

Boost Your SimpleLink MCU Development with the Open On-Chip Debugger



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TI's SimpleLink™ platform of connected MCUs continues to add capabilities to help customers optimize their development experience, recently adding Open On-Chip Debugger (OpenOCD) support for many SimpleLink devices and kits.

With built-in support for TI's XDS110 JTAG debugging probe, the SimpleLink OpenOCD package natively supports most SimpleLink LaunchPad™ development kits and contains all required files based on the OpenOCD community mainline release.

In addition to the standard debugging and programming functions, OpenOCD offers advanced features to facilitate more automation and scripting as well as support for additional remote debugging applications.

OpenOCD enables debugging through Telnet, GNU Debugger (GDB) or with Tool Command Language (TCL) scripts using Remote Procedure Call (RPC). The Telnet and GDB interfaces are controlled through human commands and the TCL interface is controlled through machine commands (see Figure 1).

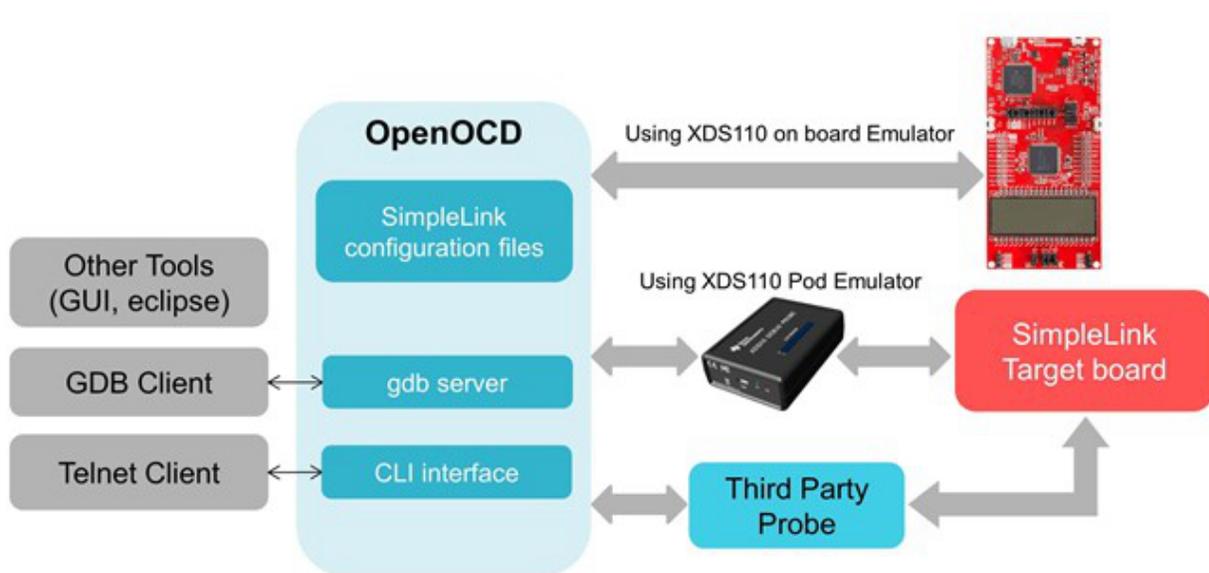


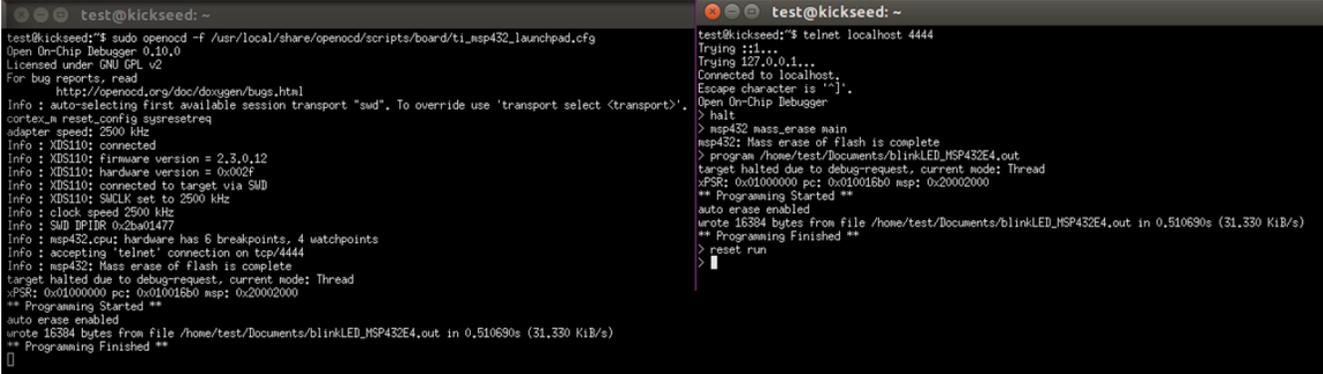
Figure 1. SimpleLink Devices Debugging with OpenOCD

GDB command-line debugging is one of the most popular industry tools for automating development without the need for an integrated development environment (IDE) and any associated overhead. GDB communication can be over Transmission Control Protocol/Internet Protocol (TCP/IP) or via pipes; many GDB command tutorials are available online.

With TCL scripting capability, you can develop with a high-level interface to OpenOCD and avoid writing more complex OpenOCD-specific commands. Scripts can help by addressing more complex bugs than what standard command-line tools can. TCL also offers an easy to build and use graphical user interface (GUI) for OpenOCD with minimal overhead. Telnet debugging also works with TCL commands and scripts.

OpenOCD is often combined with remote debugging environments, enabling the debugging of applications anytime and anywhere. This is very useful to support users across the globe or to debug devices that are not easy accessible. These environments are supported by the integration of three network interfaces: Telnet, GDB remote server and TCL server.

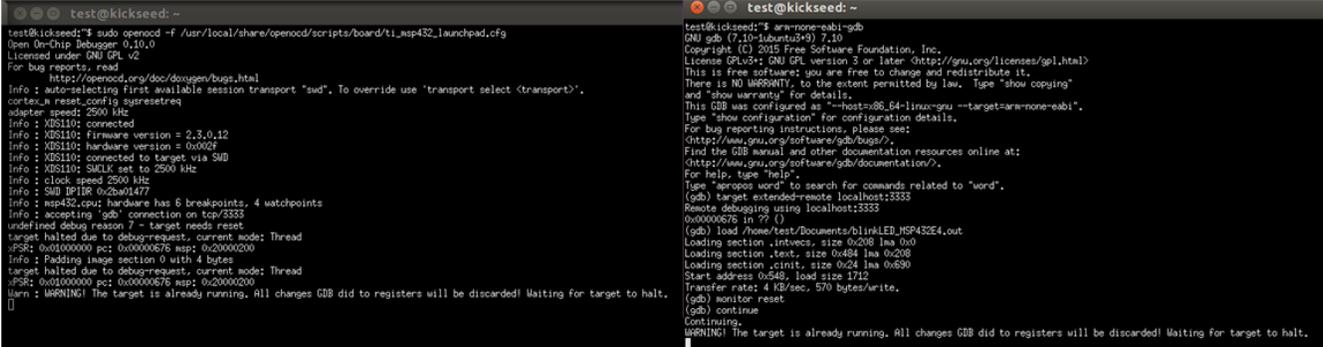
Moreover, you can use OpenOCD as a production programmer or for boundary scan testing. Programming can be accomplished through GDB or flash programming commands (see [Figure 2](#) and [Figure 3](#)). With the help of TCL scripts, those flash commands program/verify/reset/shutdown) can easily implement the entire programming flow. With the same configuration, you can program different devices and architectures using different probes.



```

test@kickseed:~$ sudo openocd -f /usr/local/share/openocd/scripts/board/ti_msp432_launchpad.cfg
Open On-Chip Debugger 0.10.0
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxugen/bugs.html
Info : auto-selecting first available session transport "swd". To override use 'transport select <transport>'.
cortex_m_reset_config svsresetreq
adapter speed: 2500 kHz
Info : XDS110: connected
Info : XDS110: firmware version = 2.3.0.12
Info : XDS110: hardware version = 0x002f
Info : XDS110: connected to target via SWD
Info : XDS110: SWCLK set to 2500 kHz
Info : clock speed 2500 kHz
Info : SWD IP1IR 0x2ba01477
Info : msp432.cpu: hardware has 6 breakpoints, 4 watchpoints
Info : accepting 'telnet' connection on top/4444
Info : msp432: Mass erase of flash is complete
target halted due to debug-request, current mode: Thread
PSR: 0x01000000 pc: 0x01001500 msp: 0x20002000
** Programming Started **
auto erase enabled
wrote 16384 bytes from file /home/test/Documents/blinkLED MSP432E4.out in 0.510690s (31.330 KiB/s)
** Programming Finished **
> reset run
>
  
```

Figure 2. SimpleLink Devices Programming through Telnet (Left: OpenOCD Server, CLI Interface; Right: Telnet Client)



```

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Open On-Chip Debugger 0.10.0
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxugen/bugs.html
Info : auto-selecting first available session transport "swd". To override use 'transport select <transport>'.
cortex_m_reset_config svsresetreq
adapter speed: 2500 kHz
Info : XDS110: connected
Info : XDS110: firmware version = 2.3.0.12
Info : XDS110: hardware version = 0x002f
Info : XDS110: connected to target via SWD
Info : XDS110: SWCLK set to 2500 kHz
Info : clock speed 2500 kHz
Info : SWD IP1IR 0x2ba01477
Info : msp432.cpu: hardware has 6 breakpoints, 4 watchpoints
Info : accepting 'gdb' connection on top/3333
undefined debug reason 7 - target needs reset
target halted due to debug-request, current mode: Thread
PSR: 0x01000000 pc: 0x00000676 msp: 0x20000200
Info : Padding image section 0 with 4 bytes
target halted due to debug-request, current mode: Thread
PSR: 0x01000000 pc: 0x00000676 msp: 0x20000200
Warn : WARNING! The target is already running. All changes GDB did to registers will be discarded! Waiting for target to halt.

test@kickseed:~$ arm-none-eabi-gdb
GNU gdb (7.11.1ubuntu2) 7.11
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 "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".
(gdb) target extended remote localhost:3333
Remote debugging using localhost:3333
0x00000676 in ?? ()
(gdb) load /home/test/Documents/blinkLED MSP432E4.out
Loading section .intvec, size 0x208 lma 0x0
Loading section .text, size 0x484 lma 0x208
Loading section .cinit, size 0x24 lma 0x630
Start address 0x548, load size 1712
Transfer rate: 4 KB/sec, 570 bytes/write.
(gdb) monitor reset
(gdb) continue
Continuing.
WARNING! The target is already running. All changes GDB did to registers will be discarded! Waiting for target to halt.
  
```

Figure 3. SimpleLink Devices Programming through GDB (Left: OpenOCD Server, Gdb Server; Right: GDB Client)

OpenOCD enables a closer debugging experience to data flows on the device and works with a panoply of open-source tools. OpenOCD is real-time operating system (RTOS)-aware, supporting Amazon FreeRTOS and other open-source kernels to facilitate the debugging of multithreaded applications. OpenOCD easily integrates with many Eclipse-based IDEs and those supporting GDB servers, like TI Code Composer Studio™ and IAR Embedded Workbench for Arm® devices. Similarly, to program SimpleLink devices, you can use any of the supported probes within OpenOCD like TI's XDS110, Segger's J-Link or any probe with Arm Cortex® Microcontroller Software Interface Standard (CMSIS) debug access port (DAP) support.

You can immediately enjoy the benefits of OpenOCD and a complete open-source ecosystem. Check out the [SimpleLink OpenOCD documentation](#) for more details.

Additional Resources

Get started with SimpleLink MCUs and LaunchPad development kits today:

- Supported SimpleLink devices
 - [SimpleLink MSP432P4 low-power microcontrollers \(MCUs\)](#).
 - [SimpleLink MSP432E4 Ethernet MCUs](#).
 - [SimpleLink Wi-Fi® family](#).
- Supported SimpleLink LaunchPad development kits:
 - [MSP432P401R LaunchPad development kit](#).
 - [MSP432P4111 LaunchPad development kit](#).
 - [MSP432E401Y LaunchPad development kit](#).
 - [CC3220SF-LAUNCHXL](#).
 - [CC3220S-LAUNCHXL](#).
 - [CC3200-LAUNCHXL](#).
- Supported debugging interfaces:
 - [Texas Instruments XDS110 JTAG debugging probe](#).

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