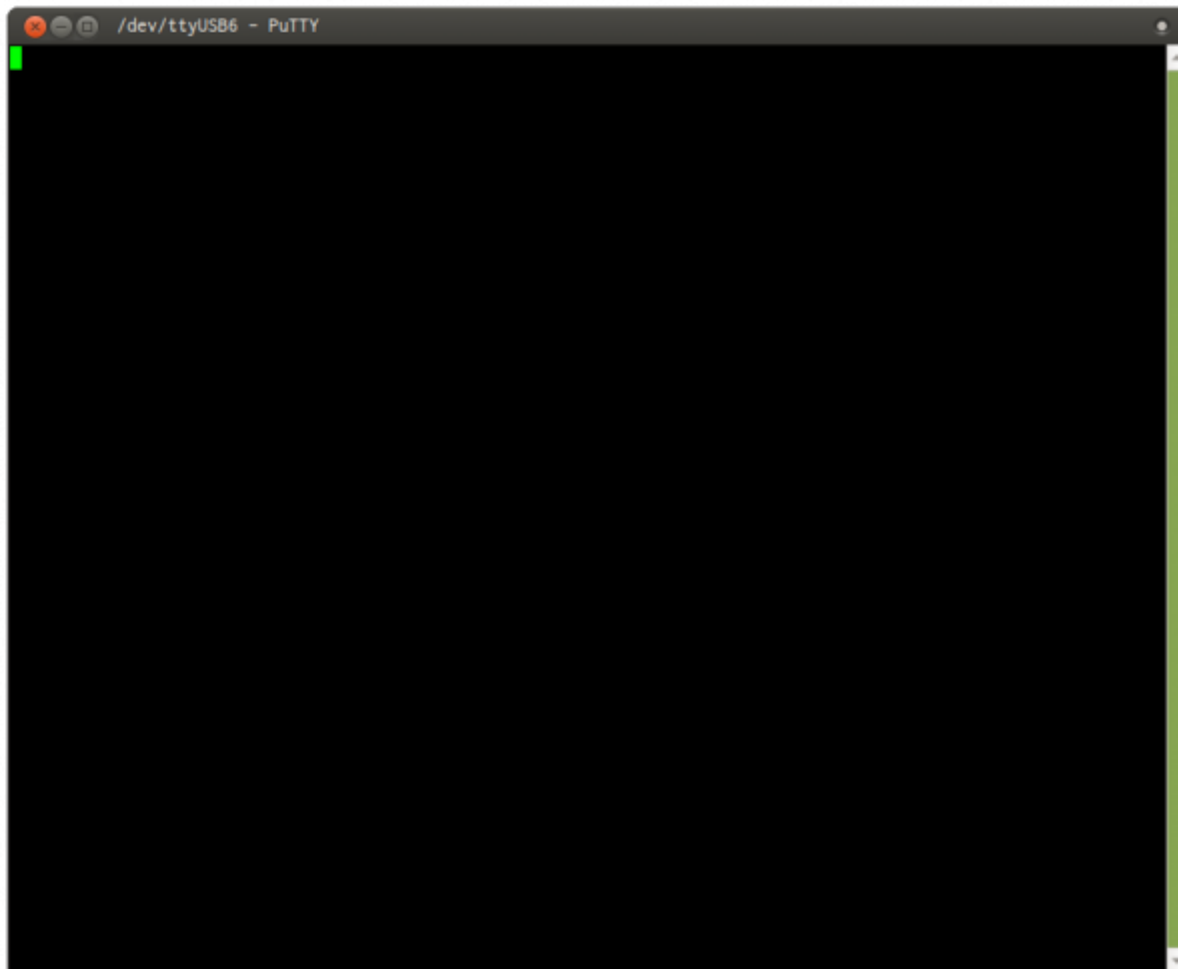
USB-Serial のポート名を確認し、ターミナルエミュレータで接続しておきます。

```
ryzen7:~$ dmesg |tail -5
```

```
[83629.247281] usb 1-4.4: Manufacturer: FTDI
[83629.247283] usb 1-4.4: SerialNumber: FT9Z0TM2
[83629.272759] ftdi_sio 1-4.4:1.0: FTDI USB Serial Device converter detected
[83629.272793] usb 1-4.4: Detected FT232RL
[83629.282853] usb 1-4.4: FTDI USB Serial Device converter now attached to
ttyUSB6
```

設定は下記の通りです。

項目	値
ボーレート	115.2kbps
Bits	8bit
Stop	1bit
Parity	None
Flow	None



OpenOCD の接続

XG-50 に OpenOCD で接続します。

設定ファイルはソースに同梱している **openocd.cfg**¹⁾を使用します。

```
develop:~/src/NuttX_XG50/nuttx$ sudo openocd -f openocd.cfg
Open On-Chip Debugger 0.10.0-00012-gc3826e5-dirty (2017-10-19-10:56)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxygen/bugs.html
Info : auto-selecting first available session transport "hla_swd". To
override use 'transport select <transport>'.
Info : The selected transport took over low-level target control. The
results might differ compared to plain JTAG/SWD
adapter speed: 500 kHz
adapter_nsrst_delay: 100
srst_only separate srst_nogate srst_open_drain connect_assert_srst
Info : Unable to match requested speed 500 kHz, using 480 kHz
Info : Unable to match requested speed 500 kHz, using 480 kHz
Info : clock speed 480 kHz
Info : STLINK v2 JTAG v29 API v2 SWIM v7 VID 0x0483 PID 0x3748
Info : using stlink api v2
Info : Target voltage: 3.289941
Info : stm32l4x.cpu: hardware has 6 breakpoints, 4 watchpoints
srst_only separate srst_nogate srst_open_drain connect_deassert_srst
```

gdb の接続

OpenOCD 経由で、XG-50 に gdb で接続します。OpenOCD を実行しているのと別のターミナルから接続します。

```
develop:~/src/NuttX_XG50/nuttx$ arm-none-eabi-gdb nuttx
GNU gdb (7.10-1ubuntu3+9) 7.10
Copyright (C) 2015 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later
<http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law. Type "show copying"
and "show warranty" for details.
This GDB was configured as "--host=x86_64-linux-gnu --target=arm-none-eabi".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<http://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
<http://www.gnu.org/software/gdb/documentation/>.
For help, type "help".
```

```
Type "apropos word" to search for commands related to "word"...
Reading symbols from nuttx...done.
0x00000000 in ?? ()
(gdb)
```

接続できました。

gdb 接続でエラーになる場合

.gdbinit で各種設定をしていますが、下記のようなエラーがでて接続できない場合があります。

```
develop:~/src/NuttX_XG50/nuttx$ arm-none-eabi-gdb nuttx
GNU gdb (7.10-1ubuntu3+9) 7.10
Copyright (C) 2015 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later
<http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law. Type "show copying"
and "show warranty" for details.
This GDB was configured as "--host=x86_64-linux-gnu --target=arm-none-eabi".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<http://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
<http://www.gnu.org/software/gdb/documentation/>.
For help, type "help".
Type "apropos word" to search for commands related to "word"...
Reading symbols from nuttx...done.
warning: File "/home/kikuchi/src/NuttX_XG50/nuttx/.gdbinit" auto-loading has
been declined by your `auto-load safe-path' set to "$debugdir:$datadir/auto-
load".
To enable execution of this file add
  add-auto-load-safe-path /home/kikuchi/src/NuttX_XG50/nuttx/.gdbinit
line to your configuration file "/home/kikuchi/.gdbinit".
To completely disable this security protection add
  set auto-load safe-path /
line to your configuration file "/home/kikuchi/.gdbinit".
For more information about this security protection see the
"Auto-loading safe path" section in the GDB manual. E.g., run from the
shell:
  info "(gdb)Auto-loading safe path"
(gdb)
```

表示されているとおり、下記内容で **~/gdbinit** を作成します。

[.gdbinit](#)

```
set auto-load safe-path /
```

ファームウェアバイナリの書き込み

接続ができたなら XG-50 をリセットし、ファームウェアのバイナリを書き込みます。

リセット

```
(gdb) reset_halt
Unable to match requested speed 500 kHz, using 480 kHz
Unable to match requested speed 500 kHz, using 480 kHz
adapter speed: 480 kHz
srst_only separate srst_nogate srst_open_drain connect_deassert_srst
target halted due to debug-request, current mode: Thread
xPSR: 0x01000000 pc: 0x08000188 msp: 0x2000657c
```

書き込み

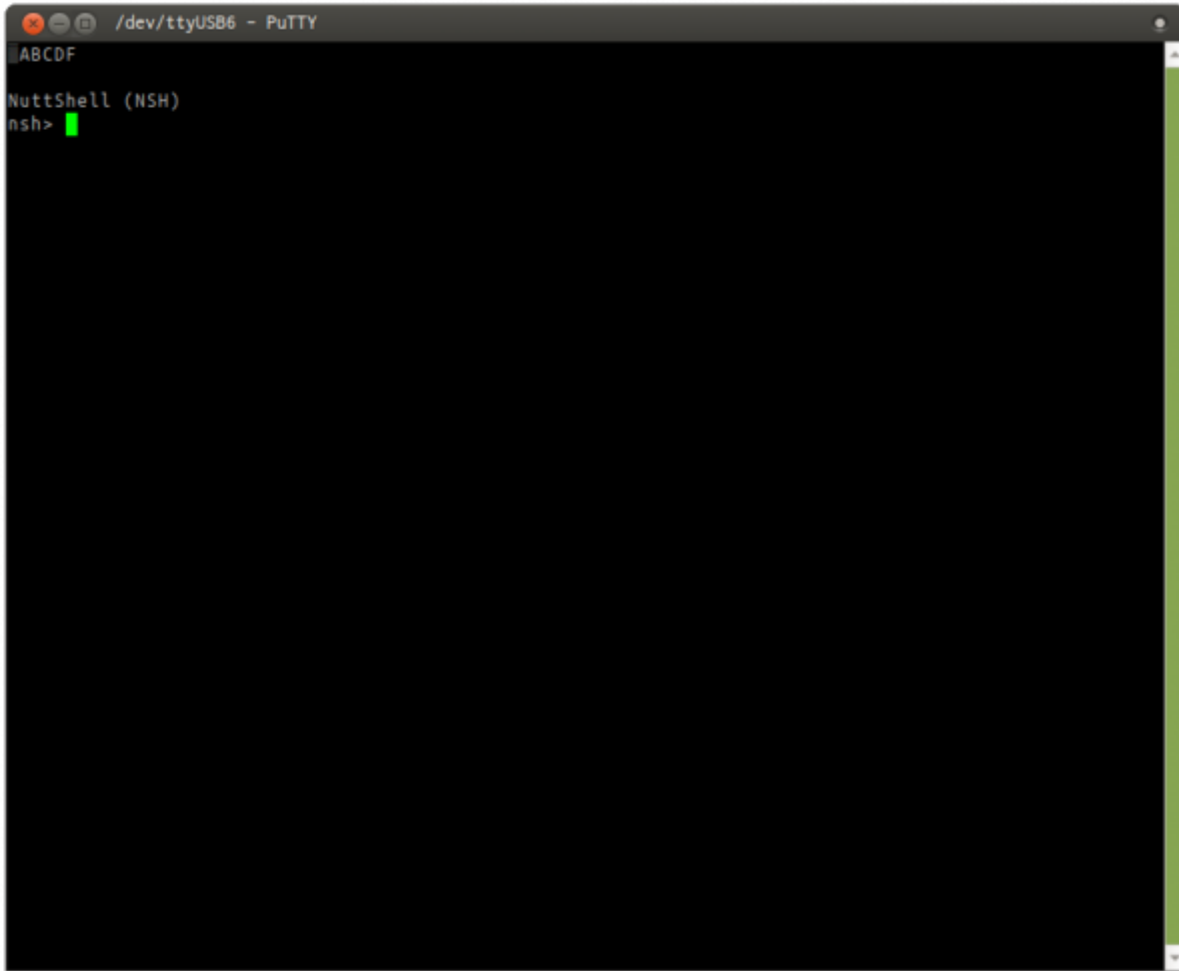
```
(gdb) flashwrite nuttx
auto erase enabled
target halted due to breakpoint, current mode: Thread
xPSR: 0x61000000 pc: 0x20000050 msp: 0x2000657c
block write succeeded
wrote 118784 bytes from file nuttx in 5.169585s (22.439 KiB/s)
```

実行

これでファームウェアバイナリが XG-50 に書き込みできましたので、早速実行してみます。
c コマンドで実行開始します。

```
(gdb) c
Continuing.
```

コンソールに NuttShell のプロンプトが出るのが確認できます。




```
/dev/ttyUSB6 - PuTTY
| ABCDF
NuttShell (NSH)
nsh> ps
  PID GROUP PRI POLICY  TYPE   NPX STATE  EVENT  SIGMASK  STACK COMMAND
   0   0   0  FIFO   Kthread N-- Ready          00000000 000000 Idle Task
   1   1  50  FIFO   Kthread --- Waiting Signal 00000000 002028 lpwork
   2   1 100  FIFO   Task    --- Running 00000000 004076 init

nsh> dmesg
[ 0.000000] stm32l4_rng_initialize: Initializing RNG
[ 0.000000] registered UART4 as /dev/console.
[ 0.000000] registered UART4 as /dev/ttyS0.
[ 0.000000] registered USART2 as /dev/ttyS1.
[ 0.000000] registered USART3 as /dev/ttyS2.
[ 0.001000] Mounting procfs to /proc

nsh> help
help usage: help [-v] [<cmd>]

[      dirname      false      nkfatfs      pwd          time
?      date          free       nkfifo       reboot       true
basename dd          help       nkrd         rn           uname
break   df          hexdump    nh           rmdir       unmount
cat     dmesg      kill       nount        set          unset
cd      echo       ls         nv           sh           usleep
cp      exec       mb         nw           sleep        xd
cnp     exit       mkdir      ps           test

Builtin Apps:
cu
i2c
sudoku
nsh>
```

1)
WFI を有効にしてあるファームウェアが書込済みであっても接続可能になっています

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Permanent link:
https://ma-tech.centurysys.jp/doku.php?id=xg_series_devel:boot_firmware:start

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