Activity: Debugging cFS

In this activity, you will install and use gdb to debug cFS and identify the source of messages.

# Use gdb to debug cFS

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| 1 | Install gdb. | debian@beaglebone:~$ sudo apt-get update  Get:1 http://repos.rcn-ee.com/debian stretch InRelease [3,064 B]  Ign:2 http://deb.debian.org/debian stretch InRelease  <snip>  Fetched 1,904 kB in 30s (61.9 kB/s)  Reading package lists... Done  debian@beaglebone:~$  debian@beaglebone:~$ sudo apt-get install gdb  Reading package lists... Done  Building dependency tree  Reading state information... Done  The following additional packages will be installed:  libbabeltrace-ctf1 libbabeltrace1 libc6-dbg libdw1  Suggested packages:  gdb-doc gdbserver  The following NEW packages will be installed:  gdb libbabeltrace-ctf1 libbabeltrace1 libc6-dbg libdw1  0 upgraded, 5 newly installed, 0 to remove and 18 not upgraded.  <snip>  Setting up gdb (7.12-6) ...  Processing triggers for libc-bin (2.24-11+deb9u4) ...  debian@beaglebone:~$ |
| 2 | Start cFS in gdb. | debian@beaglebone:~/cFS/build/exe/cpu1$ gdb ./core-cpu1  GNU gdb (Debian 7.12-6) 7.12.0.20161007-git  Copyright (C) 2016 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 "arm-linux-gnueabihf".  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 ./core-cpu1...done.  (gdb) |
| 3 | Set a breakpoint in CFE\_SB\_SendMsg(...). | (gdb) b CFE\_SB\_SendMsg  Breakpoint 1 at 0x184f0: file /home/debian/cFS/cfe/fsw/cfe-core/src/sb/cfe\_sb\_api.c, line 1157.  (gdb) |
| 4 | Start running the cFS application. Continue executing a few times each time the breakpoint is reached. Observe how many messages are sent. How can we focus on a specific message? | (gdb) r  Starting program: /home/debian/cFS/build/exe/cpu1/core-cpu1  [Thread debugging using libthread\_db enabled]  Using host libthread\_db library "/lib/arm-linux-gnueabihf/libthread\_db.so.1".  CFE\_PSP: Default Reset Type = PO  <snip>  1980-012-14:03:20.00000 ES Startup: Calling CFE\_TBL\_EarlyInit  1980-012-14:03:20.00092 ES Startup: Calling CFE\_FS\_EarlyInit  [New Thread 0xb5d4e470 (LWP 1804)]  1980-012-14:03:20.00261 ES Startup: Core App: CFE\_EVS created. App ID: 0  EVS Port1 42/1/CFE\_EVS 1: cFE EVS Initialized. cFE Version 6.7.6.0  [Switching to Thread 0xb5d4e470 (LWP 1804)]  Thread 4 "core-cpu1" hit Breakpoint 1, CFE\_SB\_SendMsg (MsgPtr=0xb5d4dd0c)  at /home/debian/cFS/cfe/fsw/cfe-core/src/sb/cfe\_sb\_api.c:1157  1157 int32 Status = 0;  (gdb) c  Continuing.  EVS Port1 42/1/CFE\_EVS 14: No subscribers for MsgId 0x808,sender CFE\_EVS  Thread 4 "core-cpu1" hit Breakpoint 1, CFE\_SB\_SendMsg (MsgPtr=0xb5d4da64)  at /home/debian/cFS/cfe/fsw/cfe-core/src/sb/cfe\_sb\_api.c:1157  1157 int32 Status = 0;  (gdb) c  Continuing.  [New Thread 0xb554d470 (LWP 1831)]  1980-012-14:03:23.06401 ES Startup: Core App: CFE\_SB created. App ID: 1  1980-012-14:03:23.06469 SB:Registered 4 events for filtering  EVS Port1 42/1/CFE\_SB 1: cFE SB Initialized  [Switching to Thread 0xb554d470 (LWP 1831)]  Thread 5 "core-cpu1" hit Breakpoint 1, CFE\_SB\_SendMsg (MsgPtr=0xb554cd0c)  at /home/debian/cFS/cfe/fsw/cfe-core/src/sb/cfe\_sb\_api.c:1157  1157 int32 Status = 0;  (gdb) c  Continuing.  EVS Port1 42/1/CFE\_SB 14: No subscribers for MsgId 0x808,sender CFE\_SB  Thread 5 "core-cpu1" hit Breakpoint 1, CFE\_SB\_SendMsg (MsgPtr=0xb554ca64)  at /home/debian/cFS/cfe/fsw/cfe-core/src/sb/cfe\_sb\_api.c:1157  1157 int32 Status = 0;  (gdb) |
| 5 | Set a conditional break on a specific message. | (gdb) cond 1 MsgPtr->Hdr.StreamId[0] == 0x08 && MsgPtr->Hdr.StreamId[1] == 0x94  (gdb) |
| 6 | Continue executing cFS. | (gdb) c  Continuing.  [New Thread 0xb554d470 (LWP 4254)]  <snip>  1980-012-14:05:02.64238 ES Startup: CFE\_ES\_Main entering OPERATIONAL state  EVS Port1 42/1/CFE\_TIME 21: Stop FLYWHEEL |
| 7 | Use Ground System to send a message to process temperature info from the bootcamp IO app. | [Switching to Thread 0xb1bfc470 (LWP 4268)]  Thread 12 "core-cpu1" hit Breakpoint 1, CFE\_SB\_SendMsg (MsgPtr=0xb1bfbde8)  at /home/debian/cFS/cfe/fsw/cfe-core/src/sb/cfe\_sb\_api.c:1157  1157 int32 Status = 0;  (gdb) |
| 8 | Observe the source of the message. | (gdb) bt  #0 CFE\_SB\_SendMsg (MsgPtr=0xb1bfbde8) at /home/debian/cFS/cfe/fsw/cfe-core/src/sb/cfe\_sb\_api.c:1157  #1 0xb3513148 in BCAMP\_IO\_ProcessCC (Msg=0x462974 <CFE\_SB+9068>) at /home/debian/cFS/apps/bcamp\_io\_app/fsw/src/bcamp\_io\_app.c:442  #2 0xb3512f90 in BCAMP\_IO\_ProcessGroundCommand (Msg=0x462974 <CFE\_SB+9068>)  at /home/debian/cFS/apps/bcamp\_io\_app/fsw/src/bcamp\_io\_app.c:292  #3 0xb3512ef0 in BCAMP\_IO\_ProcessCommandPacket (Msg=0x462974 <CFE\_SB+9068>)  at /home/debian/cFS/apps/bcamp\_io\_app/fsw/src/bcamp\_io\_app.c:238  #4 0xb3512c30 in BCAMP\_IO\_AppMain () at /home/debian/cFS/apps/bcamp\_io\_app/fsw/src/bcamp\_io\_app.c:66  #5 0x00430048 in OS\_TaskEntryPoint (task\_id=65545) at /home/debian/cFS/osal/src/os/shared/osapi-task.c:139  #6 0x00431376 in OS\_PthreadTaskEntry (arg=0x10009) at /home/debian/cFS/osal/src/os/posix/osapi.c:426  #7 0xb6f985d8 in start\_thread (arg=0x0) at pthread\_create.c:458  #8 0xb6f106fa in ?? () at ../sysdeps/unix/sysv/linux/arm/clone.S:76 from /lib/arm-linux-gnueabihf/libc.so.6  Backtrace stopped: previous frame identical to this frame (corrupt stack?)  (gdb) |
| 9 | If you are not an expert with command line debugging using gdb, investigate the commands available in gdb and debugging techniques using gdb. |  |