



Melis3.x@v459

# JLink 调试指导说明

1.0

2020.03.30

## 文档履历 (Document History)

Version No	Date	Prepared/Revised by	Content Description
1.0	2020.03.30	PDC-PSW	创建

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# 1. JLink 调试指导说明

## 1.1 JLink 仿真器介

J-Link 是德国 SEGGER 公司推出基于 JTAG 的仿真器。简单地说，J-Link 是一个小型 USB 到 JTAG 协议转换盒。其连接到计算机用的是 USB 接口，而到目标板内部用的还是 jtag 协议。它完成了一个从软件到硬件转换的工作。



图 (Figure) 1

JLink 原理

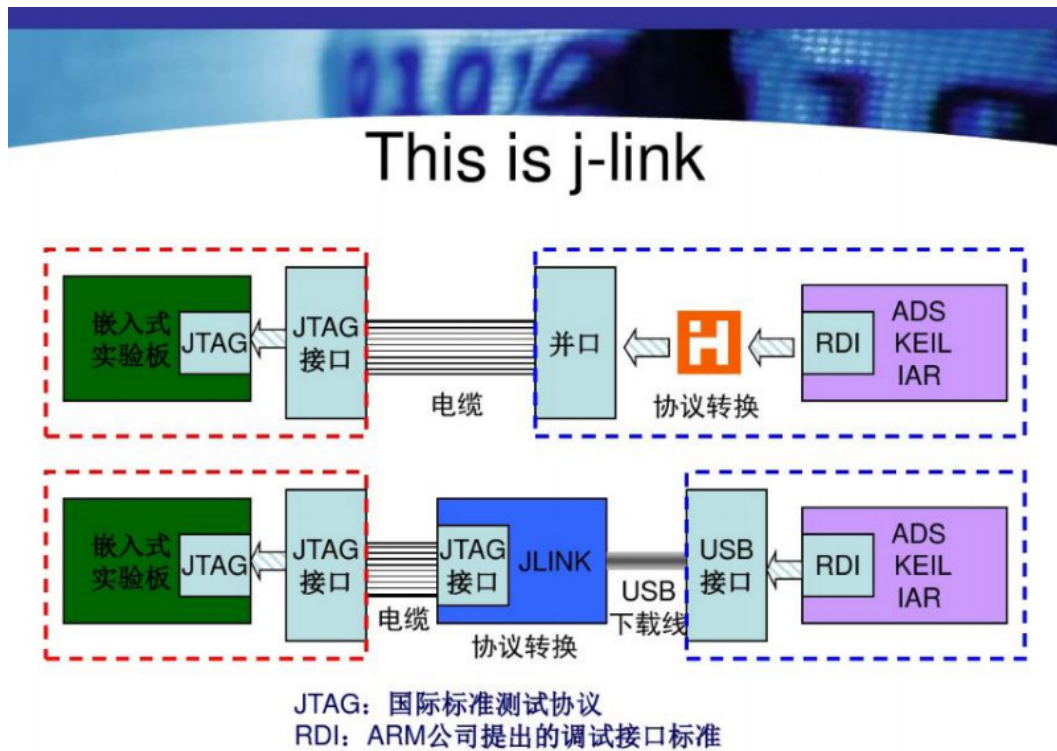


图 (Figure) 2

## 1.2 JLink 工作环境介绍

需要连接以下引脚

信号名	方向	作用
TCK	输入	为测试逻辑提供时钟
TDI	输入	接收测试指令和数据
TMS	输入	用于TAP控制器控制测试和操作
TDO	输出	串行输出到测试逻辑
GND	输入	地
nTRST	输入 (可选)	用于TAP控制器的异步初始化

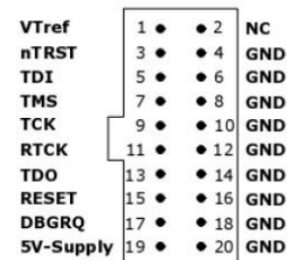


图 (Figure) 3

## 1.3 JLinkGDBServer 介绍

JLinkGDBServer 作用：

1. 解析 GDB 发送的 Remote Serial Protocol (RSP) 协议命令
2. 输出 JLink 仿真器控制信号

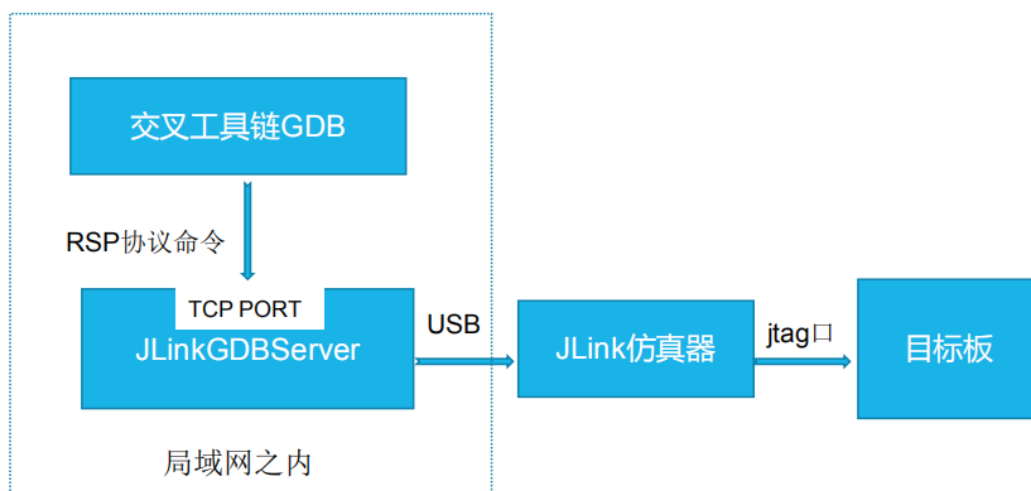


图 (Figure) 4

## 1.4 搭建 JLink 调试环境

### 1.4.1 step 1

前往 [https://www.segger.com/downloads/jlink/JLink\\_Linux\\_x86\\_64.deb](https://www.segger.com/downloads/jlink/JLink_Linux_x86_64.deb) 下载 jlink for linux 的软件包，如在 ubuntu 上使用，则下载 deb 软件包，然后使用 `sudo dpkg -i JLink_Linux_V664b_x86_64.deb` 命令来安装

## 1.4.2 step 2

在终端执行 `JLinkGDBServer -device Cortex-A7` 命令，启动 JLinkGDBServer 服务，等待 GDB 远程连接



```
wuhuatiing@PCwuhuatiing:~$ JLinkGDBServer -device Cortex-A7
SEGGER J-Link GDB Server V6.64b Command Line Version

JLinkARM.dll V6.64b (DLL compiled Mar 20 2020 10:08:28)

Command line: -device Cortex-A7
-----GDB Server start settings-----
GDBInit file:                none
GDB Server Listening port:    2331
SWO raw output listening port: 2332
Terminal I/O port:          2333
Accept remote connection:    yes
Generate logfile:            off
Verify download:            off
Init regs on start:          off
Silent mode:                 off
Single run mode:             off
Target connection timeout:    0 ms
-----J-Link related settings-----
J-Link Host interface:       USB
J-Link script:              none
J-Link settings file:        none
-----Target related settings-----
Target device:               Cortex-A7
Target interface:            JTAG
Target interface speed:      4000kHz
Target endian:               little

Connecting to J-Link...
J-Link is connected.
Firmware: J-Link V9 compiled Dec 13 2019 11:14:50
Hardware: V9.40
S/N: 59425868
Feature(s): RDI, GDB, FlashDL, FlashBP, JFlash, RDDI
Checking target voltage...
Target voltage: 3.31 V
Listening on TCP/IP port 2331
Connecting to target...

J-Link found 1 JTAG device, Total IRLen = 4
JTAG ID: 0x5BA00477 (Cortex-A7)
Connected to target
Waiting for GDB connection...█
```

图 (Figure) 5

### 1.4.3 step3

另开一个终端，进入 melis 源码 source 目录下，执行 `sudo /工具链绝对路径/arm-melis-eabi-gdb XXX.elf`，将会加载指定的符号表，进入 gdb 命令行

### 1.4.4 step4

进入 gdb 命令行之后，执行 `target remote 127.0.0.1:2331`，则会顺利连接成功，即可进行远程调试目标板

```
wuhuatng@PCwuhuatng:~/workspace/sshserver/workspace/nnn/melis-v3.0/source$ sudo /home/wuhuatng/workspace/sshserver/workspace/nnn/melis-v3.0/toolchain/bin/arm-melis-eabi-gdb /home/wuhuatng/workspace/sshserver/workspace/nnn/melis-v3.0/source/ekernel/melis30.elf
GNU gdb (GNU Tools for Arm Embedded Processors 9-2020-q1-update) 8.3.0.20190709-git
Copyright (C) 2019 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-melis-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"...
/home/wuhuatng/.gdbinit:1: Error in sourced command file:
~/GdbPlugins/gef/gef.py:57: Error in sourced command file:
Undefined command: "from". Try "help".
Reading symbols from /home/wuhuatng/workspace/sshserver/workspace/nnn/melis-v3.0/source/ekernel/melis30.elf...
(gdb) target remote 127.0.0.1:2331
Remote debugging using 127.0.0.1:2331
cpu_do_idle () at ekernel/arch/arm/armv7a/cortex-a7/vector_s.s:490
490      mov     pc, lr
(gdb) |
```

图 (Figure) 6

### 1.4.5 注意

如遇到异常或者错误，请拔出转接板，重启目标板，再插入转接板，因为转接板会供电

## 1.5 调试实例

### 1.5.1 设置断点

以在 `rt_free` 函数入口处设置断点为例，执行 `b rt_free`

```

(gdb) b rt_free
Breakpoint 1 at 0xc203c208: file ekernel/core/rt-thread/wrapper/epos.c, line 169.
(gdb) c
Continuing.

Breakpoint 1, rt_free (ptr=0xc2633100) at ekernel/core/rt-thread/wrapper/epos.c:169
169     if (ptr == RT_NULL)
(gdb) bt
#0  rt_free (ptr=0xc2633100) at ekernel/core/rt-thread/wrapper/epos.c:169
#1  0xc21587bc in dfs_file_open (fd=0xc26670d0, path=0xc2a9b700 "/", flags=2097152) at ekernel/subsys/thirdparty/dfs/src/dfs_file.c:78
#2  0xc215a1f4 in opendir (name=0xc2a9b700 "/") at ekernel/subsys/thirdparty/dfs/src/dfs_posix.c:658
#3  0xc2125cc8 in msh_auto_complete_path (path=0xc2bca76c <incomplete sequence '\303>) at ekernel/subsys/finsh_cli/msh.c:508
#4  0xc2125fa4 in msh_auto_complete (prefix=0xc2bca76c <incomplete sequence '\303>) at ekernel/subsys/finsh_cli/msh.c:624
#5  0xc2126d80 in shell_auto_complete (prefix=0xc2bca76c <incomplete sequence '\303>) at ekernel/subsys/finsh_cli/shell_entry.c:389
#6  0xc21274a8 in finsh_thread_entry (parameter=0x0) at ekernel/subsys/finsh_cli/shell_entry.c:674
#7  0xc20282cc in ret_from_create_c () at ekernel/arch/arm/armv7a/cortex-a7/port.c:68
#8  0xc2030fa4 in rt_thread_delete_sethook (hook=0xc212703c <finsh_thread_entry>) at ekernel/core/rt-thread/thread.c:84
Backtrace stopped: previous frame identical to this frame (corrupt stack?)
(gdb) info reg
r0          0xc2633100      3261280512
r1          0xc263310a      3261280522
r2          0xc2633108      3261280520
r3          0xc26670d0      3261493456
r4          0x0             0
r5          0xc212703c      3255988284
r6          0xdeadbeef      3735928559
r7          0xdeadbeef      3735928559
r8          0xdeadbeef      3735928559
r9          0xdeadbeef      3735928559
r10         0xdeadbeef      3735928559
r11         0xc2c10f04      3267432196
r12         0xffffffff      4294967295
sp          0xc2c10ed8      0xc2c10ed8
lr          0xc21587bc      3256190908
pc          0xc203c208      0xc203c208 <rt_free+16>
cpsr       0x00000053      1610612819
fpscr       0x0             0
r8_usr      0xdeadbeef      3735928559
r9_usr      0xdeadbeef      3735928559
r10_usr     0xdeadbeef      3735928559
r11_usr     0xc2c10f04      3267432196
r12_usr     0xffffffff      4294967295

```

图 (Figure) 7

## 1.5.2 观察变量

进入断点后，可以观察变量或者结构体内容

```

(gdb) p *rt_current_thread
$1 = {name = "tshell", '000' <repeats 25 times>, type = 1 '001', flags = 0 '000', module_id = 0x0, list = {next = 0xc2017270, prev = 0xc2529408 <rt_object_container+4>}, tlist = {
  next = 0xc2030fa4 <rt_thread_delete_sethook>, prev = 0xc2030fa4 <rt_thread_delete_sethook>, sp = 0xc2c10f04, entry = 0xc21274a8 <finsh_thread_entry>, parameter = 0x0, stack_addr = 0xc2c10800,
  stack_size = 262144, error = 0, stat = 1 '001', current_priority = 20 '024', init_priority = 20 '024', number_mask = 1048576, event_set = 0 '000', init_tick = 10, remaining_tick = 10,
  thread_timer = {parent = {name = "tshell", '000' <repeats 25 times>, type = 138 '212', flag = 0 '000', module_id = 0x0, list = {next = 0xc2017358, prev = 0xc2529408 <rt_object_container+132>}}, row = {{
    next = 0xc2030fa4, prev = 0xc2030fa4}}, timeout_func = 0xc2030fa4 <rt_thread_timeout>, parameter = 0xc2017358, init_tick = 0, timeout_tick = 0}, cleanup = 0x0, user_data = {0, 0, 0, 0}, cputime = 0,
  nontime = 0, sched_i = 2, sched_o = 1, born = 39, preempt_count = 0}
(gdb)

```

图 (Figure) 8

```

Continuing.

Breakpoint 2, rt_interrupt_enter () at ekernel/core/rt-thread/irq.c:65
65     level = rt_hw_interrupt_disable();
(gdb) n
66     preempt_count_add(HARDIRQ_OFFSET);
(gdb) n
67     RT_OBJECT_HOOK_CALL(rt_interrupt_enter_hook, ());
(gdb) n
68     rt_hw_interrupt_enable(level);
(gdb) n
69 }
(gdb) p rt_interrupt_enter_hook
$2 = (void (*)(void)) 0x0
(gdb)

```

图 (Figure) 9

## 2. Declaration

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