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1 Introduction

This document describes the trace implementation by different probe and IDE on the i.MX RT1170 EVK. Table 1 lists the trace mode, IDE, and probe cases discussed in this document.

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The IDE version used for this application note is:

- MCUXpresso: V11.8.0
- IAR: V9.40.1
- KEIL: V5.37.0.0

The board used in this application note is:

- MIMXRT1170-EVK SCH-32171 REVC

2 Implementation

This section describes the SWO trace and ETM trace implementation.

2.1 SWO trace by onboard LPCLink2 J-Link

Below describes the SWO trace by onboard LPCLink2 J-Link.

2.1.1 Board setup for LPCLink2 J-Link

This section describes the board setup for LPCLink2 J-Link.

2.1.1.1 Enable LPCLINK2 J-Link on i.MX RT1170 EVK

The default probe firmware on the i.MX RT1170 EVK board is DAPLink CMSIS DAP, which does not support the SWO trace. So, we need to switch to LPCLink2 J-Link.

To switch to LPCLink2 J-Link, follow the steps below:

1. Download LPCScrypt from https://www.nxp.com/lpncrypt and install it.
2. Install the jumper J22 (Marked in Figure 1) and connect the USB cable.
3. Run the program LPC-Link2 with Segger J-Link from the Windows Start menu.

4. To program LPCLink2 J-Link, press the Enter key and the log is as shown in Figure 2.
5. Disconnect jumper J22 and reconnect the USB cable. Now, the board is seen not powered. It is a known issue in LPCScript v2.1.2.

To solve this issue, there are three possible workarounds. Apply one of the following steps:

a. Change the connection to be 1 - 2 on J38 (marked in Figure 1), and power the board by a power adapter.

b. Change the connection to be 3 - 4 on J38 (marked in Figure 1), and power the board by USB OTG1 port (marked in Figure 1).

c. Solder R154 (marked in Figure 1), and power the board by USB debug port.

Then, the board can be powered.

2.1.1.2  Jumper settings

Connect J5, J6, J7, and J8 (marked in Figure 1) to select LPCLink2 J-Link.
2.1.2 By MCUXpresso

To set up the board for LPCLink2-J-Link, see Section 2.1.1 first.

1. Unzip and import the project `evkmimxrt1170_swo_demo_cm7_mcuxpresso` in AN14071SW. Build and start debugging.

2. Build and run the code, when it stops at `main()`. Configure the clock. Click the **Change** button.

![Figure 5. Configure trace clock](image)

Then set the core and trace the clock, as shown in **Figure 6**.

![Figure 6. Set core and trace clock](image)

3. Enable the SWO ITM Console and SWO Profile.
4. Run
Then we get the SWO profile result, as shown in Figure 8.

![Figure 7. Enable SWO ITM Console and SWO Profile](image1)

![Figure 8. SWO profile window](image2)

Type some characters in the UART console on PC, and these characters are also shown in the SWO ITM Console in MCUXpresso.
2.1.3 By IAR

To set up board for LPCLink2-J-Link, see Section 2.1.1.1 first.

The demo project is in AN14701SW.

1. Unzip and open `evkmimxrt1170_swo_demo_cm7_iar` attached in AN14701SW.
2. Configure CPU and SWO clock.

---

Note:
If we do not enable SWO ITM console window, the character is also shown in the Console window.

Figure 9. SWO ITM console

Figure 10. SWO ITM message goes into Console window by default
Figure 11. Configure CPU and SWO clock

3. Build and run the code, and input some characters from the UART console. The Function Profiler window and Terminal I/O window pop up, as shown in Figure 12 and Figure 13.

Figure 12. Function Profiler window

Figure 13. Terminal I/O window
2.1.4 By KEIL

To set up board for LPCLink2-J-Link, see Section 2.1.1.1 first.

The demo project is in AN14071SW.

1. Unzip and open `evkmimxrt1170_swo_demo_cm7_keil` attached in AN14071SW.
2. Configure CPU and SWO clock.

![Figure 14. Configure CPU and SWO clock](image)

3. Then build and run the code, input some characters from the UART console, and the Debug(printf) Viewer window pops up, as shown in Figure 15.

![Figure 15. Debug(printf) Viewer window](image)

4. Halt the core by clicking the button. The Instruction Trace window pops up with the PC sampling result, as shown in Figure 16.

![Figure 16. Instruction Trace window](image)
2.2 SWO trace by J-Link

2.2.1 Board setup for J-Link

Before using the J-Link probe, disconnect J5, J6, J7, J8 (marked in Figure 1) and then connect J-Link, as shown in Figure 17.

2.2.2 By MCUXpresso

To set up board for J-Link, perform the steps in Section 2.1.1.1 first.
Most steps are the same as Section 2.1.2.

Differences:
See Figure 18 for SWO configuration.
2.2.3 By IAR

For the J-Link probe, see Section 2.1.3 and the steps are same.

In addition, IAR + J-LINK can work at up to 2.06 MHz. If necessary, to switch the SWO frequency to 2.06 MHz, perform the following steps.

1. Configure the SWO clock in IAR.

2. Change the script in `evkmimxrt1170_connect_cm7.mac`, as shown in Figure 20.
2.2.4 By KEIL

For J-Link probe, see Section 2.1.4 and the steps are same.

In addition, KEIL + J-LINK can work at up to 26.4 MHz, if necessary, to switch the SWO frequency to 26.4 MHz, perform the following steps.

1. Configure the SWO clock in KEIL.

2. Change the script in `evkmimxrt1170_ram.ini`, as shown in Figure 22.

Figure 20. Configure SWO clock

Figure 21. Configure CPU and SWO clock
2.3 SWO trace by μTRACE

2.3.1 Board setup for μTrace

For board setup, refer to Figure 23. Disconnect J5, J6, J7, J8 (marked in Figure 1), and connect the μTrace cable.

2.3.2 By TRACE32

2.3.2.1 SWO trace for ITM console

To perform SWO trace for the ITM console, perform the following steps:

1. Unzip evkmimxrt1170_swo_demo_cm7_trace32.7z to directory - C:\T32\demo\arm\hardware\imxrt \imxrt117x\imxrt1170-evk\evkmimxrt1170_hello_world_demo_cm7_swo_utrace.
2. If your TRACE32 is installed in a different directory, rebuild this project by MCUXpresso.
3. Open TRACE32 and execute Files → Run script, and select `Debugtracerce_imxrt1170_evk_swo.cmm` under the directory created in Step 1.

4. Press the Go button.
5. In the UART console, type some characters.
6. Press the Break button.
7. Then in the Trace List window, we can see the data transmitted by the SWO interface, as shown in Figure 24.

![Figure 24. Trace list window](image)

2.3.2.2 SWO trace for PC sampling

To perform SWO trace for the ITM console, perform the following steps:

1. Perform Step 1 and Step 2 in Section 2.3.2.1.
2. Edit `Debugtracerce_imxrt1170_evk_swo.cmm`.

![Figure 25. Edit utrace_imxrt1170_evk_swo.cmm](image)

3. Open TRACE32 and execute Files → Run script, and select `utrace_imxrt1170_evk_swo.cmm`.

4. Press the Go button.
5. Press the Break button.
6. Now, in the Trace List window, we can see PC samples.
2.4 ETM trace by J-Trace

2.4.1 Hardware setup for J-Trace

1. Sold R1881-1885.

   | R1881 | DNP 0 | TRACE_D0 [27] |
   | R1882 | DNP 0 | TRACE_D1 [27] |
   | R1883 | DNP 0 | TRACE_D2 [27] |
   | R1884 | DNP 0 | TRACE_D3 [27] |
   | R1885 | DNP 0 | TRACE_CLK [27] |

For R1881-1885 place on board, refer to Figure 28 and Figure 29.
2. Disconnect J5, J6, J7, and J8 (marked in Figure 1).
3. Connect the J-Trace cable, as shown in Figure 30.
2.4.2 By Ozone

Perform the following steps:

1. Download the example code `NXP_iMXRT1176_M7_TracePins.zip` provided by Segger.
2. Unzip this code.
3. Open Ozone, execute File → Open, and select `NXP_iMRT1176_M7_TracePins\Ozone.jdebug` from the folder unzipped in Step 2.
4. Press the download and reset button, and then go into the ETM trace state.
2.5 ETM trace by μTRACE

About ETM trace by uTRACE on i.MX RT1170, see How to Enable Embedded Trace Macrocell (ETM) Trace for i.MXRT11xx Series (document AN14046).

2.6 Implement trace on i.MX RT1170 EVKB

On the i.MX RT1170 EVKB, as JTAG_nTRST is driven low by default, it blocks the trace feature. To avoid this issue, one workaround is to set GPIO_LPSR_10 to GPIO instead of JTAG_nTRST.

• Reference script for J-Link/J-Trace: Target.WriteU32(0x40c08028, 0xa)
• Reference script for uTrace: Data.Set AD:0x40c08028 %Long 0x0000000a

3 Reference

1. ARMv7-M Architecture Reference Manual

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5 Revision history

Table 2 summarizes the revisions to this document.

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<th>Revision number</th>
<th>Release date</th>
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<tr>
<td>1</td>
<td>13 November 2023</td>
<td>Initial public release</td>
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Trace Implementation on i.MX RT1170

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