



New LE/CICS Trace

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Agenda

- **LE / CICS trace overview**
- **Examples**

Terminology

- **ERTLI - Extended Run-Time Library Interface**
- **Feature Trace - the name given to an extension of CICS trace to allow applications to register themselves as trace users, make trace entries and format them externally**
 - Uses FT0000-FFFF trace entries
- **CEL - Common Execution Library**

Notes

Feature Trace - Trace points with domain ID FT. The format of these entries is slightly different from standard trace points in that the Module identifier contains the short name of the feature and a full module name. Feature trace point IDs are not globally defined. This means that a feature can reuse another feature's trace point IDs so you must look up the correct feature's trace point. For information about the trace points of any other product using feature trace, refer to that product's documentation.

Before z/OS 1.4

- **CICS trace records entry / exit calls to the ERTLI interface**
 1. AP 1948 and AP 1949 - LE call and return
 2. No detail once inside LE
 3. No trace of LE code

New LE / CICS Trace

- **Provides tracing of important LE events during the life of a transaction**
 - Adds Level 2 trace points inside LE at significant points
 - Event Handler
 - Set Anchor
 - Provides R13 value and parameters before call
 - Similar to 'normal' trace points, but...
 - Module id replaced with "Lang.Env." and an LE module name
 - Formats R13 and each parameter on call.
 - 1st trace data area used by Feature Trace
 - 2nd trace data area contains R13 and parameters
- **Trace is at an application program level and is controlled by CETR**

LE / CICS Trace Usage

- **Using LE / CICS Trace, you can see:**
 - Path through LE in ERTLI calls
 - Data passed on Event calls
 - Data passed on Set Anchor calls
- **Advantages**
 - Finer granularity in identifying problems
 - Restriction of trace to specific transactions or ids
 - Trace available in dumps
- **Disadvantages**
 - Extra path length when Level 2 trace is on

During Initialization

LE registers with CICS as a Feature Trace user

III	QR	DU	1F01	DUFT	ENTRY REGISTER	IBM,Language Environment,000000001,CEL4TFMT,Lang.Env.
III	QR	LM	0003	LMLM	ENTRY ADD_LOCK	FTTABLE
III	QR	LM	0004	LMLM	EXIT ADD_LOCK/OK	135A9ED8
III	QR	DU	1F10	DUFT	EVENT BEFORE-MVS-GETMAIN	FOR FEATURE TABLE
III	QR	DU	1F11	DUFT	EVENT AFTER-MVS-GETMAIN	FOR FEATURE TABLE
III	QR	LM	0003	LMLM	ENTRY UNLOCK	135A9ED8,EXCLUSIVE
III	QR	LM	0004	LMLM	EXIT UNLOCK/OK	
III	QR	DU	1F02	DUFT	EXIT REGISTER/OK	1359F020 , 00000001

Trace Example - Abbreviated

```
.
00029 QR AP 1940 APLI ENTRY START_PROGRAM DFH0CMNU, CEDF, FULLAPI, EXEC, NO, 141A6BC4, 00000000 , 00000000, 1, NO
00029 QR SM 0301 SMGF ENTRY GETMAIN 28, YES, RUWAPool, TASK31
00029 QR SM 0302 SMGF EXIT GETMAIN/OK 14500FB8
00029 QR SM 0301 SMGF ENTRY GETMAIN 37B0, YES, 00, LE_TWA, TASK31
00029 QR SM 0302 SMGF EXIT GETMAIN/OK 14500FF8
00029 QR AP 1948 APLI EVENT CALL-TO-LE/370 Thread_Initialization DFH0CMNU
00029 QR AP 1949 APLI EVENT RETURN-FROM-LE/370 Thread_Initialization OK DFH0CMNU
00029 QR SM 0301 SMGF ENTRY GETMAIN 8070, YES, LE_RUWA, TASK31
00029 QR SM 0302 SMGF EXIT GETMAIN/OK 145047B8
00029 QR AP 1948 APLI EVENT CALL-TO-LE/370 Rununit_Init_&_Begin_Invo DFH0CMNU
00029 QR FT 1014 Lang.Env. CEEZCREN EVENT CEEEVNT-ID(PRCINIT) R13(14501DC0), 4C6E00A0
00029 QR FT 1013 Lang.Env. CEEZCREN EVENT CEEEVNT-ID(OPTP) R13(14501DC0), 158006C8, 1450653C, 1450206C, 4C6E0094
00029 QR FT 1101 Lang.Env. CEECRINI EVENT SET_ANCHOR R13(14501968), 14508690, 00000002
00029 QR FT 1018 Lang.Env. CEEZINV EVENT CEEEVNT-ID(ENCINIT) R13(14509290), 1450653C, 00000000, 145066B8, 00000000, 0
00029 QR FT 1008 Lang.Env. CEECRINV EVENT CEEEVNT-ID(MAININV) R13(14509290), 00000001, 00000000, 00200050, 95800020, 4
00029 QR AP 00E1 EIP ENTRY SEND-MAP 0004, 00000000 ...., 09001804 ....
.
.
00029 QR AP 00E1 EIP ENTRY RETURN 0004, 00000000 ...., 09000E08 ....
00029 QR AP E110 EISR ENTRY TRACE_ENTRY 145096D8
00029 QR AP E160 EXEC ENTRY RETURN COBOL 00034
00029 QR AP E111 EISR EXIT TRACE_ENTRY/OK
00029 QR AP 1948 APLI EVENT CALL-TO-LE/370 Rununit_End_Invocation DFH0CMNU
00029 QR AP 1949 APLI EVENT RETURN-FROM-LE/370 Rununit_End_Invocation OK DFH0CMNU
00029 QR AP 1948 APLI EVENT CALL-TO-LE/370 Rununit_Termination DFH0CMNU
00029 QR FT 1012 Lang.Env. CEEZDSEX EVENT CEEEVNT-ID(ENCTERM) R13(14509290), 00000000, 4C6E0090
00029 QR FT 1102 Lang.Env. CEECRTRM EVENT SET_ANCHOR R13(14501968), 00000000
00029 QR AP 1949 APLI EVENT RETURN-FROM-LE/370 Rununit_Termination OK DFH0CMNU
00029 QR AP 1948 APLI EVENT CALL-TO-LE/370 Thread_Termination
00029 QR FT 1009 Lang.Env. CEEZDSPR EVENT CEEEVNT-ID(PRCTERM) R13(14501A30), 4C6E0034
00029 QR AP 1949 APLI EVENT RETURN-FROM-LE/370 Thread_Termination OK
.
.
```



Trace Example - Full

FT Lang.Env. 1014 CEEZCREN EVENT - CEEEVNT-ID(PRCINIT) R13(14501DC0), PARS(4C6E00A0)

```
TASK-00029 KE_NUM-0034 TCB-QR /008B56B8 RET-14E862C2 TIME-18:25:47.6357327055 INTERVAL-00.0000363281 =082525=  
0000 0093C9C2 D4404040 40404040 40404040 40404040 40404040 40404040 40404040 *.LIBM *  
0020 D3819587 A4818785 40C595A5 89999695 948595A3 40404040 40404040 4040F0F0 *Language Environment 00*  
0040 F0F0F0F0 F0F0F0F1 C3C5D3F4 E3C6D4E3 D3819587 4BC595A5 4B004063 *00000001CEL4TFMTLang.Env.. *  
1-0000 14501DC0 00000011 00000000 *.&.{..... *
```

FT Lang.Env. 1013 CEEZCREN EVENT - CEEEVNT-ID(OPTP) R13(14501DC0), PARS(158006C8, 1450653C, 1450206C, 4C6E0094)

```
TASK-00029 KE_NUM-0034 TCB-QR /008B56B8 RET-14E872AE TIME-18:25:47.6357464086 INTERVAL-00.0000137031 =082526=  
0000 0000C9C2 D4404040 40404040 40404040 40404040 40404040 40404040 40404040 *..IBM *  
0020 D3819587 A4818785 40C595A5 89999695 948595A3 40404040 40404040 4040F0F0 *Language Environment 00*  
0040 F0F0F0F0 F0F0F0F1 C3C5D3F4 E3C6D4E3 D3819587 4BC595A5 4B000000 *00000001CEL4TFMTLang.Env.... *  
1-0000 14501DC0 00000004 14506EB0 158006C8 1450653C 1450206C *.&.{.....&>....H.&...&.% *
```

FT Lang.Env. 1101 CEECRINI EVENT - SET_ANCHOR R13(14501968), PARS(14508690, 00000002)

```
TASK-00029 KE_NUM-0034 TCB-QR /008B56B8 RET-14E7FC12 TIME-18:25:47.6357975961 INTERVAL-00.0000511875 =082527=  
0000 0000C9C2 D4404040 40404040 40404040 40404040 40404040 40404040 40404040 *..IBM *  
0020 D3819587 A4818785 40C595A5 89999695 948595A3 40404040 40404040 4040F0F0 *Language Environment 00*  
0040 F0F0F0F0 F0F0F0F1 C3C5D3F4 E3C6D4E3 D3819587 4BC595A5 4B000160 *00000001CEL4TFMTLang.Env...- *  
1-0000 14501968 14508690 00000002 *.&...&f..... *
```

FT Lang.Env. 1018 CEEZINV EVENT - CEEEVNT-ID(ENCINIT) R13(14509290), PARS(1450653C, 00000000, 145066B8, 00000000, 01000000, 00000000, 00000000, 0030D8C3)

```
TASK-00029 KE_NUM-0034 TCB-QR /008B56B8 RET-14E89EB6 TIME-18:25:47.6358036118 INTERVAL-00.0000060156 =082528=  
0000 00C8C9C2 D4404040 40404040 40404040 40404040 40404040 40404040 40404040 *.HIBM *  
0020 D3819587 A4818785 40C595A5 89999695 948595A3 40404040 40404040 4040F0F0 *Language Environment 00*  
0040 F0F0F0F0 F0F0F0F1 C3C5D3F4 E3C6D4E3 D3819587 4BC595A5 4B00C900 *00000001CEL4TFMTLang.Env..I.*  
1-0000 14509290 00000012 00000000 1450653C 00000000 145066B8 00000000 01000000 *.&k.....&.....&..... *  
0020 00000000 00000000 *..... *  
2-0000 D8C3C5E2 C9000000 00000000 00000000 D8C3C5E2 D6000000 00000000 00000000 *QCESI.....QCESO..... *  
0020 D8C3C5E2 C5000000 00000000 00000000 *QCESE..... *
```



Notes

Event Handler Data Areas:

Data Area 1 contains R13 and Event Handler ID in the first two full words. The rest of Data Area 1 consists of 4-byte integers representing each parameter that is passed in the call. This is usually the value passed, but may be the address of the structure passed.

Data Area 2 (Trace entry 1018): EICB

Set Anchor Data Areas:

Data Area 1 contains R13 (first word); CAA address of this run unit (2nd word); 3rd word is CEEEDB_CREATOR_RINI (equates to identify creator of an enclave)

Language Interface Trace Points

Point ID	Module	Lvl	Type	Data
FT 1001	CEECEOWN	2	Event Handler (CEEEVNTIDMODEP)	See Below
FT 1002	CEECEOWN	2	Event Handler (CEEEVNTIDMODEP)	See Below
FT 1003	CEECRINI	1	Event Handler (CEEEVNTIDMODEP)	See Below
FT 1004	CEECEOWN	2	Event Handler (CEEEVNTDETWRKLEN)	See Below
FT 1005	CEECEOWN	2	Event Handler (CEEEVNTNEEDOPTP)	See Below
FT 1006	CEECRINV	2	Event Handler (CEEEVNTMAININV)	See Below
FT 1007	CEECRINV	2	Event Handler (CEEEVNTMAININV)	See Below
FT 1008	CEECRINV	2	Event Handler (CEEEVNTMAININV)	See Below
FT 1009	CEEZDSPR	2	Event Handler (CEEEVNTPRCTERM)	See Below

Language Interface Trace Points...

Point ID	Module	Lvl	Type	Data
FT 1010	CEEZDSPR	2	Event Handler (CEEEVNTPRCTERM)	See Below
FT 1011	CEEZDSPR	2	Event Handler (CEEEVNTPRCTERM)	See Below
FT 1012	CEEZDSEX	2	Event Handler (CEEEVNTENCTERM)	See Below
FT 1013	CEEZCREN	2	Event Handler (CEEEVNTOPTP)	See Below
FT 1014	CEEZCREN	2	Event Handler (CEEEVNTPRCINIT)	See Below
FT 1015	CEEZINV	2	Event Handler (CEEEVNTPOSIX)	See Below
FT 1018	CEEZINV	2	Event Handler (CEEEVNTENCINIT)	See Below
FT 1020	CEEHDSPR	2	Event Handler (CEEEVNTCOND)	See Below
FT 1021	CEEHDSPR	2	Event Handler (CEEEVNTENABLE)	See Below
FT 1022	CEEHDSPR	2	Event Handler (CEEEVNTSFZERO)	See Below
FT 1101	CEECRINI	2	Set Anchor	R13
FT 1102	CEECRTRM	2	Set Anchor	R13



LE / CICS Trace Usage

- **Control**

- Uses standard CICS Trace - CETR
- Controlled by CICS AP trace flags
 - Must have AP Level 2 active

- **Post-processing**

- Uses standard CICS Trace formatting
- Uses standard CICS Dump formatting
- Requires CEL4TFMT to be in STEPLIB to format the LE trace entries

- **Documentation**

- z/OS R1.4 Language Environment Debugging Guide

- **Requirements**

- PQ69143

LE / CICS Trace Problem Diagnosis

- **No FT trace points**
 - Ensure AP level 2 trace was enabled
 - Ensure PQ69143 is applied to CICS
 - Ensure FT trace points requested
- **Error DFHTR5002 "FEATURE ROUTINE CEL4TFMT ABENDED"**
 - Ensure CEL4TFMT is in STEPLIB