Diagnosing Application Problems Under Language Environment

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Agenda

- Important Modules
- Messages and ABENDs
- Condition Handling
- Collecting Error Documentation
- Understanding CEEDUMPs
- Using LEDATA in IPCS with System Dumps
- Summary
- Additional Information

Important Modules

- **CEEHDSP**
  - Always the top CSECT in CEEDUMPs
  - Schedules the CEEDUMP to be taken and schedules termination - **Ignore**
    - Language Environment Condition Handling CSECTs start with CEEH*
- **CEEPLPKA**
  - Language Environment's main 31 bit load module, contains CEEHDSP
  - ABENDs reported here can be either LE or application failures

Important Modules

- **CEEBINIT**
  - Language Environment's main initialization load module
    - Errors here are likely setup problems
- **CEECCICS**
  - Language Environment's main interface load module with CICS
    - Errors here are likely setup problems
- **CEEPIPI**
  - Preinitialization services interface routine

Important Modules

- **CEEHSGLT**
  - Language Environment signal handler
    - Review cause for signal generation
- **CEEV#GH/CEEV#FH**
  - Language Environment's Heap Get/Free routine
    - A signal raised here indicates heap damage

Important Modules

- **CEEEVxxx** (31 bit)
- **CELHVxxx** (31 bit XPLINK, C/C++ only)
  - Language Environment Event Handler load modules
  - xxx is the member number of the language

• 003	C/C++	• 010	PL/I
• 005	COBOL	• 011	Enterprise PL/I
• 007	FORTRAN	• 012	Debug Tool
• 008	DCE		

Messages and ABENDs

- Message (and Module) Prefixes
  - CEE — CEL (but may be reporting a problem elsewhere)
  - IGZ — COBOL
  - IBM — PL/I
  - FOR (AFH) — FORTRAN
  - EDC — C/C++ and utilities (e.g. iconv, localdef)
- See Language Environment Run-Time Messages for details on LE messages and ABENDs

Messages and ABENDs

- U4038 A severe (unhandled) error occurred, but no dump was requested (useless)
- U4039 A severe error occurred and a CEEDUMP (and optionally System dump) was requested
- U4083 Savearea backchain in error
- U4087 Error during error processing
- U4093 Error during initialization
- U4094 Error during termination

Condition Handling

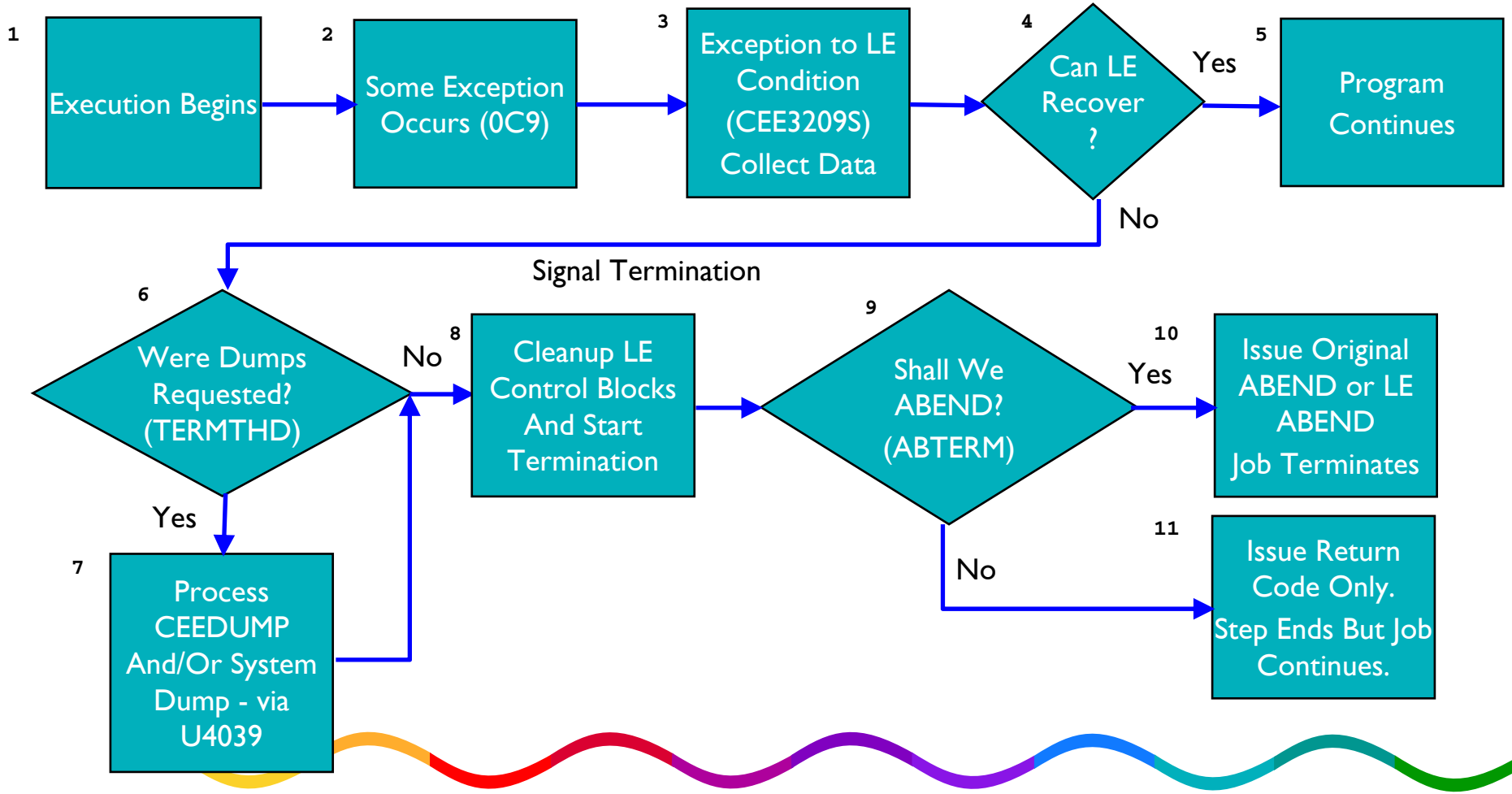
- Condition Token (Feedback Code)
  - Example: 00030C84 59C3C5C5 xxxxxxxx
    - 0003 | 0C84 | 59 | C3C5C5 | xxxxxxxx
      - 0003 Severity
        - 0000 Informational (I)
        - 0001 Warning (W)
        - 0002 Error (E)
        - 0003 Severe (S)
        - 0004 Critical (C)

Condition Handling

- Condition Token *(continued)*
  - 0003 | 0C84 | 59 | C3C5C5 | xxxxxxxx
    - 0C84 — Hex message number (3204)
    - 59 — Flags (ignore)
    - C3C5C5 — HEX Facility ID (message prefix, CEE)
    - xxxxxxxx — Instance specific information (internal use)
  - This token represents message CEE3204S

Condition Handling

- Condition Handling Flow



Collecting Error Documentation

- Getting useful information
  - Use Language Environment run-time option TERMTHDACT() to request Language Environment take a dump
    - DUMP — CEEDUMP with storage
    - TRACE — CEEDUMP with traceback only
    - UADUMP — CEEDUMP, system dump via U4039
    - UAONLY — No CEEDUMP, system dump via U4039
    - UATRACE — CEEDUMP (traceback) and system dump via U4039
    - *(UAIMM)* — *System dump via original error (only for debug purposes), also TRAP(ON,NOSPIE)*

Collecting Error Documentation

- Batch
  - CEEDUMP DD card
    - May be SYSOUT, dataset, UNIX file system
    - If not specified, dynamically allocated to SYSOUT=*
    - ENVAR('_CEE_DMPTARG=SYSOUT(x)')
      where x is any SYSOUT class

Collecting Error Documentation

- Batch *(continued)*
  - Optionally include SYSMDUMP DD for system dump
    - SYSMDUMP DD DSN=dump.name,
      SPACE=(CYL,(200,200),RLSE),
      DISP=(NEW,DELETE,CATLG),
      DCB=(RECFM=FBS,DSORG=PS,LRECL=4160,
      BLKSIZE=24960),
      UNIT=SYSDA

Collecting Error Documentation

- USS Shell
  - CEEDUMP saved to current working directory by default
    - /tmp if running in root or no write permission
    - To save in a specific directory
      - export _CEE_DMPTARG=path (case sensitive)
  - For system dump
    - export _BPXK_MDUMP=fully.qualified.dsn

Collecting Error Documentation

- CICS
  - CEEDUMP goes to CESE Transient Data Queue
  - For system dump
    - CEMT SET TRD(40xx) SYS ADD
- See APAR II10573 for additional information

That is "eye eye one zero five seven three"

Collecting Error Documentation

- Getting **NON-USEFUL** information
  - Remember: when ABTERMENC(ABEND) is set the "original " ABEND (eg, 0C4) is reissued
    - **DO NOT SLIP ON THIS ABEND**
    - Language Environment reissues this ABEND at the end of Language Environment termination
      - LE environment has already been cleaned-up and therefore a dump at this point is useless
    - Work with U4039 dump instead

Understanding CEEDUMPs

- A simple COBOL program

```
000100 CBL NOLIB,APOST,NODYNAM,NOOPT,TEST
000200     PROCESS QUOTE,MAP
000300     IDENTIFICATION DIVISION.
000400     PROGRAM-ID. COBOLED1.
000500     ENVIRONMENT DIVISION.
000600     DATA DIVISION.
000700     WORKING-STORAGE SECTION.
000800     01 WS-VARS.
000900        05 WS-COMP1 PIC S9(4) COMP-4 VALUE ZEROES.
001000     PROCEDURE DIVISION.
001100         CALL "COBOLED2".
001200         STOP RUN.
001300     END PROGRAM COBOLED1.
```

Understanding CEEDUMPs

- A simple COBOL program *(continued)*

```
001400     IDENTIFICATION DIVISION.
001500     PROGRAM-ID. COBOLED2.
         ...
001800     01 WS-VARS.
001900        05 WS-COMP1 PIC S9(4) COMP-4 VALUE ZEROES.
002000        05 WS-COMP2 PIC S9(4) COMP-4 VALUE ZEROES.
002100        05 WS-COMP3 PIC S9(4) COMP-4 VALUE ZEROES.
002200     PROCEDURE DIVISION.
002300        MOVE 32 TO WS-COMP3.
002400        MOVE 10 TO WS-COMP1.
002500        DIVIDE WS-COMP1 BY WS-COMP2 GIVING WS-COMP3.
002600        STOP RUN.
002700     END PROGRAM COBOLED2.
```

Understanding CEEDUMPs

- Job log shows

```
IEA995I SYMPTOM DUMP OUTPUT
  USER COMPLETION CODE=4039 REASON CODE=00000000
TIME=21.45.36  SEQ=03447  CPU=0000  ASID=0153
 PSW AT TIME OF ERROR  078D1000   A3E207B0  ILC 2  INTC 0D
    ACTIVE LOAD MODULE      ADDRESS=23E19D30 OFFSET=00006A80
   NAME=CEEPLPKA
   DATA AT PSW  23E207AA - 00181610  0A0D58D0  D00498EC
   GPR  0-3  84000000  84000FC7  00024478  23E207B0
   GPR  4-7  23E178A0  00000000  00024478  00025017
   GPR  8-11 23E238A5  23E228A6  000243D0  A3E206E0
   GPR 12-15 00015910  00026180  A3E22F1E  00000000
 END OF SYMPTOM DUMP
IEA993I SYSMDUMP TAKEN TO JMONTI.GOYANKS.SYSMDUMP
IEF450I JMONTI@B GO - ABEND=S0C9 U0000 REASON=00000009
```

Understanding CEEDUMPs

- Program output

```
CEE3209S The system detected a fixed-point divide exception.
         From compile unit COBOLED2 at entry point COBOLED2 at
         statement 13 at compile unit offset +00000308 at
         address 23E029E0.
```

- CEEDUMPs are formatted dumps and may simply be browsed
  - ISPF Browse
  - USS OBROWSE
  - CICS CEBR CESE
  - Transfer to PC and use a PC editor

Understanding CEEDUMPs

- Sample CEEDUMP

```
CEE3DMP V1 R4.0: Condition processing resulted in the unhandled condition.  02/26/03 9:48:42 PM    Page:  1

Information for enclave COBOLED1

  Information for thread 8000000000000000

  Traceback:
    DSA Addr  Program  PU Addr   PU Offset  Entry    E Addr    E  Offset   Stmt  Load Mod  Service  Status
    00024018  CEEHDSP  23E208A8  +000026A6  CEEHDSP  23E208A8  +000026A6         CEEPLPKA  UQ24548  Call
    000260C8  COBOLED2 23E026D8  +00000308  COBOLED2 23E026D8  +00000308     13  COBOL1              Exception
    00026018  COBOLED1 23E00978  +0000033E  COBOLED1 23E00978  +0000033E     14  COBOL1              Call
```

Understanding CEEDUMPs

```
CEE3DMP V1 R4.0:  Condition processing resulted in the unhandled condition. 02/26/03 9:48:42 PM   Page:  1

Information for enclave COBOLED1

  Information for thread 8000000000000000

Traceback:
  DSA Addr  Program  PU Addr   PU Offset  Entry    E Addr    E  Offset   Stmt  Load Mod  Service  Status
  00024018  CEEHDSP  23E208A8  +000026A6  CEEHDSP  23E208A8  +000026A6         CEEPLPKA  UQ24548  Call
  000260C8  COBOLED2 23E026D8  +00000308  COBOLED2 23E026D8  +00000308     13  COBOL1             Exception
  00026018  COBOLED1 23E00978  +0000033E  COBOLED1 23E00978  +0000033E     14  COBOL1             Call
```

STATUS

Why I left this entry point!

Understanding CEEDUMPs

```
Condition Information for Active Routines
  Condition Information for COBOLED2 (DSA address 000260C8)
    CIB Address: 00024478
    Current Condition:
      CEE0198S The termination of a thread was signaled due to an unhandled condition.
    Original Condition:
      CEE3209S The system detected a fixed-point divide exception.
    Location:
      Program Unit: COBOLED2 Entry: COBOLED2 Statement: 13 Offset: +00000308
    Machine State:
      ILC..... 0002    Interruption Code..... 0009
      PSW..... 078D2000 A3E029E2
      GPR0..... 00026180  GPR1..... 00000000  GPR2..... 00000000  GPR3..... 0000000A
      GPR4..... 00000000  GPR5..... 00046038  GPR6..... 00000000  GPR7..... 00FCCBF0
      GPR8..... 23F1B100  GPR9..... 23F17700  GPR10.... 23E027E0  GPR11.... 23E028B0
      GPR12.... 23E027D4  GPR13.... 000260C8  GPR14.... A3E029D4  GPR15.... A3E02916
  Storage dump near condition, beginning at location: 23E029D0
    +000000 23E029D0  45E0913A 48208000 8E200020 48408002  1D244030 800445E0 913A9140 905558B0 ..j.........
```

Failing PSW

Registers at Failure

Storage around PSW

Understanding CEEDUMPs

```
Condition Information for Active Routines
  Condition Information for COBOLED2 (DSA address 000260C8)
    CIB Address: 00024478
    Current Condition:
      CEE0198S The termination of a thread was signaled due to an unhandled condition.
    Original Condition:
      CEE3209S The system detected a fixed-point divide exception.
    Location:
      Program Unit: COBOLED2 Entry: COBOLED2 Statement: 13 Offset: +00000308
    Machine State:
      ILC..... 0002    Interruption Code..... 0009
      PSW..... 078D2000 A3E029E2
      GPR0..... 00026180  GPR1..... 00000000  GPR2..... 00000000  GPR3..... 0000000A
      GPR4..... 00000000  GPR5..... 00046038  GPR6..... 00000000  GPR7..... 00FCCBF0
      GPR8..... 23F1B100  GPR9..... 23F17700  GPR10.... 23E027E0  GPR11.... 23E028B0
      GPR12.... 23E027D4  GPR13.... 000260C8  GPR14.... A3E029D4  GPR15.... A3E02916
  Storage dump near condition, beginning at location: 23E029D0
    +000000 23E029D0  45E0913A 48208000 8E200020 48408002  1D244030 800445E0 913A9140 905558B0 ..j.........
```

DR R2,R4

See Principles of Operation

Understanding CEEDUMPs

```
Parameters, Registers, and Variables for Active Routines:
CEEHDSP (DSA address 00024018):
  Saved Registers:
    GPR0..... 00000000  GPR1..... 000243B4  GPR2..... A3E22F52  GPR3..... 00000003
    GPR4..... 23E178A0  GPR5..... 00000000  GPR6..... 00024FA4  GPR7..... 00025017
    GPR8..... 23E238A5  GPR9..... 23E228A6  GPR10.... 23E218A7  GPR11.... 23E208A8
    GPR12.... 00015910  GPR13.... 00024018  GPR14.... 8001C0E2  GPR15.... A3E675A0
GPREG STORAGE:
  Storage around GPR0 (00000000)
    +0000 00000000    Inaccessible storage.
    +0020 00000020    Inaccessible storage.
    +0040 00000040    Inaccessible storage.
  Storage around GPR1 (000243B4)
    -0020 00024394  23E17934 00025017 23E238A5 23E228A6  23E218A7 23E208A8 00015910 00000000 |......&..S.
    +0000 000243B4  00025097 000250E7 00024FA4 00024FA4  00024E04 00024ED4 00025218 00024478 |...&p..&X.\
    +0020 000243D4  00024478 00000000 00000000 00000000  00000001 00000005 A3EEBAA0 00000000 |...........
  Storage around GPR2 (A3E22F52)
    -0020 23E22F32  40404040 00000009 4EF0F0F0 F0F0F1F9  C3000000 00000008 F2F3C4C4 C6F5F1F4 |    ....+00
    +0000 23E22F52  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 |...........
    +0020 23E22F72  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 |...........
  Storage around GPR3 (00000003)
   ...
```

Registers for each savearea on chain

Storage around each register

Understanding CEEDUMPs

- Storage displayed starts 20 bytes BEFORE the address in the register
- Don't like the amount of storage formatted around each register?
  - TERMTHDACT(,,96) value can be 0-256
    - TERMTHDACT(,,0) to turn off
  - On CEE3DMP call, use REGSTOR(nn)

Understanding CEEDUMPs

```
LAST WHERE SET                  OPTION
-------------------------------------------------------------------------------
Installation default              ABPERC(NONE)
Installation default              ABTERMENC(ABEND)
Installation default            NOAIXBLD
Installation default              ALL31(ON)
Installation default              ANYHEAP(16384,8192,ANYWHERE,FREE)
Installation default            NOAUTOTASK
Installation default              BELOWHEAP(8192,4096,KEEP)
Installation default              CBLOPTS(ON)
Installation default              CBLPSHPOP(ON)
Installation default              CBLQDA(ON)
Installation default              CHECK(ON)
Installation default              COUNTRY(US)
Installation default            NODEBUG
Installation default              DEPTHCONDLMT(10)
Installation default              ENVAR("")
Installation default              ERRCOUNT(0)
Installation default              ERRUNIT(6)
Installation default              FILEHIST
Installation default              FILETAG(NOAUTOCVT,NOAUTOTAG)
Default setting                 NOFLOW
Installation default              HEAP(32768,32768,ANYWHERE,KEEP,8192,4096)
Installation default              HEAPCHK(OFF,1,0)
...
```

Options Report

Understanding CEEDUMPs

```
Local Variables:
        6 01 WS-VARS            AN-GR
        7  02 WS-COMP1          S9999 COMP       +00010
        8  02 WS-COMP2          S9999 COMP       +00000
        9  02 WS-COMP3          S9999 COMP       +00032
```

Variable values

.
.
.

```
Program COBOLED2 was compiled 02/26/99 9:45:32 PM
COBOL Version = 01 Release = 02 Modification = 02
TGT for COBOLED2: 23F17700
```

Compile date/time

```
User Level = '    '
```

Using LEDATA with System Dumps

- To review a SYSMDUMP, use VERBEXIT CEEERRIP (alias LEDATA) from within IPCS (PQ56893 – if IMS through V1 R4)
  - E.g. IP VERBX LEDATA 'CEEDUMP'
  - No options (or 'SUMMARY') for general info and run-time options
  - 'CEEDUMP' for a traceback report similar to that found in a CEEDUMP
  - 'CM' for condition information such as condition code, failing PSW, and registers at the time of error

Using LEDATA with System Dumps

- VERBX CEEERRIP 'SUMMARY'

```
*******************************************************************************
                          LANGUAGE ENVIRONMENT DATA
*******************************************************************************

 Language Environment V1 R4.0
TCB: 008ADE88                    LE Level: 10                    ASID: 0153

Active Members: COBOL

   CEECAA:  00015910
   +000000  FLAG0:00    LANGP:08    BOS:00026000      EOS:00046000
   +000044  TORC:00000000     TOVF:8000F100     ATTN:23E16B10
   +00015C  HLLEXIT:00000000        HOOK:50C0D064 05C058C0 C00605CC
   +0001A4  DIMA:0000F316     ALLOC:0700C198    STATE:0700C198
   +0001B0  ENTRY:0700C198    EXIT:0700C198     MEXIT:0700C198
   +0001BC  LABEL:0700C198    BCALL:0700C198    ACALL:0700C198
   +0001C8  DO:0700C198       IFTRUE:0700C198   IFFALSE:0700C198
   +0001D4  WHEN:0700C198     OTHER:0700C198    CGOTO:0700C198
   +0001F4  CRENT:00000000    EDCV:00000000     TCASRV_USERWORD:00000000
   +00025C  TCASRV_WORKAREA:23E16460      TCASRV_GETMAIN:00000000
   +000264  TCASRV_FREEMAIN:00000000      TCASRV_LOAD:8000F840
      .
      .
```

Common Anchor Area

Using LEDATA with System Dumps

- VERBX CEEERRIP 'SUMMARY' *(continued)*

```
CEERCB:  00013918
+000000  EYE:CEERCB        SYSTM:03    HRDWR:03    SBSYS:02    FLAGS:80
+000014  DMEMBR:23E09BB8   ZLOD:23ED4320     ZDEL:23E7D108
+000020  ZGETST:23ED5EC8   ZFREEST:23ED3FA0        VERSION_ID:04010400
```

```
CEEEDB:  000148B0
+000000  EYE:CEEEDB        FLAG1:D0    BIPM:00     BPM:00
+00000B  CREATOR_ID:01     MEMBR:000157D0    OPTCB:00014F00
+000014  URC:00000000      RSNCD:00000000    DBGEH:00000000
+000020  BANHP:00014D78    BBEHP:00014DA8    BCELV:0001B038
+00002C  PCB:00014558      ELIST:00000000    PL_ASTRPTR:00000000
+000038  DEFPLPTR:000149D0       CXIT_PAGE:00000000
+000040  DEBUG_TERMID:00000000   PARENT:00000000   R13_PARENT:00005F88
+000054  LEOV:00000000     ENVAR:23E16708    ENVIRON:00014908
+000064  OTRB:00000000     PSA31:00000000    PSL31:00000000
+000070  PSA24:00000000    PSL24:00000000    PSRA:23ED3DB0
+00007C  CAACHAIN@:00015910      FLAG1A:70   MEMBERCOMPAT1:00
+000090  THREADSACTIVE:00000001        CURMSGFILEDCBPTR:00013B80
+000098  CEEINT_INPUT_R1:00005FD8      LAST_RBADDR:008ADD78
+0000A0  LAST_RBCNT:00000001
    .
    .
    .
```

Region Control Block

Enclave Data Block

Using LEDATA with System Dumps

- VERBX CEEERRIP 'SUMMARY' *(continued)*

```
LAST WHERE SET          Override   OPTIONS
*************************************************************************
INSTALLATION DEFAULT    OVR          ABPERC(NONE)
PROGRAM INVOCATION      OVR          ABTERMENC(ABEND)
INSTALLATION DEFAULT    OVR        NOAIXBLD
INSTALLATION DEFAULT    OVR          ALL31(ON)
INSTALLATION DEFAULT    OVR          ANYHEAP(00016384,00008192,ANY   ,FREE)
INSTALLATION DEFAULT    OVR        NOAUTOTASK
INSTALLATION DEFAULT    OVR          BELOWHEAP(00008192,00004096,FREE)
INSTALLATION DEFAULT    OVR          CBLOPTS(ON)
INSTALLATION DEFAULT    OVR          CBLPSHPOP(ON)
INSTALLATION DEFAULT    OVR          CBLQDA(ON)
INSTALLATION DEFAULT    OVR          CHECK(ON)
INSTALLATION DEFAULT    OVR          COUNTRY(US)
INSTALLATION DEFAULT    OVR        NODEBUG
INSTALLATION DEFAULT    OVR          DEPTHCONDLMT(00000010)
INSTALLATION DEFAULT    OVR          ENVAR("")
INSTALLATION DEFAULT    OVR          ERRCOUNT(00000000)
INSTALLATION DEFAULT    OVR          ERRUNIT(00000006)
INSTALLATION DEFAULT    OVR          FILEHIST
INSTALLATION DEFAULT    OVR          FILETAG(NOAUTOCVT,NOAUTOTAG)
DEFAULT SETTING         OVR        NOFLOW
```

Using LEDATA with System Dumps

- VERBX CEEERRIP 'SUMMARY' *(continued)*

```
INSTALLATION DEFAULT    OVR        HEAP(00032768,00032768,ANY   ,
                                       KEEP,00008192,00004096)
INSTALLATION DEFAULT    OVR        HEAPCHK(OFF,00000001,00000000)
INSTALLATION DEFAULT    OVR        HEAPPOOLS(OFF,
                                             00000008,00000010,
                                             00000032,00000010,
                                             00000128,00000010,
                                             00000256,00000010,
                                             00001024,00000010,
                                             00002048,00000010)
REGION_DEFAULT          OVR        INFOMSGFILTER(OFF)
INSTALLATION DEFAULT    OVR        INQPCOPN
INSTALLATION DEFAULT    OVR        INTERRUPT(OFF)
INSTALLATION DEFAULT    OVR        LIBRARY(SYSCEE)
INSTALLATION DEFAULT    OVR        LIBSTACK(00000512,00001008,FREE)
INSTALLATION DEFAULT    OVR        MSGFILE(SYSOUT  ,FBA ,00000121,00000000,
                                             NOENQ)
INSTALLATION DEFAULT    OVR        MSGQ(00000015)
INSTALLATION DEFAULT    OVR        NATLANG(ENU)
IGNORED                 OVR      NONONIPTSTACK(00004096,00004096,BELOW,KEEP)
INSTALLATION DEFAULT    OVR        OCSTATUS
INSTALLATION DEFAULT    OVR      NOPC
```

Using LEDATA with System Dumps

- VERBX CEEERRIP 'SUMMARY' *(continued)*

```
INSTALLATION DEFAULT    OVR       PLITASKCOUNT(00000020)
INSTALLATION DEFAULT    OVR       POSIX(OFF)
INSTALLATION DEFAULT    OVR       PROFILE(OFF,"")
INSTALLATION DEFAULT    OVR       PRTUNIT(00000006)
INSTALLATION DEFAULT    OVR       PUNUNIT(00000007)
INSTALLATION DEFAULT    OVR       RDRUNIT(00000005)
INSTALLATION DEFAULT    OVR       RECPAD(OFF)
INSTALLATION DEFAULT    OVR       RPTOPTS(OFF)
INSTALLATION DEFAULT    OVR       RPTSTG(OFF)
INSTALLATION DEFAULT    OVR     NORTEREUS
INSTALLATION DEFAULT    OVR       RTLS(OFF)
INSTALLATION DEFAULT    OVR     NOSIMVRD
INSTALLATION DEFAULT    OVR       STACK(00131072,00131072,ANY ,KEEP,524288,131072))
INSTALLATION DEFAULT    OVR       STORAGE(NONE,NONE,NONE,00008192)
PROGRAM INVOCATION      OVR       TERMTHDACT(UADUMP)
INSTALLATION DEFAULT    OVR     NOTEST(ALL,*,PROMPT,INSPPREF)
INSTALLATION DEFAULT    OVR       THREADHEAP(00004096,00004096,ANY  ,KEEP)
INSTALLATION DEFAULT    OVR       THREADSTACK(OFF,00004096,00004096,ANYWHERE,KEEP,
                                       00131072,00131072)
INSTALLATION DEFAULT    OVR       TRACE(OFF,00004096,DUMP,LE=00000000)
INSTALLATION DEFAULT    OVR       TRAP(ON,SPIE)
INSTALLATION DEFAULT    OVR       UPSI(00000000)
```

Using LEDATA with System Dumps

- VERBX CEEERRIP 'SUMMARY' *(continued)*

```
INSTALLATION DEFAULT    OVR      NOUSRHDLR()
INSTALLATION DEFAULT    OVR        VCTRSAVE(OFF)
INSTALLATION DEFAULT    OVR        VERSION()
INSTALLATION DEFAULT    OVR        XPLINK(OFF)
INSTALLATION DEFAULT    OVR        XUFLOW(AUTO)
*******************************************************************************
Exiting Language Environment Data
```

Using LEDATA with System Dumps

- VERBX CEEERRIP 'CEEDUMP'

```
*******************************************************************************
                          LANGUAGE ENVIRONMENT DATA
*******************************************************************************
Information for enclave COBOLED1
 Information for thread 800000000000000

Traceback:
   DSA Addr  Program   PU Addr   PU Offset  Entry     E Addr    E  Offset  Stmt  Load Mod  Service  Status
   00026180  CEEHSDMP  23E206E0  +00089AD6  CEEHSDMP  23E206E0  +00089AD6        CEEPLPKA           Call
   00024018  CEEHDSP   23E208A8  +00002674  CEEHDSP   23E208A8  +00002674        CEEPLPKA  UQ24548  Call
   000260C8  COBOLED2  23E026D8  +00000308  COBOLED2  23E026D8  +00000308    13  COBOL1             Exception
   00026018  COBOLED1  23E00978  +0000033E  COBOLED1  23E00978  +0000033E    14  COBOL1             Call
```

.
.
.

Using LEDATA with System Dumps

- VERBX CEEERRIP 'CM'

```
Condition Management Control Blocks
     HCOM:  23E16AC8
   +000000  PICA_AREA:00000000 00000000   EYES:HCOM   CAA_PTR1:000FAB00
   +000014  CVTDCB:9B   FLAG:60504000     EXIT_STK:23EA26F8
   +000020  RSM_PTR:23E8FFA8        HDLL_STK:00000000
   +000028  SRP_TOKEN:00000000      CSTK:00000000     CIBH:000248C0
   +000094  DSA_4083:00000000

     CIBH:  000248C0
   +000000  EYE:CIBH    BACK:23E178A0     FRWD:00000000
   +000010  PTR_CIB:00000000        FLAG1:00    ERROR_LOCATION_FLAGS:00
   +000018  HDLQ:00000000     STATE:00000000    PRM_DESC:00000000
   +000024  PRM_PREFIX:00000000
   +000028  PRM_LIST:00000000 00000000 00000000 00000000
   +000038  PARM_DESC:00000000      PARM_PREFIX:00000000
   +000040  PARM_LIST:00000000 00000000 00000000 00000000   FUN:00000000
   +000054  CIB_SIZ:0000      CIB_VER:0000      FLG_5:00    FLG_6:00
   +00005A  FLG_7:00    FLG_8:00    FLG_1:00    FLG_2:00    FLG_3:00
   +00005F  FLG_4:00    ABCD:00000000     ABRC:00000000
       ...
```

- First CIBH always zero and should be ignored

Using LEDATA with System Dumps

- VERBX CEEERRIP 'CM'

```
  CIBH:  23E178A0
+000000  EYE:CIBH    BACK:00000000     FRWD:000248C0
+000010  PTR_CIB:00024478        FLAG1:C5    ERROR_LOCATION_FLAGS:1F
+000018  HDLQ:00000000     STATE:00000008    PRM_DESC:00000000
+000024  PRM_PREFIX:00000000
+000028  PRM_LIST:00024490 00024558 00024564 23E17CBC
+000038  PARM_DESC:00000000      PARM_PREFIX:00000000
+000040  PARM_LIST:00024554 00024478 00024564 23E17CBC   FUN:00000067
+000054  CIB_SIZ:0000      CIB_VER:0000      FLG_5:48    FLG_6:23
+00005A  FLG_7:00    FLG_8:00    FLG_1:00    FLG_2:00    FLG_3:00
+00005F  FLG_4:05    ABCD:940C9000    ABRC:00000009
+000068  OLD_COND_64:00030C89 59C3C5C5       OLD_MIB:00000001
+000074  COND_64:00030C89 59C3C5C5    MIB:00000001      PL:23E026EC
+000084  SV2:000260C8      SV1:000260C8      INT:23E029E0
+000090  MID:00000005      HDL_SF:000161A8   HDL_EPT:A3EEBAA0
+00009C  HDL_RST:00000000        RSM_SF:000260C8   RSM_POINT:23E029E2
```

CEE3209S

.
.

- Second CIBH contains most recent exception

Using LEDATA with System Dumps

- VERBX LEDATA 'CM'

```
        Machine State
+000348 MCH_EYE:ZMCH
+000350 MCH_GPR00:00026180      MCH_GPR01:00000000
+000358 MCH_GPR02:00000000      MCH_GPR03:0000000A
+000360 MCH_GPR04:00000000      MCH_GPR05:00046038
+000368 MCH_GPR06:00000000      MCH_GPR07:00FCCBF0
+000370 MCH_GPR08:23F1B100      MCH_GPR09:23F17700
+000378 MCH_GPR10:23E027E0      MCH_GPR11:23E028B0
+000380 MCH_GPR12:23E027D4      MCH_GPR13:000260C8
+000388 MCH_GPR14:A3E029D4      MCH_GPR15:A3E02916
+000390 MCH_PSW:078D2000 A3E029E2    MCH_ILC:0002      MCH_IC1:00
+00039B MCH_IC2:09  MCH_PFT:00000000 MCH_FLT_0:00000000 00000000
+0003A8 MCH_FLT_2:00000000 00000000  MCH_FLT_4:00000000 00000000
+0003B8 MCH_FLT_6:00000000 00000000  MCH_EXT:00000000
+000418 MCH_FLT_1:00000000 00000000  MCH_FLT_3:00000000 00000000
+000428 MCH_FLT_5:00000000 00000000  MCH_FLT_7:00000000 00000000
+000438 MCH_FLT_8:00000000 00000000  MCH_FLT_9:00000000 00000000
```

General Registers

PSW

Floating Point Registers

- Machine state information at time of exception

Using LEDATA with System Dumps

- VERBX CEEERRIP 'NTHREADS(*)'

```
  Unable to determine DSA for TCB at address:007E7B68 CAA at address:00015A80
  Language Environment Product    V1 R4.0
To Display Additional Information:
  IP VERBX LEDATA 'CAA(00015910)DSA(00026180) ALL'
Information for enclave COBOLED1
  Information for thread 8000000000000000
   PCB Address: 00161558
```

Traceback for each Language Environment-enabled TCB

```
 Traceback:
DSA Addr  Program   PU Addr   PU Offset  Entry     E Addr    E  Offset  Stmt  Load Mod  Service  Status
00026180  CEEHSDMP  23E206E0  +00089AD6  CEEHSDMP  23E206E0  +00089AD6        CEEPLPKA          Call
00024018  CEEHDSP   23E208A8  +00002674  CEEHDSP   23E208A8  +00002674        CEEPLPKA  UQ24548  Call
000260C8  COBOLED2  23E026D8  +00000308  COBOLED2  23E026D8  +00000308    13  COBOL1            Exception
00026018  COBOLED1  23E00978  +0000033E  COBOLED1  23E00978  +0000033E    14  COBOL1            Call
    .
    .
    .
```

- Show traceback for each thread in the process

Using LEDATA with System Dumps

- ANALYZE ALL

```
                          CONTENTION REPORT BY RESOURCE NAME
RESOURCE #0001:
   NAME=Mutex Object ADDR=251D72C0
```

Resource

```
RESOURCE #0001 IS HELD BY:

JOBNAME=WELLIE0   ASID=0020  TCB=009DDCF0
DATA=MSB ADDR: 251D35C0 SQEL ADDR: 24D2DFC0 CAA ADDR: 24D33CB0
     USER MUTEX/CV
```

Owner

```
RESOURCE #0001 IS REQUIRED BY:

JOBNAME=WELLIE0   ASID=0020  TCB=009AB288
DATA=MSB ADDR: 251D35C0 SQEL ADDR: 2520AC78 CAA ADDR: 2520BAC0

JOBNAME=WELLIE0   ASID=0020  TCB=009AD190
DATA=MSB ADDR: 251D35C0 SQEL ADDR: 2520FC78 CAA ADDR: 25210AC0
```

Waiters

- Show latches, mutexes, and condition variables

Using LEDATA with System Dumps

- Other LEDATA (CEEERRIP) options
  - 'HEAP'
    - Heap Storage Management control blocks
  - 'STACK'
    - Stack Storage Management control blocks
  - 'ALL'
    - All control blocks, including C and COBOL specific
      - C/C++ errno and errnojr at bottom

Using LEDATA with System Dumps

- Other LEDATA (CEEERRIP) options *(continued)*
  - 'TCB(xxxxxxxx)'
    - Allows specific TCB to be used as base
    - Helpful for console dumps
  - 'CAA(xxxxxxxx)'
    - Allows specific CAA to be used as base
    - Required for CICS (R12)

Using LEDATA with System Dumps

- Other LEDATA (CEEERRIP) options *(continued)*
  - 'DSA(xxxxxxxx)'
    - Allows specific DSA to be used for traceback
    - Required for CICS and console dumps (R13)

Summary

- Don't SLIP on Language Environment reissued ABEND (eg, 0C4)
- Use TERMTHDACT(UADUMP) to get a CEEDUMP
  - Add SYSMDUMP DD for system dump
- Use CEEDUMP or LEDATA formatter in IPCS to review traceback, PSW, and registers
  - Use **Exception** line in traceback for program checks
    - Except CEEHSGLT, review reason for signal

Additional Information

- Language Environment Programming Reference
- Language Environment Programming Guide
- Language Environment Debugging Guide
- Language Environment Run-Time Messages

- All Language Environment documentation available on
  - z/OS CD collection
  - Language Environment website
    - http://www.ibm.com/servers/eserver/zseries/zos/le/