



Debugging IMS Transactions With VisualAge Remote Debugger

E89

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Topics to be covered:

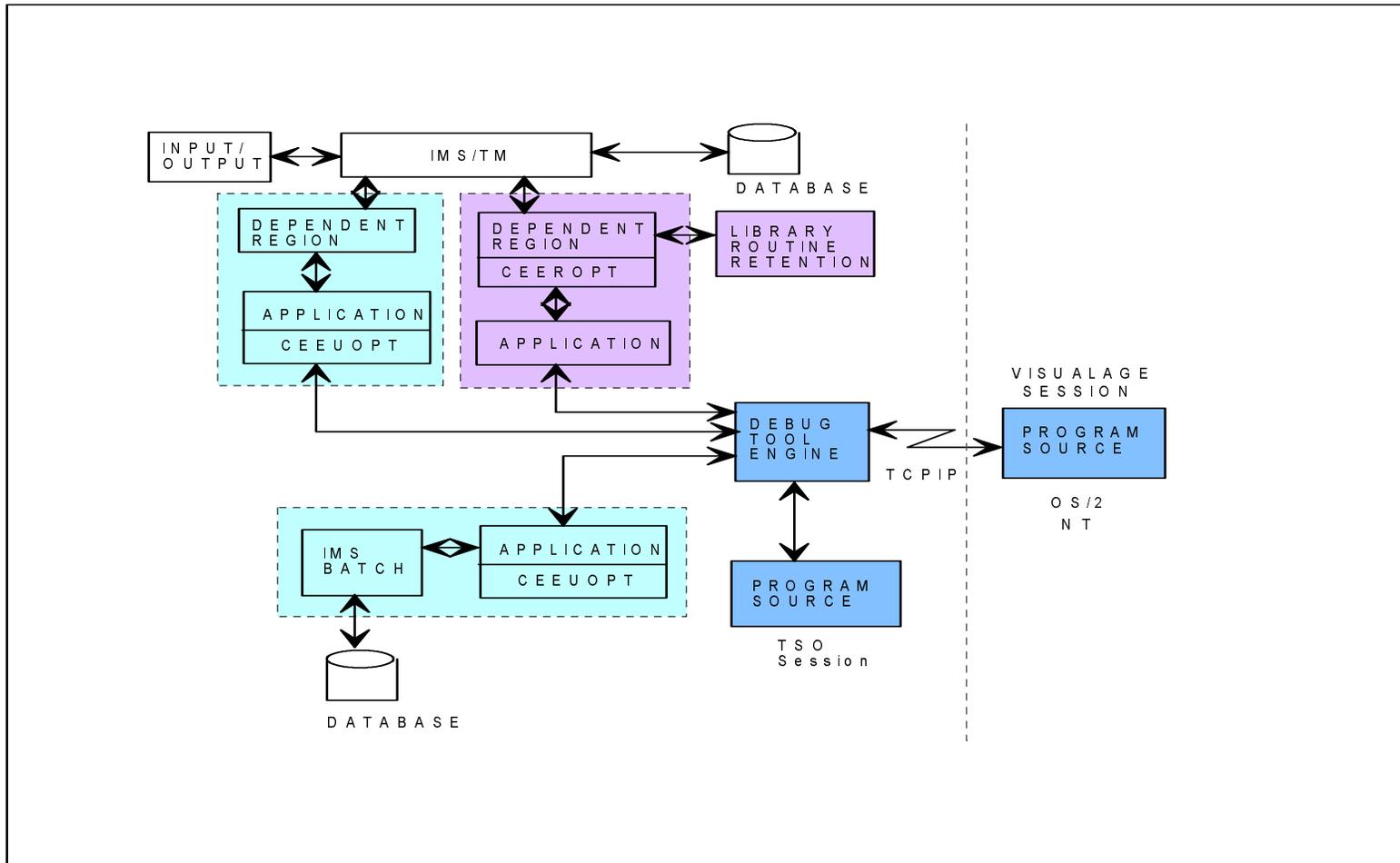
Overview

Setup

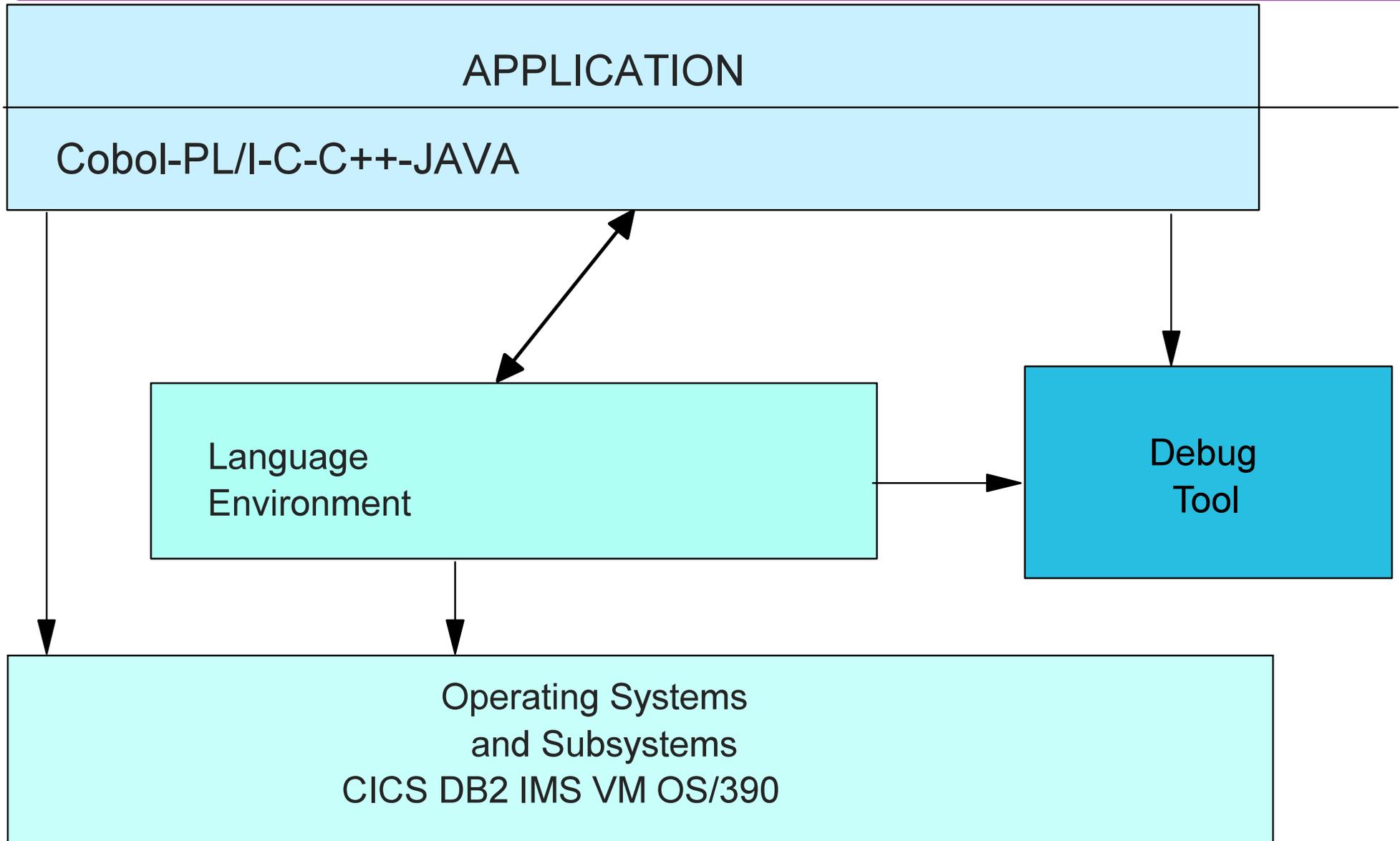
User Interface

Overview

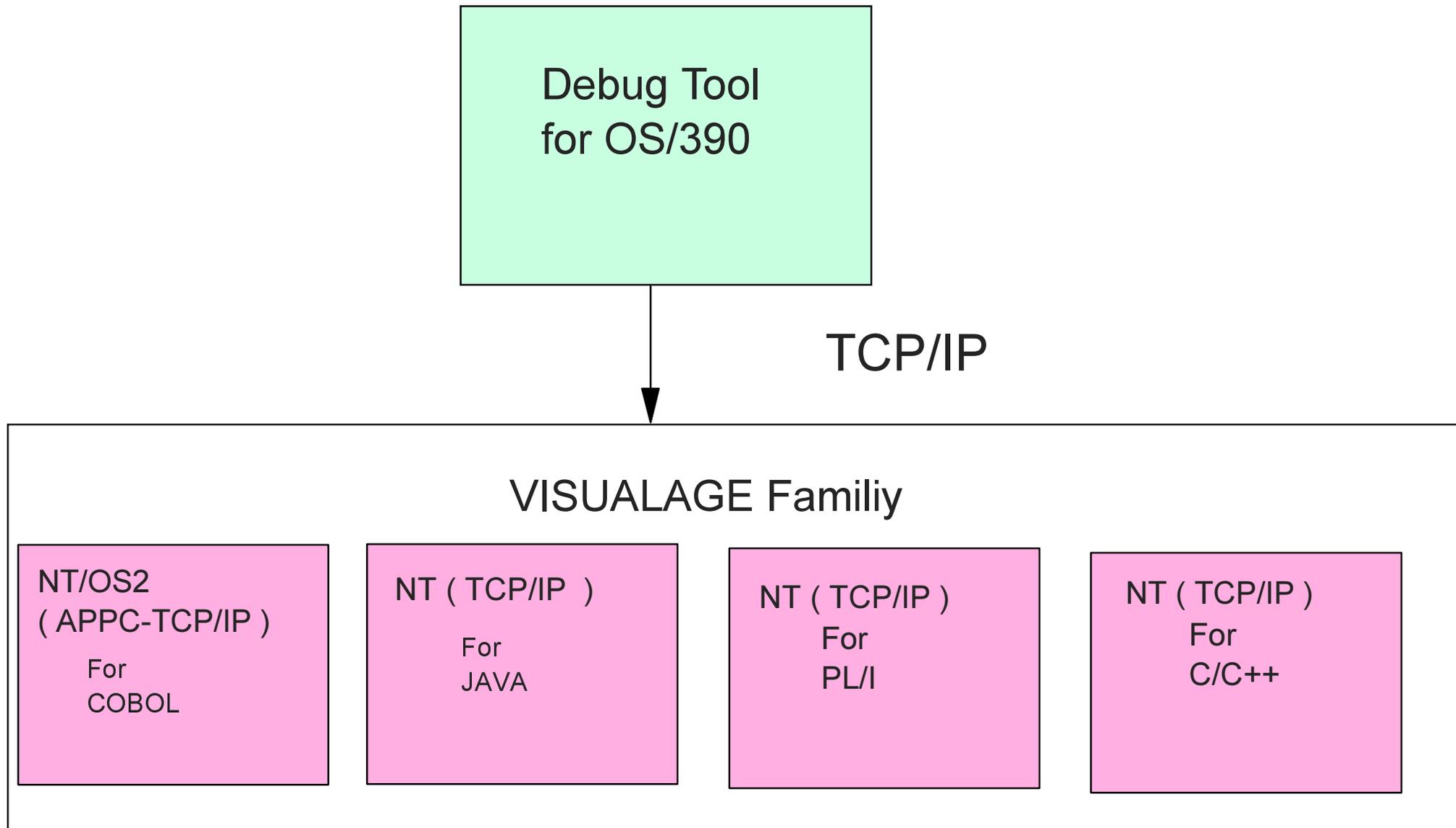
Debug Tool in the IMS Environment



Debug Tool and the LE Runtime Environment



Remote Debugger Components



Compilers Supported

- ▲ **IBM COBOL for OS/390**
- ▲ **IBM COBOL for MVS**
- ▲ **IBM C/C ++ for MVS**
- ▲ **IBM OS/390 C/C++**
- ▲ **VisualAge for Java, Enterprise Edition for OS/390**
- ▲ **IBM PL/I for MVS**
- ▲ **IBM VisualAge PL/I for OS/390**

Other SubSystems Supported

▲ **CICS**

▲ **TSO**

▲ **JES/BATCH**

▲ **DB2 including DB2 Stored Procedures**

▲ **USS (Unix System Services formerly known as Open Edition)**

▲ **WEBSPHERE's DOMINO WEB SERVER**

Host Requirements

▲ **Debug Tool. It can be ordered as a feature of the following compilers:**

- IBM COBOL for OS/390
- IBM COBOL for MVS
- IBM C/C++ for MVS
- IBM OS/390 C/C++
- IBM PL/I for MVS
- IBM VisualAge PL/I for OS/390
- VisualAge for Java, Enterprise Edition for OS/390

▲ **TCP/IP Version 3 Release 2 or Release 4 for MVS/ESA (5655-HAL)
(TCP/IP Version 3 Release 3 is not recommended)**

Buy once, Use many

Workstation Requirements

- ▲ **IBM VisualAge COBOL Enterprise for OS/2 and Windows NT Version 2.2 (5639-B92)**
- ▲ **VisualAge for Java, Enterprise Edition for OS/390**
- ▲ **Microsoft Windows NT Version 4.0 (Service Pack 3 is recommended) or**
- ▲ **OS/2 Version 4**
- ▲ **<http://www.software.ibm.com/ad/c390/cmvsbeta.htm>**

Setup

Setting up Debug Tool

CEEUOPT/CEEROPT

Setup Dependent Region

Preinit=xx

Build/Invoke Application Program: TEST option

Debugging IMS/TM Applications

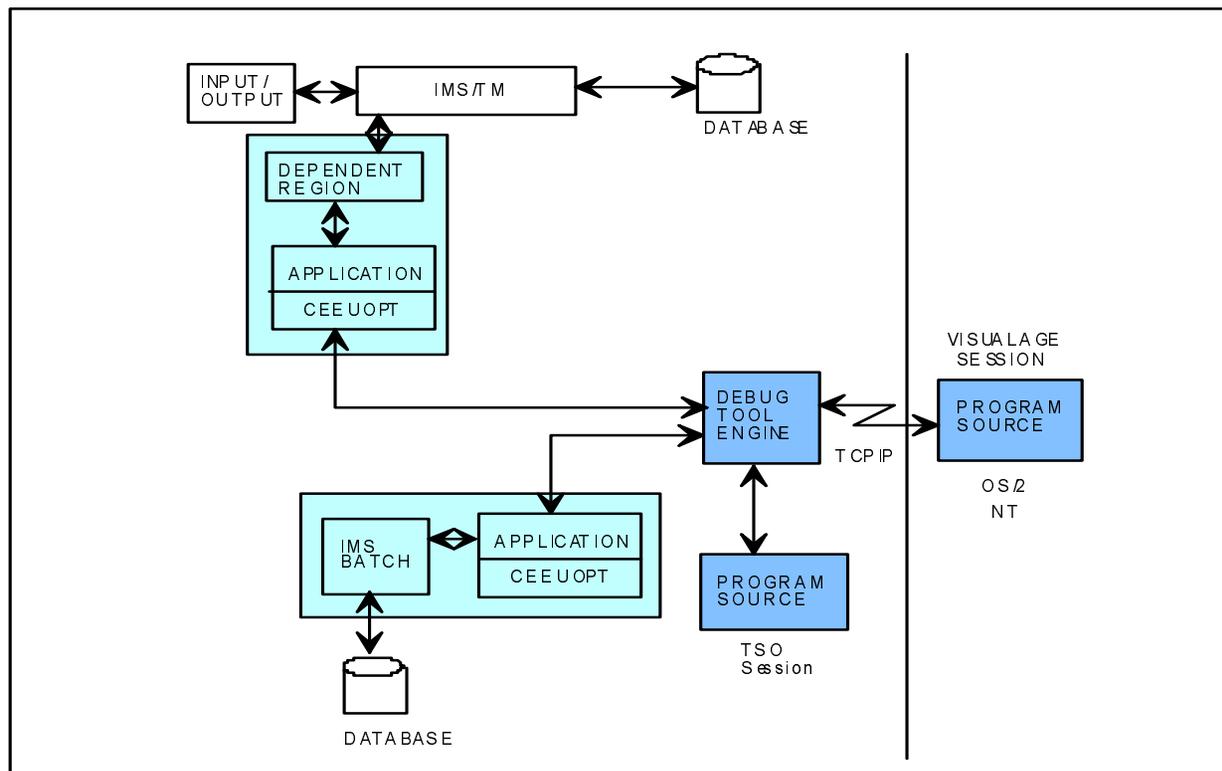
LE Run-time Options Modules

- **CEEUOPT** - Application defaults
- **CEEROPT** - Dependent region defaults

Debugging IMS/TM Applications with CEEUOPT

- ▲ **CEEUOPT - Using CEEXOPT macro**
- ▲ **Sets application defaults**
- ▲ **Links with application**
- ▲ **Concatenate LE and Debug Tool run-time library in STEPLIB**

Debugging IMS/TM Applications with CEEUOPT



LE Run-time option module - CEEUOPT

```

CEEUOPT CSECT
CEEUOPT AMODE ANY
CEEUOPT RMODE ANY
  CEEXOPT ABPERC=(NONE),           X
    ABTERMENC=(RETCODE),          X
    AIXBLD=(OFF),                  X
    ALL31=(OFF),                   X
    ANYHEAP=(16K,8K,ANYWHERE,FREE), X
    BELOWHEAP=(8K,4K,FREE),        X
    CBLPTS=(ON),                   X
    CBLPSHPOP=(ON),                X
    CBLQDA=(OFF),                  X
    CHECK=(ON),                    X
    COUNTRY=(US),                  X
    DEBUG=(OFF),                   X
    DEPTHCONDLMT=(10),             X
    ENVAR=("",),                   X
    ERRCOUNT=(0),                 X
    ERRUNIT=(6),                   X
    FILEHIST=(ON),                 X
    HEAP=(32K,32K,ANYWHERE,KEEP,8K,4K), X
    HEAPCHK=(OFF,1,0),             X
    HEAPPOOLS=(OFF,8,10,32,10,128,10,256,10,1024,10,2048, X
    10),                            X
    INFMSGFILTER=(OFF,,,,),        X
    INQPCOPN=(ON),                 X
    INTERRUPT=(OFF),               X
    LIBRARY=(SYSCEE),              X
    LIBSTACK=(4K,4K,FREE),         X
    MSGFILE=(SYSOUT,FBA,121,0),    X
    MSGQ=(15),                     X

```

```

NATLANG=(ENU),                    X
NOAUTOTASK=,                       X
NONONIPSTACK=(4K,4K,BELOW,KEEP),  X
NOTEST=(ALL,*,PROMPT,INSPREF),    X
NOUSRHDLR=("",),                   X
OCSTATUS=(ON),                     X
PC=(OFF),                           X
PLITASKCOUNT=(20),                X
POSIX=(OFF),                        X
PROFILE=(OFF,"),                   X
PRTUNIT=(6),                        X
PUNUNIT=(7),                        X
RDRUNIT=(5),                        X
RECPAD=(OFF),                       X
RPTOPTS=(OFF),                      X
RPTSTG=(OFF),                       X
RTEREUS=(OFF),                      X
RTLIS=(OFF),                        X
SIMVRD=(OFF),                       X
STACK=(128K,128K,BELOW,KEEP),      X
STORAGE=(NONE,NONE,NONE,8K),      X
TERMTHDACT=(TRACE),                X
THREADHEAP=(4K,4K,ANYWHERE,KEEP), X
TRACE=(OFF,4K,DUMP,LE=0),          X
TRAP=(ON,SPIE),                     X
UPSI=(00000000),                    X
VCTRSVAVE=(OFF),                    X
VERSION=("",),                       X
XUFLOW=(AUTO)                        X
END

```

Sample Invocation of CEEXOPT within the CEEUOPT Source Program

LE Run-time option "TEST" parameter

TEST=(,*,,VADTCPIP&&1.2.3.4:8000)

- 1.2.3.4 is the target IP address for the Remote Debugger session.
- 8000 is the port number. Your port number has to match the port number used when you start the Remote Debugger Daemon. The default is 8000.

LE Run-time option module - CEEUOPT

```

CEEUOPT CSECT
CEEUOPT AMODE ANY
CEEUOPT RMODE ANY
  CEEXOPT ABPERC=(NONE),           X
    ABTERMENC=(RETCODE),          X
    AIXBLD=(OFF),                  X
    ALL31=(OFF),                   X
    ANYHEAP=(16K,8K,ANYWHERE,FREE), X
    BELOWHEAP=(8K,4K,FREE),        X
    CBLPTS=(ON),                   X
    CBLPSHPOP=(ON),                X
    CBLQDA=(OFF),                  X
    CHECK=(ON),                    X
    COUNTRY=(US),                  X
    DEBUG=(OFF),                   X
    DEPTHCONDLMT=(10),             X
    ENVAR="",                       X
    ERRCOUNT=(0),                 X
    ERRUNIT=(6),                   X
    FILEHIST=(ON),                 X
    HEAP=(32K,32K,ANYWHERE,KEEP,8K,4K), X
    HEAPCHK=(OFF,1,0),              X
    HEAPPOOLS=(OFF,8,10,32,10,128,10,256,10,1024,10,2048, X
    10),                             X
    INFMSGFILTER=(OFF,,,,),        X
    INQPCOPN=(ON),                 X
    INTERRUPT=(OFF),               X
    LIBRARY=(SYSCEE),              X
    LIBSTACK=(4K,4K,FREE),         X
    MSGFILE=(SYSOUT,FBA,121,0),    X
    MSGQ=(15),                     X

```

```

NATLANG=(ENU),                     X
NOAUTOTASK=,                        X
NONONIPSTACK=(4K,4K,BELOW,KEEP),   X
TEST=(ALL,*,VADTCPIP&9.1.2.*),     X
NOUSRHDLR=("",                      X
OCSTATUS=(ON),                       X
PC=(OFF),                             X
PLITASKCOUNT=(20),                  X
POSIX=(OFF),                          X
PROFILE=(OFF,"),                     X
PRTUNIT=(6),                          X
PUNUNIT=(7),                          X
RDRUNIT=(5),                          X
RECPAD=(OFF),                         X
RPTOPTS=(OFF),                        X
RPTSTG=(OFF),                         X
RTEREUS=(OFF),                       X
RTL5=(OFF),                           X
SIMVRD=(OFF),                         X
STACK=(128K,128K,BELOW,KEEP),        X
STORAGE=(NONE,NONE,NONE,8K),        X
TERMTHDACT=(TRACE),                  X
THREADHEAP=(4K,4K,ANYWHERE,KEEP),   X
TRACE=(OFF,4K,DUMP,LE=0),            X
TRAP=(ON,SPIE),                      X
UPSI=(00000000),                     X
VCTRSVAVE=(OFF),                     X
VERSION="",                           X
XUFLOW=(AUTO)                         X
END

```

Sample Invocation of CEEXOPT within the CEEUOPT Source Program

Links with Application

```
//LKED EXEC PGM=IEWL,COND=(8,LE,COBOL2),
//      PARM='LIST,XREF,LET,RENT,MAP'
//SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR
//      DD DSN=CEE.SCEERUN,DISP=SHR
//      DD DSN=CEE.SCEELKED,DISP=SHR
//      DD DSN=USER.TESTLIB,DISP=SHR
/* IMS RESLIB
//RESLIB DD DSN=IMSBLD.I61RTS25.CRESLIB,DISP=SHR
/*
//SYSLMOD DD DSN=USER.RESLIB,DISP=SHR
//SYSUT1 DD UNIT=SYSDA,DCB=BLKSIZE=1024,
//      SPACE=(1024,(200,20))
/*
//SYSPRINT DD SYSOUT=*
/*
//SYSLIN DD *
INCLUDE SYSLIB(IAPMDI26)
INCLUDE SYSLIB(CEEUOPT)
INCLUDE RESLIB(DFSLI000)
ENTRY DLITCBL
NAME IAPMDI26(R)
/*
```

Sample Linkedit JCL for IMS transaction IAPMDI26

IMS Dependent Region Setup

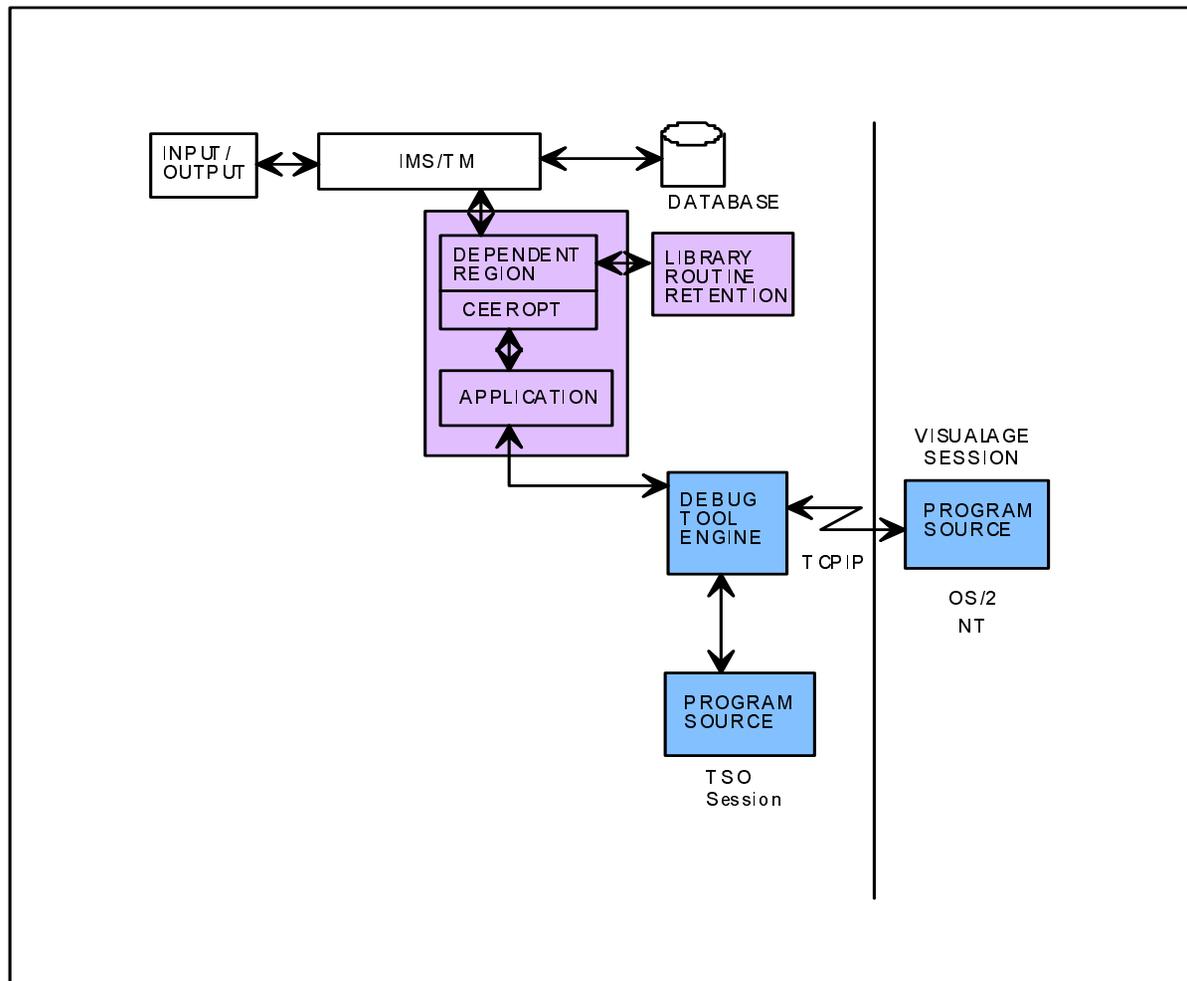
- Concatenate **LE** and **Debug Tool** run-time library in **STEPLIB**
 - ▶ **CEE.SCEERUN** <= LE
 - ▶ **EQAW.SEQAMOD** <= Debug Tool

```
//MPP1 PROC RGN=1000K,  
//      VCAT=VCATQAV,  
//      RESLIB='IMSBLD.I61RTS25.CRESLIB',  
//      C1=001,C2=002,C3=003,C4=004,  
//      OPT=W,OVLA=0,SPIE=0,VALCK=0,TLIM=00,PCB=040,  
//      PRLD=,STIMER=0,SOD=,DBLDL=,  
//      NBA=05,OBA=05,IMSID=,  
//      AGN=,VSFX=,VFREE=,SSM=,  
//      PREINIT=,ALTID=,WFI=,APARM=,LOCKMAX=  
//STEPLIB DD DSN=USER.RESLIB,DISP=SHR  
//      DD DSN=CEE.SCEERUN,DISP=SHR    <= LE run-time  
//      DD DSN=EQAW.SEQAMOD,DISP=SHR  <= Debug Tool run-time
```

Debugging IMS/TM Applications with CEEROPT

- ▲ **CEEROPT - Stand-alone load module**
- ▲ **Using CEEXOPT macro**
 - Must specified either overrideable (OVR) or nonoverrideable (NONOVR)
- ▲ **New with OS/390 Language Environment V2R7**
- ▲ **Establishes region-wide defaults to a IMS dependent region**
- ▲ **LE Library Routine Retention (LRR) must be in effect**
- ▲ **Resides in dependent region STEPLIB**
- ▲ **Concatenate LE and Debug Tool run-time library in STEPLIB**

Debugging IMS/TM Applications with CEEROPT



LE Run-time option module - CEEROPT

```

CEEROPT CSECT
CEEROPT AMODE ANY
CEEROPT RMODE ANY
  CEEOPT ABPERC=((NONE),OVR),          X
    ABTERMENC=((RETCODE),OVR),        X
    AIXBLD=((OFF),OVR),                X
    ALL31=((OFF),OVR),                 X
    ANYHEAP=((16K,8K,ANYWHERE,FREE),OVR), X
    BELOWHEAP=((8K,4K,FREE),OVR),     X
    CBLOPTS=((ON),OVR),                X
    CBLPSHPOP=((ON),OVR),              X
    CBLQDA=((OFF),OVR),                X
    CHECK=((ON),OVR),                  X
    COUNTRY=((US),OVR),                X
    DEBUG=((OFF),OVR),                 X
    DEPTHCONDLMT=((10),OVR),           X
    ENVAR=("",OVR),                    X
    ERRCOUNT=((0),OVR),                X
    ERRUNIT=((6),OVR),                  X
    FILEHIST=((ON),OVR),                X
    HEAP=((32K,32K,ANYWHERE,KEEP,8K,4K),OVR), X
    HEAPCHK=((OFF,1,0),OVR),            X
    HEAPPOOLS=((OFF,8,10,32,10,128,10,256,10,1024,10,2048,10),OVR), X
    INFMSGFILTER=((OFF,,),OVR),         X
    INQPCOPN=((ON),OVR),                X
    INTERRUPT=((OFF),OVR),              X
    LIBRARY=((SYSCEE),OVR),              X
    LIBSTACK=((4K,4K,FREE),OVR),        X
    MSGFILE=((SYSOUT,FBA,121,0),OVR),   X
    MSGQ=((15),OVR),                    X

```

```

NATLANG=((ENU),OVR),                  X
NOAUTOTASK=(OVR),                     X
NONONIPTSTACK=((4K,4K,BELOW,KEEP),OVR), X
NOTEST=((ALL*,PROMPT,INSPREF),OVR),    X
NOUSRHDLR=((),OVR),                   X
OCSTATUS=((ON),OVR),                   X
PC=((OFF),OVR),                         X
PLITASKCOUNT=((20),OVR),              X
POSIX=((OFF),OVR),                     X
PROFILE=((OFF,"),OVR),                  X
PRTUNIT=((6),OVR),                      X
PUNUNIT=((7),OVR),                      X
RDRUNIT=((5),OVR),                      X
RECPAD=((OFF),OVR),                     X
RPTOPTS=((OFF),OVR),                    X
RPTSTG=((OFF),OVR),                     X
RTEREUS=((OFF),OVR),                    X
RTLS=((OFF),OVR),                       X
SIMVRD=((OFF),OVR),                     X
STACK=((128K,128K,BELOW,KEEP),OVR),    X
STORAGE=((NONE,NONE,NONE,8K),OVR),     X
TERMTHDACT=((TRACE),OVR),               X
THREADHEAP=((4K,4K,ANYWHERE,KEEP),OVR), X
TRACE=((OFF,4K,DUMP,LE=0),OVR),         X
TRAP=((ON,SPIE),OVR),                   X
UPSI=((00000000),OVR),                  X
VCTRSAVE=((OFF),OVR),                   X
VERSION=("",OVR),                       X
XUFLOW=((AUTO),OVR)
END

```

Sample Invocation of **CEEOPT** within the CEEROPT Source Program

LE Run-time option "TEST" parameter

TEST=((,*,,VADTCPIP&&1.2.3.4:*),NONOVR)

- 1.2.3.4 is the target IP address for the Remote Debugger session.
- Notice a * instead of a port number. You can use a * to indicate to use the default port number. The default port number is 8000.

IMS Dependent Region Setup

Initialize LE Library Routine Retention (LRR)

- **PREINIT=DT**

```
//MPP1 PROC RGN=1000K,  
//      VCAT=VCATQAV,  
//      RESLIB='IMSBLD.I61RTS25.CRESLIB',  
//      C1=001,C2=002,C3=003,C4=004,  
//      OPT=W,OVLA=0,SPIE=0,VALCK=0,TLIM=00,PCB=040,  
//      PRLD=,STIMER=0,SOD=,DBLDL=,  
//      NBA=05,OBA=05,IMSID=,  
//      AGN=,VSFX=,VFREE=,SSM=,  
//      PREINIT=DT,ALTID=,WFI=,APARM=,LOCKMAX=  
//STEPLIB DD DSN=USER.RESLIB,DISP=SHR  
//      DD DSN=CEE.SCEERUN,DISP=SHR  
//      DD DSN=EQAW.SEQAMOD
```

IMS Dependent Region Setup

Included *CEELRRIN* in the DFSINTDT member

PREINIT=DT

```
EDIT  IMS.PROCLIB(DFSINTDT) - 01.00      Columns 00001 00072
Command ==>                               Scroll ==> PAGE
***** ***** Top of Data *****
000100 CEELRRIN
***** ***** Bottom of Data *****
```

IMS Dependent Region Setup

- Concatenate **LE** and **Debug Tool** run-time library in **STEPLIB**
 - ▶ **CEE.SCEERUN** <= LE Run-time
 - ▶ **EQAW.SEQAMOD** <= Debug Tool Run-time

```
//MPP1 PROC RGN=1000K,  
//      VCAT=VCATQAV,  
//      RESLIB='IMSBLD.I61RTS25.CRESLIB',  
//      C1=001,C2=002,C3=003,C4=004,  
//      OPT=W,OVLA=0,SPIE=0,VALCK=0,TLIM=00,PCB=040,  
//      PRLD=,STIMER=0,SOD=,DBLDL=,  
//      NBA=05,OBA=05,IMSID=,  
//      AGN=,VSFX=,VFREE=,SSM=,  
//      PREINIT=DT,ALTID=,WFI=,APARM=,LOCKMAX=  
//STEPLIB DD DSN=USER.RESLIB,DISP=SHR      <= CEEROPT  
//          DD DSN=CEE.SCEERUN,DISP=SHR    <= LE run-time  
//          DD DSN=EQAW.SEQAMOD,DISP=SHR  <= Debug Tool run-time
```

Build/Invoke Application Program

- ▲ **Programs that are to be debugged must be compiled with the TEST compile option.**
- ▲ **The Program's source (C/C++/HPJava) or the Program's listing (COBOL) must be accessible to Debug Tool.**
- ▲ **Specify TEST runtime option. The TEST runtime option is used to invoke Debug Tool at runtime. The TEST runtime option and suboptions are used to indicate under which conditions the debugger gets control.**

```
//COMPILE EXEC PGM=IGYCRCTL,REGION=2048K,  
                PARM='TEST(ALL,SYM),SOURCE'
```

TEST(ALL,SYM)	Compiled-in hooks
TEST(NONE,SYM)	Dynamic Debug
TEST(NONE,SYM,SEPERATE)	Sidefile

User Interface

COBOL LOCATION: EMPLOOK :> 166.1

Command ==> Scroll ==> PAGE

SOURCE: EMPLOOK --1--2--3--4--5-- + LINE: 1 OF 343

```

***** TOP OF SOURCE *****
* Update: 05/07/1997 *
* Before running on STLMVS1, issue the following at the *
* TSO READY prompt: *
* ALLOC FI(SYSIN) DA(*) *
*****
***** IDENTIFICATION DIVISION. *****
***** PROGRAM-ID. "EMPLOOK". *****
***** AUTHOR. Programmer. *****
***** * *****
***** * NAME.....EMPLOOK *****
***** * LANGUAGE.....COBOL *****
***** * FUNCTION.....Employee Lookup *****
***** * This program displays a list of employees *****

```

PF 1:? 2:STEP 3:QUIT 4:LIST 5:FIND 6:AT/CLEAR
PF 7:UP 8:DOWN 9:GO 10:ZOOM 11:ZOOM LOG 12:RETRIEVE



COBOL LOCATION: EMPLOOK :> 173.1
 Command ==>> Scroll ==>> PAGE
 MONITOR --+--1--2--3--4--5--6 LINE: 0 OF 0
 ***** TOP OF MONITOR *****
 ***** BOTTOM OF MONITOR *****

SOURCE: EMPLOOK --1--2--3--4--5--6 LINE: 169 OF 343
 169 PERFORM UNTIL WK-LOOP-FLAG NOT = SPACES
 170 DISPLAY "Enter search type (D, E, or P), H for help,
 171 "or Q to quit:
 172 ACCEPT WK-SEARCH-TYPE

173 MOVE FUNCTION UPPER-CASE(WK-SEARCH-TYPE)
 174 TO WK-SEARCH-TYPE

LOG 0--1--2--3--4--5--6 LINE: 9 OF 12
 0009 AT 173 ;
 0010 GO ;
 0011 LIST WK-SEARCH-TYPE ;
 0012 WK-SEARCH-TYPE = 'D'

PF 1:? 3:QUIT 4:LIST 5:FIND 6:AT/CLEAR
 PF 7:UP 2:STEP 8:DOWN 9:GO 10:ZOOM 11:ZOOM LOG 12:RETRIEVE

PntScrn
 Copy
 Paste
 Send
 Recv
 Display
 Color
 Map
 Record
 Stop
 Play
 Quit
 Clipbrd
 Support
 Index

COBOL LOCATION: EMPLOOK :> 246.1
 Command ==>>
 Scroll ==>> PAGE
 MONITOR --+--1--2--3--4--5--6 LINE: 0 OF 0
 ***** TOP OF MONITOR *****
 ***** BOTTOM OF MONITOR *****

```

SOURCE: EMPLOOK --1--2--3--4--5-- LINE: 244 OF 343
244 MOVE WK-DEPARTMENT TO CS-DEPT.
245
246 CALL "EMPSRCH" USING CS-PASS-AREA.
247
248 IF CS-RETURN-CODE = 0
249   PERFORM 2100-DISPLAY-RESULTS THRU 2100-EXIT

```

```

LOG 0--1--2--3--4--5-- LINE: 11 OF 14
0011 LIST WK-SEARCH-TYPE ;
0012 WK-SEARCH-TYPE = 'D'
0013 AT CALL EMPSRCH ;
0014 GO ;
PF 1:? 2:STEP 3:QUIT 4:LIST 5:FIND 6:AT/CLEAR
PF 7:UP 8:DOWN 9:GO 10:ZOOM 11:ZOOM LOG 12:RETRIEVE

```

MA C
 02/015

PrtScrn Copy Paste Send Recv Display Color Map Record Stop Play Quit Clipbird Support Index

COBOL LOCATION: EMPSRCH :> 246.1

Command ==>> Scroll ==>> PAGE

```

MONITOR  --+---1---+---2---+---3---+---4---+---5---+---6 LINE: 1 OF 1
*****
0001 1 CS-RETURN-CODE  0
*****
***** BOTTOM OF MONITOR *****

```

```

SOURCE: EMPSRCH  --1---+---2---+---3---+---4---+---5--- LINE: 244 OF 469
244
245 * Initialize CS-RESULT-DATA
246 INITIALIZE CS-RESULT-DATA
247 MOVE 0 TO RESULT-DATA-MAX
248
249 * Initialize return code

```

```

LOG 0  --+---1---+---2---+---3---+---4---+---5--- LINE: 27 OF 30
0027 MONITOR GLOBAL 1
0028 LIST CS-RETURN-CODE ;
0029 STEP ;
0030 STEP ;
PF 1: ? 2:STEP 3:QUIT 4:LIST 5:FIND 6:AT/CLEAR
PF 7:UP 8:DOWN 9:GO 10:ZOOM 11:ZOOM LOG 12:RETRIEVE

```

```

MA C 02/015

```

PrtScrn Copy Paste Send Recv Display Color Map Record Stop Play Quit Clipbird Support Index

COBOL LOCATION: EMPSRCH :> 290.1

Command ==>> Scroll ==>> PAGE

```

MONITOR --+---1---+---2---+---3---+---4---+---5---+---6 LINE: 1 OF 2
*****
0001 1 CS-RETURN-CODE 0
0002 2 EMP-PTR 03
*****
***** BOTTOM OF MONITOR *****

```

```

SOURCE: EMPSRCH --1---+---2---+---3---+---4---+---5--- LINE: 286 OF 469
286 * Move all entries to CS-RESULT-DATA
287 PERFORM UNTIL EMP-PTR > EMP-ARRAY-MAX
288 MOVE EMP-ENTRY(EMP-PTR) TO CS-RESULT-DETAILS(RESULTS-P
289 ADD 1 TO EMP-PTR
290 ADD 1 TO RESULTS-PTR
291 END-PERFORM.

```

```

LOG 0 --+---1---+---2---+---3---+---4---+---5--- LINE: 40 OF 43
STEP ;
MONITOR GLOBAL 2
LIST EMP-PTR ;
MOVE 3 TO EMP-PTR ;
PF 1:? 2:STEP 3:QUIT 4:LIST 5:FIND 6:AT/CLEAR
PF 7:UP 8:DOWN 9:GO 10:ZOOM 11:ZOOM LOG 12:RETRIEVE

```

```

MA C 02/015

```

Source: IAP26A - Thread : 1

File View Breakpoints Monitors Run Options Windows Help



```

44 05 FLGS
45 05 FACID
46 05 ISI
47
48 LINKAGE SECTION.
49 01 RCNT
50 01 VCNT
51 01 CCNT
52 01 IOPCB.
53 02 IO-LTERM
54 02 IO-RESV
55 02 IO-STATUS
56 02 IO-PREF
57 02 IO-MODN
58 02 IO-USERID
59 02 IO-GROUPID
60
61 PROCEDURE DIVISION USING RCNT, CCNT, VCNT,
62 BY VALUE
63 BY REFERENCE IOPCB.
64
65 DISPLAY "***** ENTER IAP26A *****"
66 DISPLAY "RCNT BY REFERENCE: ", RCNT, " BY CONTENT: ", CCNT.
67 DISPLAY "VCNT BY VALUE: ", VCNT.
68
69 * ENTRY 'DLITCBL' USING IOPCB.
70 *****
71 * GET IMS MESSAGES FROM INPUT QUEUE AND PROCESS
72 *****
73 * COMPUTE VCNT = VCNT + 100.
74 CALL 'CBLTDLI' USING GU-FUNC, IOPCB,
75 INPUT-MESSAGE.
76
77 * COMPUTE CCNT = CCNT - 100.
78 GOBACK.
79 *****
80 * ERROR ROUTINE TO CATER FOR UNEXPECTED DLI S
81 D-RETURN-CODE.
82 DISPLAY DLI-MSG.
83 GOBACK.

```

Debugger - Session Control

File Breakpoints Monitors Run Options Windows Help

STATUS : Ready.

Threads	COBIMS1
<ul style="list-style-type: none"> Thread: 1 <ul style="list-style-type: none"> IAPMDI26 <ul style="list-style-type: none"> COBIMS1 <ul style="list-style-type: none"> IAP26A 	

Source: IAP26A - Thread : 1

File View Breakpoints Monitors Run Options Windows Help



```

44 05 FLGS PIC X(1).
45 05 FACID PIC X(3).
46 05 ISI PIC X(4).
47
48 LINKAGE SECTION.
49 01 RCNT PIC S9(9) USAGE IS BINA
50 01 VCNT PIC S9(9) USAGE IS BINA
51 01 CCNT PIC S9(9) USAGE IS BINA
52 01 IOPCB.
53 02 IO-LTERM PIC X(8).
54 02 IO-RESV PIC X(2).
55 02 IO-STATUS PIC X(2).
56 02 IO-PREF PIC X(12).
57 02 IO-MODN PIC X(8).
58 02 IO-USERID PIC X(8).
59 02 IO-GROUPID PIC X(8).
60 PROCEDURE DIVISION USING RCNT, CCNT,
61 BY VALUE VCNT,
62 BY REFERENCE IOPCB.
63
64 DISPLAY "***** ENTER IAP26A *****"
65 DISPLAY "RCNT BY REFERENCE: ", RCNT, " BY CO
66 DISPLAY "VCNT BY VALUE: ", VCNT.
67 ENTRY 'DLITCBL' USING IOPCB.
68
69
70
71
72
73
74
75
76
77
78
79
80
81

```

Local Variables - Thread: 1

File Edit Options Windows Help

```

- IOPCB
IO-LTERM
IO-RESV
IO-STATUS
IO-PREF
IO-MODN
IO-USERID
IO-GROUPID
CCNT +0000001910
VCNT +0000001110
RCNT +0000000010
- FC
SEV +00000
MSGNO +00000
FLGS
FACID
ISI
- CEETEST-PARMS
CMD-LENGTH
CMD-LIST
- DLI-MSG

```

Program Monitor

File Edit Options Windows Help

```

VCNT +0000001110
*****
TUS CODES
*****

```

```

Source: IAP26A - Thread :1
File View Breakpoints Monitors Run Options Windows Help

44 05 FLGS PIC X(1).
45 05 FACID PIC X(3).
46 05 ISI PIC X(4).
47
48 LINKAGE SECTION.
49 01 RCNT PIC S9(9) USAGE IS BINARY.
50 01 VCNT PIC S9(9) USAGE IS BINARY.
51 01 CCNT PIC S9(9) USAGE IS BINARY.
52 01 IOPCB PIC X(8).
53 02 IO-ITERM PIC X(8).
54 02 IO-RESV PIC X(2).
55 02 IO-STATUS PIC X(2).
56 02 IO-PREF PIC X(12).
57 02 IO-MODN PIC X(8).
58 02 IO-USERID PIC X(8).
59 02 IO-GROUPID PIC X(8).
60 PROCEDURE DIVISION USING RCNT, CCNT,
61 BY VALUE VCNT,
62 BY REFERENCE IOPCB.
63 DISPLAY "***** ENTER IAP26A *****".
64 DISPLAY "RCNT BY REFERENCE: ", RCNT, " BY CONTENT: ", CCNT.
65 DISPLAY "VCNT BY VALUE : ", VCNT.
66 * ENTRY 'DLITCBL' USING IOPCB.
67 *****
68 * GET IMS MESSAGES FROM INPUT QUEUE AND PROCESS
69 *****
70 GET-IMS-MSG.
71 COMPUTE VCNT = VCNT + 100.
72 CALL 'CBLTDLI' USING GU-FUNC, IOPCB,
73 INEDIT-MESSAGE.

```

Breakpoints List								
File	Set	Options	Windows	Help				
Type	Executable	Source	File	Function	Line	Address	State	Status
	IAPMDI26	IAP26A	USER.IMSTM.ROPT.LISTING(IAP26A]	IAP26A	71	0X0002E730	Enabled	Active

```

Source: IAP26A - Thread :1
File View Breakpoints Monitors Run Options Windows Help

44 05 FLGS PIC X(1).
45 05 FACID PIC X(3).
46 05 ISI PIC X(4).
47
48 LINKAGE SECTION.
49 01 RCNT PIC S9(9) USAGE IS BINARY.
50 01 VCNT PIC S9(9) USAGE IS BINARY.
51 01 CCNT PIC S9(9) USAGE IS BINARY.
52 01 IOPCB.
53 02 IO-ITERM PIC X(8).
54 02 IO-RESV PIC X(2).
55 02 IO-STATUS PIC X(2).
56 02 IO-PREF PIC X(12).
57 02 IO-MODN PIC X(8).
58 02 IO-USERID PIC X(8).
59 02 IO-GROUPID PIC X(8).
60 PROCEDURE DIVISION USING RCNT, CCNT,
61 BY VALUE VCNT,
62 BY REFERENCE IOPCB.
63 DISPLAY "***** ENTER IAP26A *****".
64 DISPLAY "RCNT BY REFERENCE: ", RCNT, " BY CONTENT: ", CCNT.
65 DISPLAY "VCNT BY VALUE : ", VCNT.
66 ENTRY 'DLITCBL' USING IOPCB.
67 *****
68 * GET IMS MESSAGES FROM INPUT QUEUE AND PROCESS
69 *****
70 GET-IMS-MSG.
71 COMPUTE VCNT = VCNT + 100.
72 CALL 'CONTINUE' USING CC, FBMS, TABCB.

```

Storage - 0002E420 HEX and Character

Flat	00	04	08	0C	HEX and Character
0002E420	47F0F028	00C3C5C5	000000B0	00000014	00..CEE.....
0002E430	47F0F001	98CEAC00	0002E4D6	00000000	.00.q.....UO....
0002E440	00000000	00000000	90ECD00C	4110F0380.
0002E450	98EFF04C	07FF0000	0002E420	00000000	q.0<.....U.....
0002E460	00030A58	0002E4CE	0002E420	0002E66CU...U...W%
0002E470	000314A8	0002E4EA	00104001	00000008	...y..U...
0002E480	C9C1D7F2	F6C14040	F2F0F0F0	F0F8F2F3	IAP26A 20000823
0002E490	F1F2F1F6	F0F9F0F2	F0F2F0F0	00000000	121609020200....

```

*****
* ER
*****
D-R

```



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Stacks Breakpoints Modules

Stacks

- Thread 1

Source

Thread 1: USER.IMSTM.ROPT.LISTING(COBIMS1)

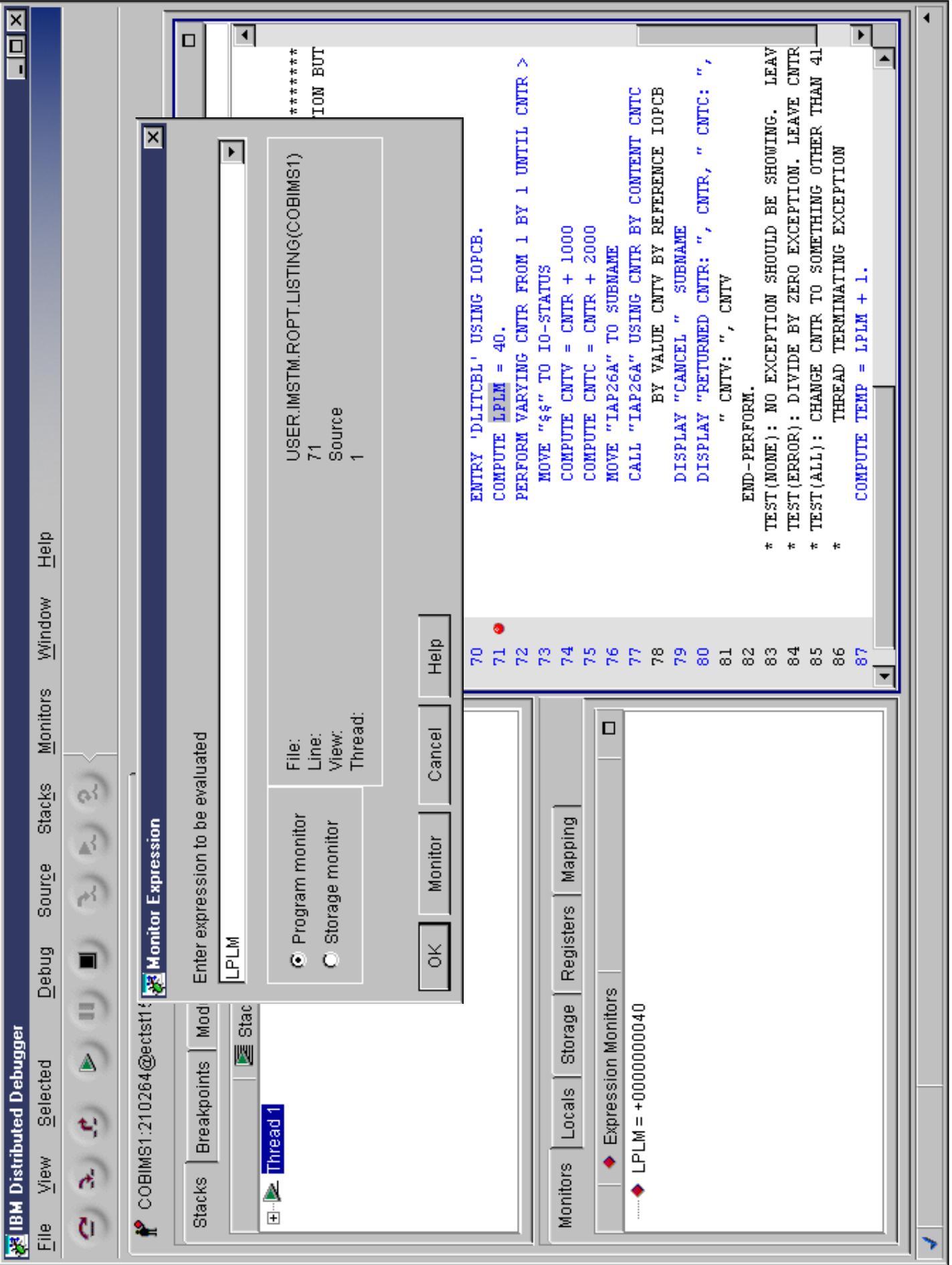
```

60      PROCEDURE DIVISION.
61
62      *****
63      * CALL CEETEST IF NOT COMPILED WITH TEST OPTION BUT
64      * WANT TO INVOKE THE DEBUGGER
65      * MOVE SPACES TO CMD-LIST.
66      * MOVE ";" TO CMD-LIST.
67      * CALL "CEETEST" USING CEETEST-PARMS FC.
68      * DISPLAY "CEETEST-PARMS" CEETEST-PARMS.
69      * DISPLAY "FC " FC.
70      ENTRY 'DLITCBL' USING IOPCB.
71      COMPUTE LPLM = 40.
72      PERFORM VARYING CNTR FROM 1 BY 1 UNTIL CNTR >
73      MOVE "%%" TO IO-STATUS
74      COMPUTE CNTV = CNTR + 1000
75      COMPUTE CNTC = CNTR + 2000
76      MOVE "IAP26A" TO SUBNAME
77      CALL "IAP26A" USING CNTR BY CONTENT CNTC
78      BY VALUE CNTV BY REFERENCE IOPCB
79      DISPLAY "CANCEL " SUBNAME
80      DISPLAY "RETURNED CNTR: ", CNTR, " CNTC: ",
81      " CNTV: ", CNTV
82      END-PERFORM.
83      * TEST(NONE): NO EXCEPTION SHOULD BE SHOWING. LEAV
84      * TEST(ERROR): DIVIDE BY ZERO EXCEPTION. LEAVE CNTR
85      * TEST(ALL): CHANGE CNTR TO SOMETHING OTHER THAN 41
86      *      THREAD TERMINATING EXCEPTION
87      COMPUTE TEMP = LPLM + 1.
    
```

Monitors Locals Storage Registers Mapping

Locals

- Thread 1
 - GU-FUNC = 'GU'
 - ROLL-FUNC = 'ROLL'
 - DISPLAY-LL = 000000
 - DISPLAY-ZZ = 000000
 - INPUT-MESSAGE
 - LPLM = +0000000040
 - DLI-MSG
 - SUBNAME = 'IAP26A'
 - CNTR = +0000000001
 - CNTC = +0000002001





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Stacks Breakpoints Modules

Stacks

- Thread 1

Source

Thread 1: USER.IMSTM.ROPT.LISTING(COBIMS1)

```

60 PROCEDURE DIVISION.
61
62 *****
63 * CALL CEETEST IF NOT COMPILED WITH TEST OPTION BUT
64 * WANT TO INVOKE THE DEBUGGER
65 * MOVE SPACES TO CMD-LIST.
66 * MOVE ";" TO CMD-LIST.
67 * CALL "CEETEST" USING CEETEST-PARMS FC.
68 * DISPLAY "CEETEST-PARMS" CEETEST-PARMS.
69 * DISPLAY "FC " FC.
70 ENTRY 'DLITCBL' USING IOPCB.
71 COMPUTE LPLM = 40.
72 PERFORM VARYING CNTR FROM 1 BY 1 UNTIL CNTR >
73 MOVE "%%" TO IO-STATUS
74 COMPUTE CNTV = CNTR + 1000
75 COMPUTE CNTC = CNTR + 2000
76 MOVE "IAP26A" TO SUBNAME
77 CALL "IAP26A" USING CNTR BY CONTENT CNTC
78 BY VALUE CNTV BY REFERENCE IOPCB
79 DISPLAY "CANCEL " SUBNAME
80 DISPLAY "RETURNED CNTR: ", CNTR, " CNTC: ",
81 " CNTV: ", CNTV
82 END-PERFORM.
83 * TEST(NONE): NO EXCEPTION SHOULD BE SHOWING. LEAV
84 * TEST(ERROR): DIVIDE BY ZERO EXCEPTION. LEAVE CNTR
85 * TEST(ALL): CHANGE CNTR TO SOMETHING OTHER THAN 41
86 * THREAD TERMINATING EXCEPTION
87 COMPUTE TEMP = LPLM + 1.
    
```

Monitors Locals Storage Registers Mapping

Flat	00	01	02	03	HEX and Character
0002B468	47	F0	28	.00.	
0002B46C	00	C3	C5	.CEE	
0002B470	00	00	C0	...{	
0002B474	00	00	14	...	
0002B478	47	F0	01	.00.	
0002B47C	98	CE	AC	00	q...
0002B480	00	02	B5	1E	...
0002B484	00	00	00	00	...

Content Style: HEX and Character Columns Per Line: 4



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Stacks Breakpoints Modules

Breakpoints

Line Breakpoints
 Source: USER.IMSTM.ROPT.LISTING(COBIMS1) Line: 71

Thread 1: USER.IMSTM.ROPT.LISTING(COBIMS1)

Source

```

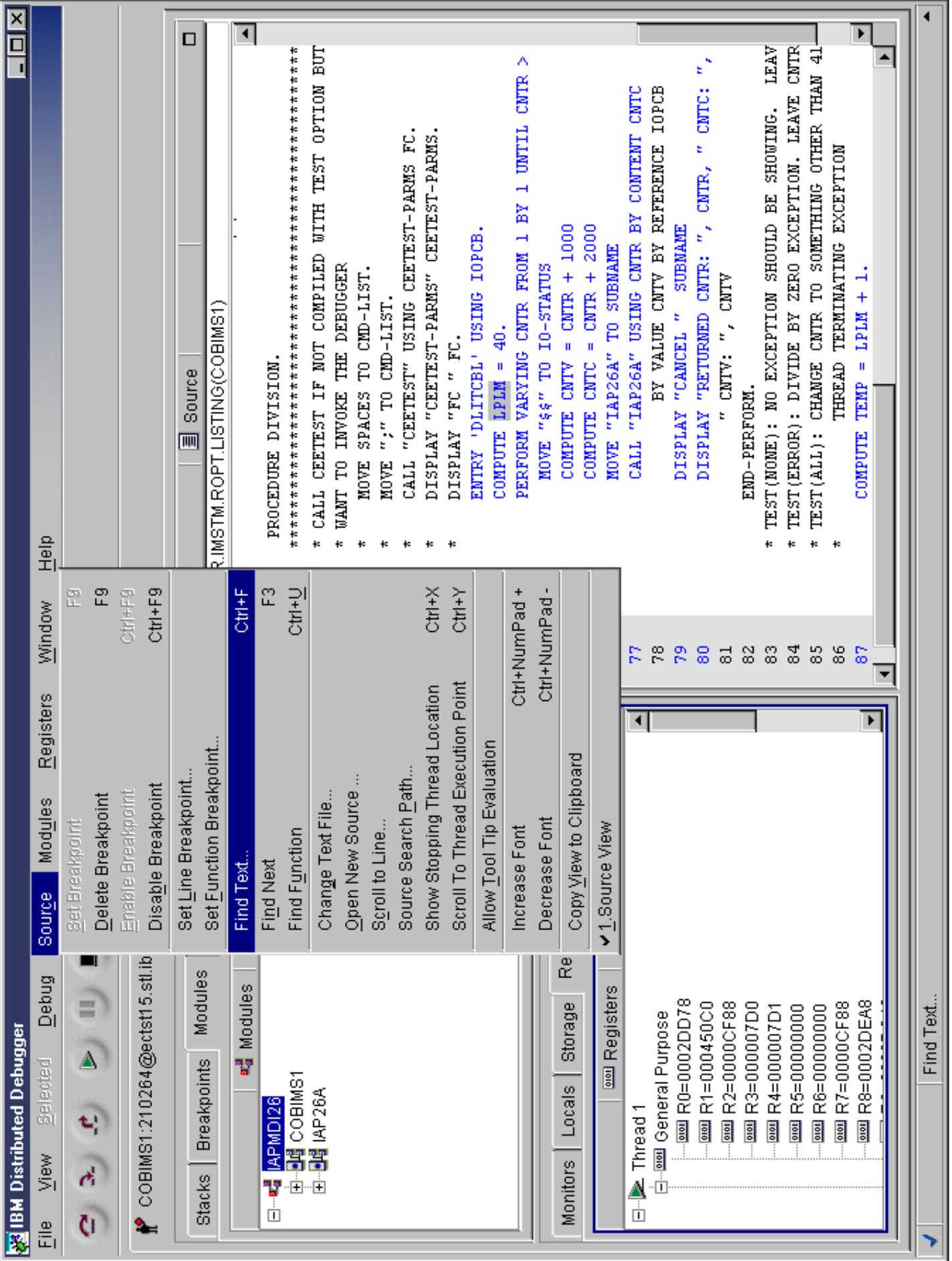
60      PROCEDURE DIVISION.
61
62      *****
63      * CALL CEEEST IF NOT COMPILED WITH TEST OPTION BUT
64      * WANT TO INVOKE THE DEBUGGER
65      * MOVE SPACES TO CMD-LIST.
66      * MOVE ";" TO CMD-LIST.
67      * CALL "CEEEST" USING CEEEST-PARMS FC.
68      * DISPLAY "CEEEST-PARMS" CEEEST-PARMS.
69      * DISPLAY "FC " FC.
70      ENTRY 'DLITCBL' USING IOPCB.
71      COMPUTE LPLM = 40.
72      PERFORM VARYING CNTR FROM 1 BY 1 UNTIL CNTR >
73      MOVE "%%" TO IO-STATUS
74      COMPUTE CNTV = CNTR + 1000
75      COMPUTE CNTC = CNTR + 2000
76      MOVE "IAP26A" TO SUBNAME
77      CALL "IAP26A" USING CNTR BY CONTENT CNTC
78      BY VALUE CNTV BY REFERENCE IOPCB
79      DISPLAY "CANCEL " SUBNAME
80      DISPLAY "RETURNED CNTR: ", CNTR, " CNTC: ",
81      " CNTV: ", CNTV
82      END-PERFORM.
83      * TEST(NONE): NO EXCEPTION SHOULD BE SHOWING. LEAV
84      * TEST(ERROR): DIVIDE BY ZERO EXCEPTION. LEAVE CNTR
85      * TEST(ALL): CHANGE CNTR TO SOMETHING OTHER THAN 41
86      *      THREAD TERMINATING EXCEPTION
87      COMPUTE TEMP = LPLM + 1.
    
```

Monitors Locals Storage Registers Mapping

Registers

Thread 1

- General Purpose
- Special Purpose
- Floating Point
- Double Floating Point
- Long Floating Point



R.IMSTM.ROPT.LISTING(COBIMIS1)

```

PROCEDURE DIVISION.
*****
* CALL CEETEST IF NOT COMPILED WITH TEST OPTION BUT
* WANT TO INVOKE THE DEBUGGER
* MOVE SPACES TO CMD-LIST.
* MOVE ";" TO CMD-LIST.
* CALL "CEETEST" USING CEETEST-PARMS FC.
* DISPLAY "CEETEST-PARMS" CEETEST-PARMS.
* DISPLAY "FC " FC.
ENTRY 'DLITCBL' USING IOPCB.
COMPUTE LPLM = 40.
PERFORM VARYING CNTR FROM 1 BY 1 UNTIL CNTR >
MOVE "%%" TO IO-STATUS
COMPUTE CNTV = CNTR + 1000
COMPUTE CNTC = CNTR + 2000
MOVE "IAP26A" TO SUBNAME
CALL "IAP26A" USING CNTR BY CONTENT CNTC
BY VALUE CNTV BY REFERENCE IOPCB
DISPLAY "CANCEL " SUBNAME
DISPLAY "RETURNED CNTR: ", CNTR, " CNTVC: ",
" CNTV: ", CNTV
END-PERFORM.
* TEST(NONE): NO EXCEPTION SHOULD BE SHOWING. LEAV
* TEST(ERROR): DIVIDE BY ZERO EXCEPTION. LEAVE CNTR
* TEST(ALL): CHANGE CNTR TO SOMETHING OTHER THAN 41
* THREAD TERMINATING EXCEPTION
COMPUTE TEMP = LPLM + 1.

```

- Set Breakpoint F9
- Delete Breakpoint F9
- Enable Breakpoint Ctrl+F9
- Disable Breakpoint Ctrl+F9
- Set Line Breakpoint...
- Set Function Breakpoint...
- Find Text... Ctrl+F
- Find Next F3
- Find Function Ctrl+U
- Change Text File...
- Open New Source ...
- Scroll to Line...
- Source Search Path...
- Show Stopping Thread Location Ctrl+X
- Scroll To Thread Execution Point Ctrl+Y
- Allow Tool Tip Evaluation
- Increase Font Ctrl+NumPad +
- Decrease Font Ctrl+NumPad -
- Copy View to Clipboard
- 1.Source View

Registers

Thread 1	General Purpose
	R0=0002DD78
	R1=000450C0
	R2=0000CF88
	R3=000007D0
	R4=000007D1
	R5=00000000
	R6=00000000
	R7=0000CF88
	R8=0002DEA8

Find Text...



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Stacks Breakpoints Modules

Modules

- IAPMDI26
- COBIMS1
- IAP26A

Thread 1: USER.IMSTM.ROPT.LISTING(COBIMS1)

Source

```

60      PROCEDURE DIVISION.
61
62      *****
63      * CALL CEEEST IF NOT COMPILED WITH TEST OPTION BUT
64      * WANT TO INVOKE THE DEBUGGER
65      * MOVE SPACES TO CMD-LIST.
66      * MOVE ";" TO CMD-LIST.
67      * CALL "CEEEST" USING CEEEST-PARMS FC.
68      * DISPLAY "CEEEST-PARMS" CEEEST-PARMS.
69      * DISPLAY "FC " FC.
70      ENTRY 'DLITCBL' USING IOPCB.
71      COMPUTE LPLM = 40
72      PERFORM VA
73      MOVE " $$
74      COMPUTE
75      COMPUTE
76      MOVE "IA
77      CALL "IA
78
79      DISPLAY "CANCEL " SUBNAME
80      DISPLAY "RETURNED CNTR: ", CNTR, " CNTVC: ",
81      " CNTV: ", CNTV
82      END-PERFORM.
83      * TEST(NONE): NO EXCEPTION SHOULD BE SHOWING. LEAV
84      * TEST(ERROR): DIVIDE BY ZERO EXCEPTION. LEAVE CNTR
85      * TEST(ALL): CHANGE CNTR TO SOMETHING OTHER THAN 41
86      *      THREAD TERMINATING EXCEPTION
87      COMPUTE TEMP = LPLM + 1.
    
```

Context menu options: Add to Program Monitor, Add to Storage Monitor, Copy to Clipboard, Find, Find Next, Find Function, F3, UNTIL CNTR >

Monitors Locals Storage Registers Mapping

Registers

Thread 1

- General Purpose
 - R0=0002DD78
 - R1=000450C0
 - R2=0000CF88
 - R3=000007D0
 - R4=000007D1
 - R5=00000000
 - R6=00000000
 - R7=0000CF88
 - R8=0002DEA8

Contacts and more information

<http://www.s390.ibm.com/dt>

CODE/370 CFORUM on TALKLINK

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General Information

Debug Tool provides advanced facilities for debugging and testing applications compiled with the following IBM high-level language compilers:

- VisualAge for Java, Enterprise Edition for OS/390 (remote debug only)
- IBM COBOL for OS/390 & VM
- IBM COBOL for MVS & VM
- IBM C/C++ for MVS & VM
- IBM OS/390 C/C++
- IBM VisualAge PL/I for OS/390
- IBM PL/I for MVS & VM
- IBM COBOL for VSE/ESA
- IBM C for VSE/ESA
- IBM PL/I for VSE/ESA

On the next page, you can debug applications interactively with the VisualAge

Document Done